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THE INFLUENCE OF A LEARNING GOAL ORIENTATION ON THE INFLUENCE OF ANTECEDENTS OF FLOW

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INTRODUCTION

In this master thesis I will present a research on the use of Serious Games (SG). Especially I want to highlight the possibilities of SGs for learning purposes.
After introducing the concept of a SG, I will explain in more detail what is important for learning environments. Also I will explain in detail the research that has been done in the past on Information Management and games especially in order then to come to my hypothesis.
The main goal of thesis will be:

- **to examine the influence of a learning Goal Orientation" (LGO), on the influence of antecedents of Flow.**

I will explain the way I have set up my research and data collection and also I will show in detail the analysis of these data. After that I will share the results that have been obtained by doing this research.
As a result this research will show that there are at least five antecedents of Flow: Challenge, Playfulness, Feedback, Focussed Attention and Clear Goals.
Also this research will show that on none of these five antecedent LGO has a significant moderating influence, although for Playfulness and Control the results are very interesting.
In a discussion I will advise both the academic world and the business world and I will end with a conclusion wherein I conclude that this research is useful, needed that there is still a lot to do, and having said that there could also be a new way of looking at this discourse and field of expertise.

Martijn Lageveen

p.s.
I also would like to thank Matthias Trier a lot. First for his enthusiasm on this topic: He helped me a lot during our conversations. Also he has given me a lot of advice that has helped me to be able to finish this research. It was a pleasure to work with / and to learn from him.

CONTENT

I. WHAT IS A SERIOUS GAME?
AN OVERVIEW

In this chapter I will introduce the concept "serious game". I will go back in history and will explain how the concept has evolved and what connotations can be made, what the current use is of serious games, what problems are present at this time and what future possibilities are.

DEFINITIONS

It seems wise to first introduce the term "serious game". First maybe look into the term "play" in order to later understand also why many terms come back in all SG research. One of the first persons to talk about play was the Dutch historian Johan Huizinga who with his book Homo Ludens gave the following definition: "play as a free and meaningful activity, carried out for its own sake, spatially and temporally segregated from the requirements of practical life, and bound by a self-contained system of rules that holds absolutely." According to Huizinga play is by definition not a serious activity. Herewith the contradiction in playing a "serious game" is born. How can something that by definition is not serious be serious? Rodriguez (2006).

According to Rodriguez every ludic experience is characterized and individuated with reference to the various rules and resources available to the person. Different types of play can be distinguished from one another via the structures that underpin them. For instance, playing games differs from playing with toys because the former typically specifies winning conditions; game rules normally determine what counts as victory or defeat. The winner may, for instance, score more points than the opponents, arrive first at a certain location, or achieve checkmate. Thus the quality of the player's experience depends, at least to some extent, on the structure of norms and resources that guide or organize the actions. Herewith the term "game" has also been introduced as the area (with boundaries) where play can be experienced. Interestingly the scholar in his article writes about the fact that serious gaming is often considered a medium of education and sometimes also for social change. Are these efforts incompatible with Huizinga's claims about the fundamental difference between play and seriousness? Does the serious game designer misunderstand the essential nature of play?

With this insight I have still not given any definition for the term "serious game". One of the definitions used and referred to is the definition by Zyda (2005): "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."

The definition is an important one, because firstly it explains the direction, intention and goal of the game that makes it "serious", second it states clearly the different types of use, and finally, not the least important, this definition mentions the fact that these objectives should be met by using entertainment.

Corti (2006) comes with a slightly different angle. Although he is aware of the fact that serious games can be used for many purposes he merely focuses on the fact that it is a tool for game based learning (GBL). "Games based Learning (a.k.a. 'Serious Games') is all about leveraging the power of computer games to captivate and engage end users for a specific purpose, such as to develop new knowledge and skills."

Wikipedia gives the following definition: "A serious game is a game designed for a primary purpose other than pure entertainment. The "serious" adjective is generally prepended to refer to products used by industries like defense, education, scientific exploration, health care, emergency management, city planning, engineering, religion, and politics. Serious games are designed for the purpose of solving a problem. Although serious games can be entertaining, their main purpose is to train, investigate, or advertise. Sometimes a game will deliberately sacrifice fun and entertainment in order to make a serious point. Whereas video game genres are classified by gameplay, serious games are not a game genre but a category of games with different purposes. This category includes educational games and advergames, political games, or evangelical games. The category of serious games for training is also known as "game-learning".

The last definition I would like to present is the one by Abt (1975): "We are concerned with serious games in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement."

SERIOUS GAMES, E-LEARNING AND OTHER CONCEPTS

It is clear when combining the definitions that learning is one of the important goals when we talk about a serious game. The fact that this should happen through entertainment makes serious games different to other computer based learning environments. In the work of Welsh et al. (2003) e-learning for example is said to be dominantly asynchronous and that all material is pre-recorded. Although they mention that synchronous e-learning tools exist, but then merely as in chat sessions, something that makes the experience slightly interactive, in sum e-learning is a tool that is passive. In the work of Breuer & Bente (2010) they give a nice

overview on how all types of (entertainment / computer based) learning environments are to be compared.

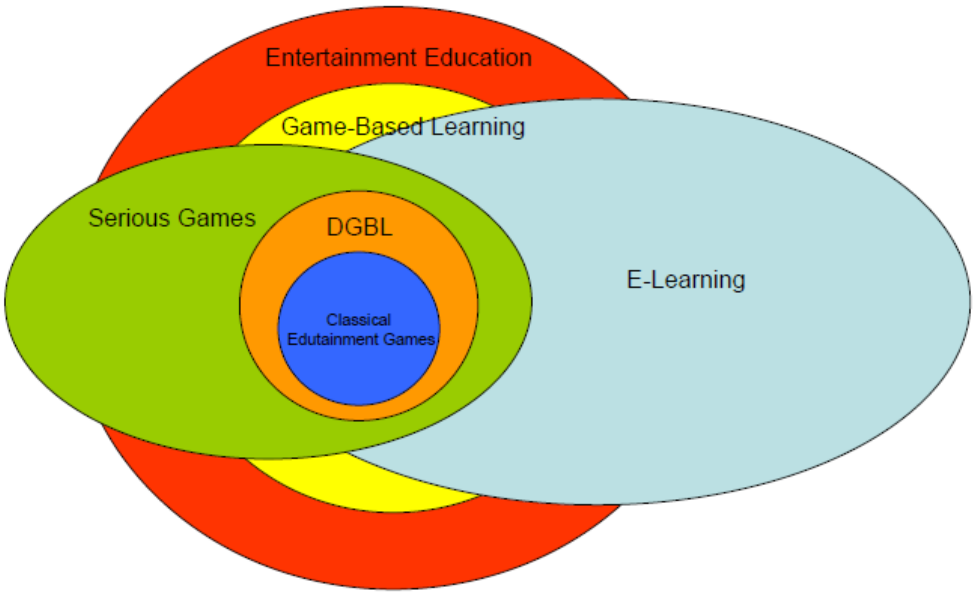

Figure 1. After Breuer and Bente, the relationship between serious games and similar educational concepts.

Entertainment education in their model refers to all attempts to make learning more enjoyable. It does not matter if it is media based, mediated or in a classroom setting. Game based learning are basically all games with the purpose to learn. Serious games can also go outside that spectrum but are definitely digital and digital game based learning is the spectrum that solely is aimed at education and learning. E-learning for them is different as in the fact that e-learning is, although digital, sole purpose is to educate and entertainment is no part of that.

Taken all of the above mentioned information together, when I speak of a serious game (SG), I shall use the definition of Zyda and solely in the field/ purpose of education/learning.

CREATION AND DEVELOPMENT OF SERIOUS GAMES

Since there are many different parties involved in the development of a serious game (SG), and with that many different angles, interests and questions, in this part of the thesis at least I would like to give a short overview of the playing field. For that I use a model by Zyda (2005):

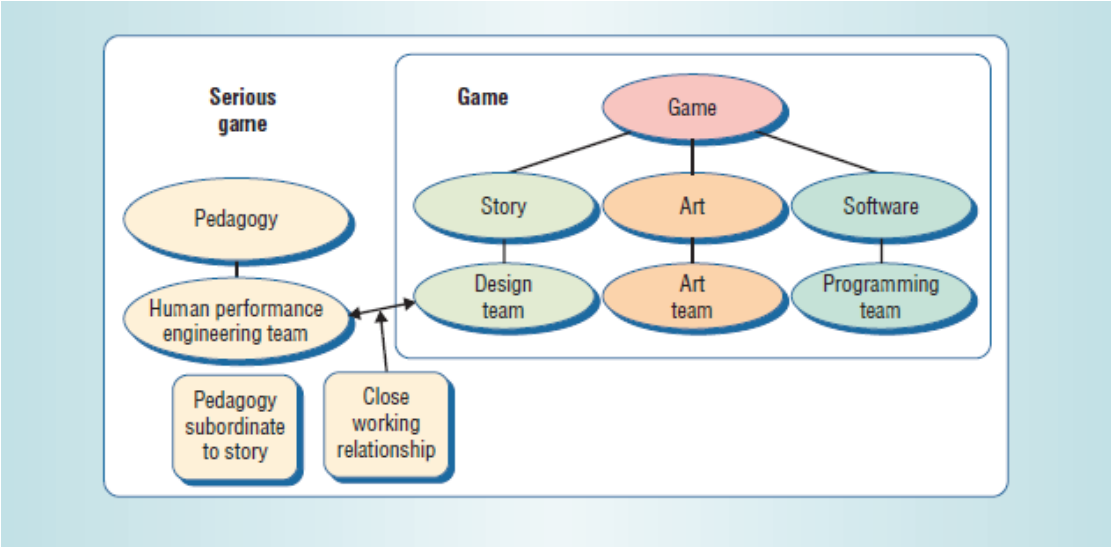

Figure 2. After Zyda, 2005

The model makes clear that in order to be able to develop a good SG many fields of expertise are needed. First you need software programmers to write the code that is in the game; they are responsible for all technical aspects of the project like with any other IT related project. Second you need a good art team that will create a beautiful and attractive environment for the user to play. They are responsible for the 'look and feel' of the product. Third, the environments and pictures need to be embedded in a credible and logical storyline, the entertainment value is incorporated in that and for that this also is important. But merely developing a game that is fun to play, cool to watch, has cool music and sounds and in order to play it, is easy to connect to via internet or to install on your computer, all that is not enough when we are talking about a SG. Where the development team in a solely commercial environment might talk to the marketers and sales representatives in order to know what customers want so they can sell more products, SG has a goal and an underlying purpose as has been addressed in the previous part. For that a very close working relationship with other disciplines is also needed. Zyda calls the representatives of these disciplines "the human performance engineering team". In that team pedagogical issues are addressed as in the form and the process of learning, but also people who deliver the content, experts in subjects to be taught, need to have their influence. Of course the other stakeholders are the users who will play the game and the organisations that have to invest time and resources. One further and for this thesis it is important observation to make, is that in the end, although learning and development is the goal of the SG, all the efforts need to be subordinate to the story and the look and feel of the game. If you want to have a SG, this game has to be able to be different to the other types of learning that are out there. SGs have to be entertaining and they have to

teach. Based on this observation the following two chapters will have the focus on the educational part, the learning and the information system management part (ISM).

II. WHAT IS IMPORTANT WHEN USING SERIOUS GAMES?

(The learning perspective)

In this chapter I will look into the research that has been conducted on the use of SG where the main aim clearly is learning. First I will go into what learning is according to various scholars. Then I will give attention to the role of game features that make the design and which have an impact on the learning outcome when using the SG, I will focus on two key factors that come back in all research on learning: goal setting and feedback, and finally I will address in more detail the role of goal orientation as that is one of the key components in this thesis, a so called moderator.

LEARNING

In this thesis the focus within the arena of SGs lies in the domain of learning. For this reason I want to highlight several perspectives on learning theory that are influencing the academic discourse and (also with that) the development of SGs in real time. In their article on theories of learning, Siang and Rao (2003) for example mention behavioural learning, cognitive learning and motivation theory.

In **behavioural learning theory** the most important is the reinforcement of behaviour, the change of this behaviour, depending upon the perceived outcome of the action. Behaviour therein is dependent upon external stimuli. This is important as SG depend on action and result combinations. In their article they mention two distinct types of ways to come to this behavioural change. The first is *classical conditioning* (Pavlov). The idea behind this is that a user of the game will be exposed to various (conditioned and unconditioned) stimuli and through combination of several environmental situations starts to combine actions and situations in order to achieve a result. This can lead to (unintended but still effective) behavioural change. The next type is *operant conditioning* where by accident behaviour is being discovered. According to Skinner this is because there are two different types of behaviour; respondent behaviour elicited by a known stimulus and operant behaviour which is elicited just by the user because it can. In a way this is a trial and error technique. Although the two types are close they are different. The authors mention two opposite types of rein forcers, positive and negative. One could state that the abovementioned theories are happening to the games/user, they adapt and change, become more effective and for that progress and learn.

If the user of SG is actually intentionally changing the behaviour and actions one can state that this is happening due to cognitive effort, the thinking. Learning is in this case more a complex process that utilises problem solving in addition of the stimulus-response chain. Building blocks that make this **cognitive learning theory** viable for example are memory processing, remembering and forgetting and constructivism. The building blocks together make a chain that starts with receiving the stimulus, process this stimulus, find connections on various levels and be able to combine these levels in order to come up with solutions. Key is of course that one is able to find back the solutions; otherwise the process needs to be repeated in a never ending loop. I guess being able to retrieve the information and use it correctly to achieve the wanted outcome is learning in this case. Even one could say the distinction between single- and double loop learning can be in place (Argyris 1976).

The last angle these scholars mentioned in learning theory is **motivation theory** based on the hierarchy of needs by Maslow. They adapted the model to the game environment. It all has to do with motivating the user/gamer to play the game. It start out with knowing the rules of the game, then the need to feel secure in order to widen their range of activities, third they then have to feel comfortable and feel that they can be in that environment, that they belong there. When in that stage the user can feel good and develop esteem. When they can control the environment they like to understand and know more about the game. Not before then they will also focus on good graphics, sounds and other aesthetic needs in order to be and stay motivated to play. Not until then they will feel that they want to do anything in the environment that they are in; self-fulfilment. "Graphics alone would not safe the bad gameplay" according to Siang and Rao (2003).

Another important approach was introduced by Kolb (1984). According to him, **experiential learning** consists of four stages: a concrete experience, the collection of information and data and reflection based upon that experience, the next stage is the forming of abstract concepts and ideas on how things might work, and the last stage is testing the formed hypothesis. This then would lead to the first stage and the cycle repeats itself.

The last influential mainstream I would like to introduce as useful to SGs in this thesis is the **cognitive load theory**. Merrienboer and Sluijsmans (2009) state in their article that learning a task consists of three elements: learners must first perform the task, then assess their task performance and at last select future tasks to improve their performance. Key of the cognitive load theory is that people cannot deal with unlimited cognitive input without losing their capacity to stay in control of the learning process; an overload of working memory. To the scholars it is important that there will remain a balance between *intrinsic* and *extraneous cognitive load*. The primary being the challenge and complexity of the task itself and the latter the complexity of the environment that can inhibit focus on the task at hand and that has

nothing to do with the first. *Germane cognitive load* is the positive counterpart of extraneous cognitive load as it is helping to fulfil the primary task.

Al of the above general theories of learning have had an impact upon the design and development of SGs for learning. They do not exclude each other but are complimentary. The abovementioned theories help to understand the way of analysing and perceiving a game. In the next part I will focus more on the actual advice and recommendations in the field of SGs and learning. The next part will try to incorporate the cognitive, learning and pedagogical principles into the design in order to explain how to improve training effectiveness.

LEARNING, SERIOUS GAMES AND DESIGN

Greizner (2007) firstly likes to differentiate between simple and complex games. Simple games are finished within the hour. Complex games can take much longer than that and often combine many mini games wherein several learning purposes can be embedded. "What makes a complex game different from a mini-game is that a complex game requires a player to learn a wide variety of often new and difficult skills and strategies and to master these skills and strategies by advancing through dozens of ever-harder "levels." Doing this often requires both outside research and collaboration with others while playing." A number of features distinguish complex games according to the authors: levelling up, adaptability, clear and worthwhile goals, shared experiences and interaction with other players. Garris et al. (2002) use the following model to combine games and learning:

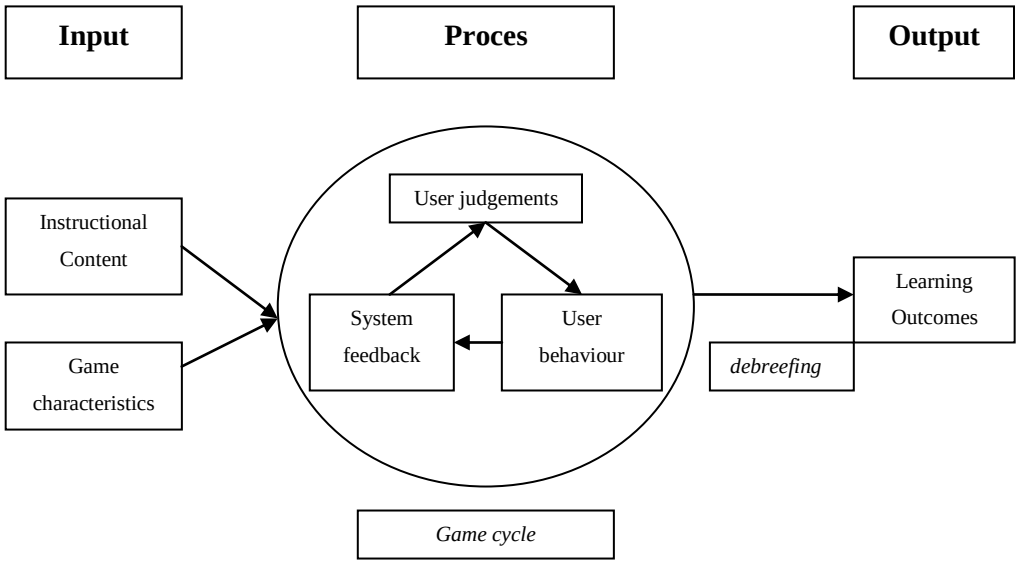

Figure 3: Input, process, output model after Garris et al. 2002

They see the game cycle as an iterative process where judgement-behaviour feedback loops are central. By receiving the stimuli the gamer develops a certain behaviour and attitude by the feedback the system is giving. This feedback is an assessment of the goal and performance gap; in other words, how well have you done your task. By trying to improve the performance the authors distinguish between three forms of learning: skill based knowledge as in technical and motor skills, cognitive knowledge as in declarative-, procedural- and strategic knowledge and the third form of learning would be affective learning, referring to attitudes.

Wilson et al. (2008) second this analysis. In their article furthermore they state that it is of the upmost importance that the game and its design, the features that will send the stimuli to the gamer, need to be made as tailor made as possible based upon the learning goal. They clearly state that it is very important to study the impact of attributes on the learning outcomes: "It is not clear whether one attribute had a greater impact on learning than another, or whether it was the combination of attributes that led to success. Therefore, future research must seek to understand which specific game attribute(s) have the greatest impact on learning."

Moreno-Ger et al. (2008) highlight that in the game design it is very important to incorporate adaptation and assessment features. They state that this can keep the balance between fun and educational value through matching the game with learning styles, different levels of initial knowledge and different expectations and objectives.

According to Ahdell & Andersen (2001) it is important that for people to be able to learn by SG some requirements need to be met. Motivational factors as in willingness to learn and expectations. In-game factors as in content, learning design and engagement. Finally mentoring and collaboration being the social factors.

According to Chen en Michael (2005) and also Breuer en Bente (2009) key in the success of a SG will be the ability to assess and measure. This to be able to inform, give feedback, about progress and results to teachers, companies, students. One wants to know the outcome of the learning process. Key for that is data collection, interpretation of the data and the feedback itself. There are three forms of assessment according to the scholars. First there is completion assessment, did one finish/pass the test or not. Second in-process assessment, how and when a player of the SG did what to the idea of formative assessment and last teacher assessment by observation and judgement and witch is external. The last form in a way is not interesting for this research; it is interesting to companies though. Breuer en Bente state that to be able to measure and assess, first there need to be clear goals set so one knows what to measure. Then a competence model needs to be developed with a constellation of skills, knowledge and abilities. Next to that one needs an evidence model that will measure the performance and

actions. They call this evidence centred design. For them feedback is the central mechanism for both gaming and learning.

In an article by Graesser and Jackson (2007) they showed that there are two forms of feedback, content feedback and progress feedback. The former having a positive influence on learning but not on motivation and progress feedback influencing motivation positively. It is clear that feedback can be interpreted differently and that the quality of feedback can vary.

Where measurement and feedback are key for the previous scholars, and although goal setting is shortly mentioned by Bente en Breuer, for Watt (2009) the goal setting is key. Where the goal setting stops the feedback can begin. Good goal articulation into a set of empirically observable outcomes is eminent for him. Otherwise you never know what to measure and why you are doing this.

GOAL ORIENTATION AS MODERATOR

It is clear that a SG sends stimuli to a gamer, and that the gamer will interpret these interesting or boring, good or bad, beautiful or ugly stimuli (on the quality of stimuli later more). The way that these stimuli are being perceived and processed depends then again upon the qualities of the receiver, the gamer. Ennemoser (2009) mentions in his article the influence of moderators. The fact that feedback loops are in place, that goals are clear and set and also communicated does not change this. He mentions difference in goal orientation as being one: “For example, the path between mediator and outcome variable (e.g. between entertainment experience and knowledge gain) might be moderated by variables like goal orientation…” He uses the following model to explain this (modified from Bucy and Tao 2007

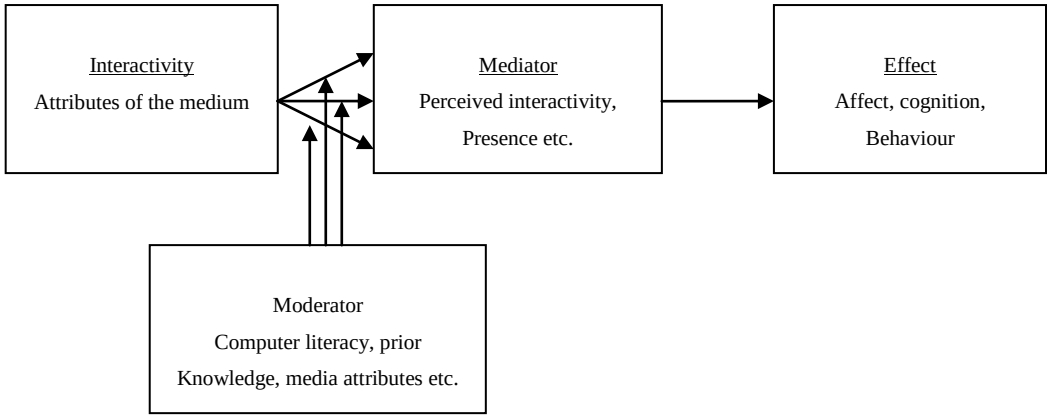

Figure 4: after Ennemoser (2009)

What Ennemoser states id that future development will be a complex process, "we have to consider third variables, include mediating variables, in order to explain and further optimize the potential of an (learning) intervention and we must take into account moderating variables that govern the magnitude or direction of effects". This means that next to hedonic features that make an (interactive) game, also other variables influence for example (perceived) goal setting and feedback among others.

So what is goal orientation exactly? Basically it is a disposition that a person has; A trait or quality that can differ across individuals. According to Gully and Phillips (1997) people hold either a learning or performance orientation toward a task. A learning orientation is characterized by a desire to increase ones task competence, whereas a performance orientation reflects a desire to do well and to be positively evaluated by others. Individuals who possess a high learning goal orientation are thought to believe that their abilities are malleable and thus approach tasks with the intention of developing their skills and abilities. Individuals with a high performance goal orientation, on the other hand, view their capacities as fixed, and perform the task solely with the intention of doing well. People with a high learning goal orientation will interpret experiences from the past, even when it is failure, as something positive since they can learn something from it. They also state that although traits, they might be situation ally manipulated. Also the scholars mention that it is not clear whether the two are on one and the same continuum in opposite directions or if they are separate constructs.

Matsui et al. (1982) have combined the, for learning environments so important feedback and goal setting, with goal orientation. In their study they found that subjects who were higher in achievement need set harder goals (in an open choice of goal setting situation) and performed better than did subjects who were lower in achievement need. Achievement need affected the

task motivation through its effect on the goal difficulty set by the subjects. Achievement need moderated the feedback-performance relationship. Suggested that the moderating effect of achievement need might result from the fact that the subjects who were higher in achievement need set harder goals than did the subjects who were lower in achievement need. This led the former to progress more slowly in relation to their goals than the latter; the high achievement need subjects performed better after than before the feedback.

In a study conducted by Seijts et al. (2004) they found that "a specific learning goal led to higher performance than did either a specific performance goal or a vague goal…" Additional "…goal orientation predicted performance when the goal was vague. The performance goal attenuated correlations between goal orientation and performance. The correlation between a learning goal orientation and performance was significant when a learning goal was set."

III. THEORETICAL FRAMEWORK AND OVERVIEW

(The information management perspective)

In order to be able to explain my research model that will be presented, it is important to first introduce an overview on the body of research that forms the basis. As it is my goal to try to explain the influence of a person's goal orientation on how flow antecedents influence Flow, and with that how the learning outcome by using the information system (serious game) can be influenced through the amount of flow and perceived enjoyment, I will first explain the TRA model and TAM. I will then highlight all external factors (based on PAT) that can have an influence on TAM in my model. Then I shall explain the reason why I have chosen to take goal orientation as a moderator. In the chapter after that I shall introduce the operationalization of the constructs in my model and also the methodology and hypotheses.

TRA

The history of research on interaction between people and information systems (IS research) and the use of ICT systems by individuals goes a long way back. If one would take into consideration the even more broadly defined Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) for example, this theory makes clear the broad range of research on this topic. The TRA model is not so much purely a theory aimed at explaining the use of IS, it is more a well-researched intention model that has proven successful in predicting and explaining behaviour across a wide variety of domains, including the use of IT as a special case. In short the TRA model states that a person's performance or specific behaviour is determined by his or her behavioural intention (BI) to perform the behaviour, and BI is jointly determined by the persons attitude (A) and subjective norm (SN) concerning the behaviour. As a model this would look as follows:

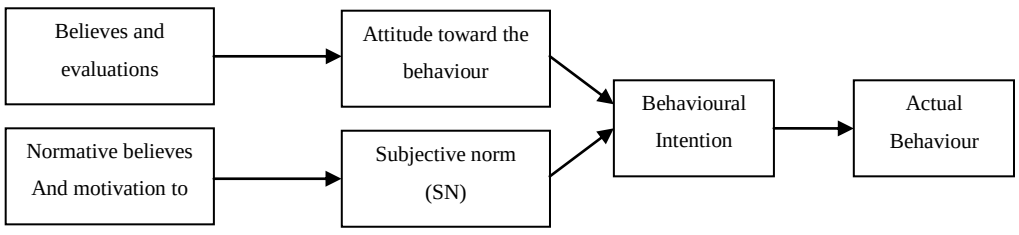

Figure 5. Theory of reasoned action (TRA).

One of the key features of this model is that it assumes that any other factors that influence behaviour do so only indirectly by influencing A or SN, meaning that for example system design characteristics, user characteristics (including cognitive style and other personality variables), task characteristics, nature of the development or implementation process, political influences, organizational structure and so on would fall into this category, which Fishbein and Ajzen (1975) refer to as "external variables".

TAM

Based on this model and the definition and positioning of these external variables Davis (1986) introduced and adaptation of the TRA model, namely TAM (Theory of Action Model). The goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations. A key purpose of TAM is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions. TAM looks as follows:

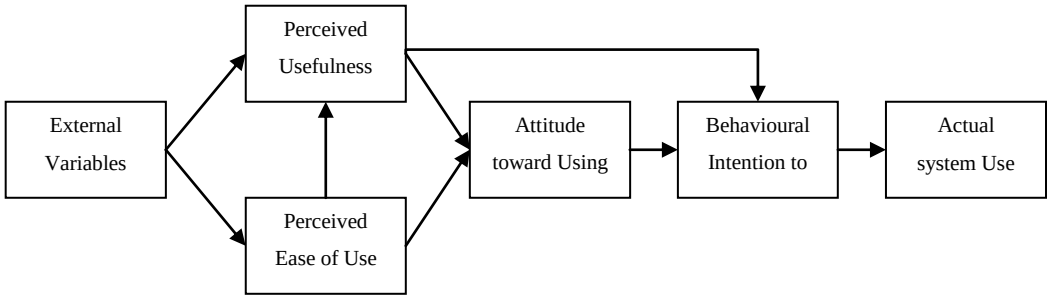

Figure 6. Technology Acceptance Model (TAM)

In the model two particular believes are of primary relevance for computer acceptance behaviours, perceived usefulness and perceived ease of use. Perceived usefulness (U) is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context. Perceived ease of use (EOU) refers to the degree to which the prospective user expects the target system to be free of effort (Davis, Bagozzi & Warshaw, 1989). Similar to TRA, TAM postulates that computer usage is determined by BI, but differs in that BI is viewed as being jointly determined by the person's attitude toward using the system (A) and perceived usefulness (U). The A-BI relationship represented in TAM implies that people form intentions to perform behaviours toward which they have positive affect. The A-BI relationship is fundamental to TRA. The U-BI relationship is based on the idea that, within organizational settings, people

form intentions toward behaviours they believe will increase their job performance, over and above whatever positive or negative feelings may be evoked toward the behaviour per se. EOU is also hypothesized to have a significant effect on A. TAM distinguishes two basic mechanisms by which EOU influences attitudes and behaviour: self-efficacy and instrumentality. The easier a system is to interact with, the greater should be the user's sense of efficacy and personal control regarding the ability to perform the behaviour needed to operate the system. Efficacy is thought to operate autonomously from instrumental determinants of behaviour. The direct EOU-A relationship is meant to capture this intrinsically motivating aspect of EOU. Improvements in EOU may also be instrumental, contributing to increased performance. Effort saved due to improved EOU may be redeployed, enabling a person to accomplish more work for the same effort. To the extent that increased EOU contributes to improved performance, as would be expected, EOU would have a direct effect on U. EOU and U are separate but related constructs in this model. The external variables in the model are for example the same factors as mentioned before in the TRA model. The authors (Davis, Bagozzi & Warshaw, 1989) again underline in their article, that although like the TRA model, it is the aim to predict and explain user behaviour, the TAM is especially designed to explain the impact of external variables. It's then also exactly for this reason that after the introduction of the model by Davis, many other scholars have used the TAM model as a basis for further research.

OTHER RESEACH ON TAM AND EXTERNAL FACTORS

Because the TAM model sets the door wide open for exploring the influence of external variables on peoples behaviour trough EOU en U where the (continued) use of IT and IS is concerned many researches did so and in these efforts a wide range of variables that could have this "external influence" have been reviewed. Venkatesh and Davis (2000) for example introduced their TAM2 model wherein various different factors have either influence on perceived usefulness (subjective norm, image, job relevance, output quality, result demonstrability, experience) or directly on intention to use (subjective norm). Venkatesh (2000) in his study on determinants of perceived ease of use mentioned computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment and objective usability. Hsu & Lu (2004) qualified the external factors as social influences (social norm and critical mass) and flow experience. Yeung & Jordan (2007) combined the TAMs perceived ease of use and usefulness constructs with the expectation-confirmation model by Bhattacherjee (2001) in order to explain continued usage of IS by people. In their research enjoyment was the external factor on both ease of use and usefulness.

Other scholars like Van der Heijden (2004) again stated that enjoyment would be influenced by the central construct perceived ease of use. Also Lee, Ceung and Chen (2005) assume an influence of PEU on enjoyment.

It is clear that in this field of research there still is room for interpretation and that the range of explanations is wide. In all research though the centre of attention is the actual use of the IS. This then also holds for the use of serious games. As earlier explained, serious games have a purpose; the organisation has invested in the game because it wants the users of the game to learn something when they are playing the game. In this perspective it is important that A, the people use the IS and that B, they enjoy doing so. So it is important to find out how this enjoyment can be influenced.

Central to my research for that reason then is another theory, work done by Yi and Whang (2003). It is important to explain this model in more detail in order to be able to introduce my own model later on. The model proposed by them looks as follows:

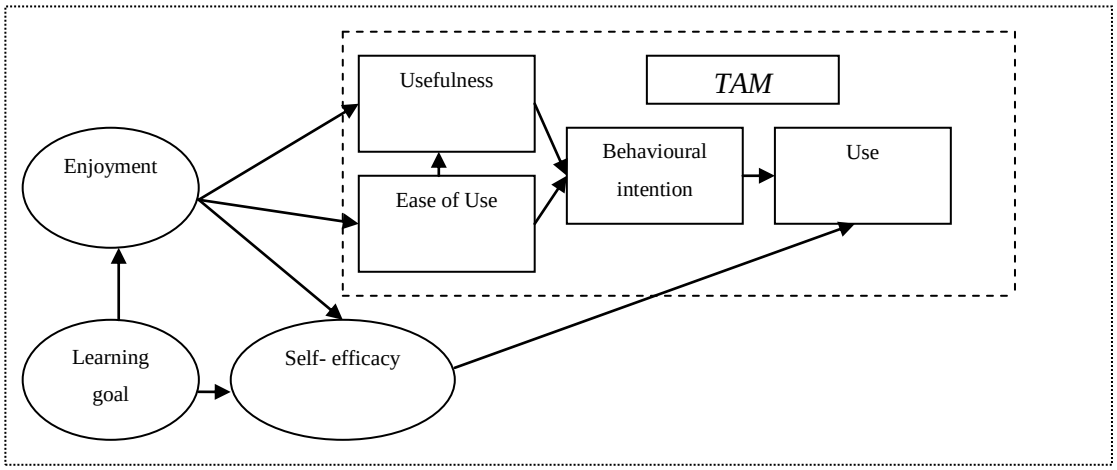

Figure 7. Proposed model by Yi and Whang

The basis of their model is the assumption that the investment for IS can only be earned back if the system actually is being used like all other models also. They second that the intention to use the IS will be influenced by usefulness and ease of use of the system. They hold to the definitions made by Davis et al (1989) and with that the TAM. In their model they name the three external factors intrinsic. This is important to mention since for example Ryan & Deci (2000) name intrinsic motivation as an important factor for learning (and that's in the end what the goal is of a serious game). Intrinsic motivation for example according to the authors is to set out for high quality and creative learning. "Intrinsic motivation is defined as the doing of an activity for its inherent satisfactions rather than for some separable consequence.

When intrinsically motivated a person is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards." Davis et al. (1992) refer to intrinsic motivation as ''the performance of an activity for no apparent reinforcement other than the process of performing the activity per se.'' It is not surprising that intrinsic motivators get a lot of attention.

Factor 1: Self efficacy

The first external intrinsic factor named by Yi & Whang is Self Efficacy. The construct first was introduced by Bandura (1977): a key regulatory mechanism that affects human behaviour is self-efficacy, people's judgments of their capabilities to perform a given task. Following on that is the term Computer Self Efficacy (CSE) by Marakas et al. (1998). General CSE is defined as an individual judgment of efficacy across multiple computer domains and application-specific self-efficacy is defined as an individual perception of efficacy in using a specific application or system within the domain of general computing.

Factor 2: Enjoyment

The authors have taken the definition of enjoyment of Davis et al. (1992). Enjoyment refers to the extent to which the activity of using a computer system is perceived to be personally enjoyable in its own right aside from the instrumental value of the technology.

Factor 3: Learning goal orientation

Goal orientation refers to typically two types of goals people can hold during task performance: learning goal orientation and performance goal orientation (Nicholls, 1984). People with a learning goal orientation will perceive an activity as one that can enable them to learn something new or to develop something and improve. Challenging tasks are seen as chances and errors are a natural past of learning (Yi & Whang 2003). "Individuals with a high learning goal orientation pursue an adaptive response pattern in which they persist, escalate effort, and report enjoying the challenge. With a performance goal orientation, individuals pursue a maladaptive response pattern in which they withdraw from the task, make negative ability attributions, and report decreased interest in the task. The more challenging a task becomes, the more it is perceived as an opportunity to build competence. Thus, in the context of adopting a new technology, individuals with a learning goal orientation are expected to enjoy the challenge of learning new features of the technology and develop self-confidence in using the technology".

The result of their study outside the TAM (external variables) was that self-efficacy had an effect on the ease of use and on use. Enjoyment had an effect on ease of use, usefulness and self-efficacy. All together their first 5 hypothesis where accepted. Also learning goal orientation had an effect on self-efficacy supporting their 7th hypotheses. Interestingly goal orientation had no effect on enjoyment although this was predicted. In their findings they show critical roles of application-specific self-efficacy, enjoyment, and learning goal orientation in determining actual usage of a Web-based information system. Furthermore on learning environments they state that organizational or training interventions that boost application-specific self-efficacy, enjoyment, learning goal orientation should be able to promote and facilitate the usage of a similar type of system. Also "learning goal orientation had a positive effect on application-specific self-efficacy. Practitioners should create an environment where conceiving one's ability as a fixed entity is discouraged, accepting challenging goals is encouraged, and making errors while learning is regarded as a normative part of skill acquisition. Collectively, the findings from the present study suggest that practitioners should provide a working and learning environment where self-efficacy, personal enjoyment, and learning goal orientation are supported and fostered in order to facilitate successful acceptance of technology. Overlooking these motivational variables could have detrimental effects on the user acceptance of information technology."

It is interesting to look into the fact that learning goal orientation, although well-defined and logically placed in its position toward enjoyment, does not have an influence on enjoyment. And since enjoyment seems to be a critical factor in the use of (serious) games, in the coming part I want to introduce the term flow and with that redefine the relationship suggested by Yi & Whang of goal orientation and enjoyment.

THE CONCEPT OF FLOW VERSUS ENJOYMENT

According to Chen et al. (1999) the concept of flow refers to an optimal and very enjoyable experience while being engaged in an activity with total involvement, concentration and enjoyment, an experience of intrinsic interest with a sense of time distortion. "As a result, when an activity produces such enjoyable experiences, even without any extrinsic motivation or material reward, individuals are willing to duplicate their experience whenever possible." If we follow them, flow and enjoyment are the same concept. Other scholars like Ghani et al. (1991) state that enjoyment is a part of flow. Cowley et al. (2008) also put, by referring to Csikszentmihalyi (1975a; 1975b; 1990), enjoyment and optimal experience in the same basket.

Sweetser en Whyeth (2005) also come to this conclusion by saying that their model on enjoyment is structured by and based on flow. They say that although many heuristics exist, no good integrated model for enjoyment was available and for that they developed the concept of game flow criteria that exist of: concentration, challenge, skills, control, clear goals, feedback, immersion and social interaction. They state that previous models always aimed to explain enjoyment in terms of one specific aspect or concept. Further they refer to research done by Csikszentmihalyi (1990) to say that the combination of the eight flow elements lead to a deep sense of enjoyment. Based on the mentioned theory enjoyment is flow or flow leads to (perceived) enjoyment. For the above mentioned reasons, now I would like to refine the model presented by Yi and Whang and I would like to introduce the following model:

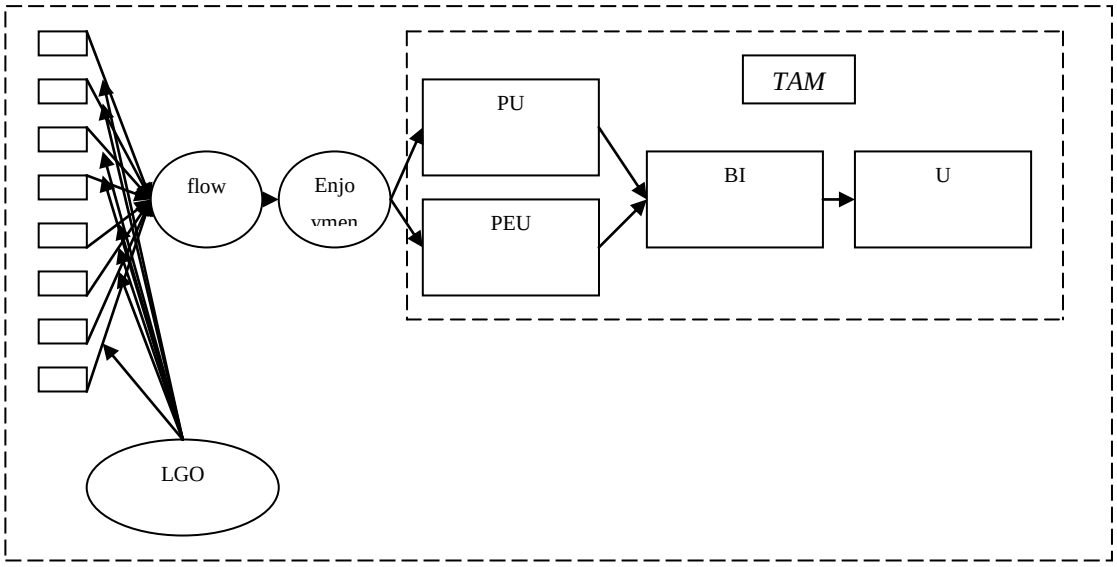

Figure 8: proposed research model

In order to explain this model in more detail it is useful to refer to more work of other scholars who also have done research in explaining flow. For example Kiili (2005) explains in his work as do Chen et al. (1999) that flow consists of three stages: flow antecedents, flow experience and flow consequences. Kiili also mentions that there is a debate what relevant factors belong in each stage. Skanberg & Kimmel (2004) and Finneran and Zhang (2003) with their PAT model influenced Kiili to come up with the following antecedents of flow that also are being used in the above mentioned research model: playfulness, clear goals, control, feedback, focused attention, usability, challenge and skills.

When these antecedents are present this would lead to flow and with that to enjoyment. This then again should positively influence to use of the IS by TAM. The end result is learning by the user.

Based on the model by Yi and Whang (2003) any user of the game has either a learning goal orientation or a performance goal orientation. Since the two goal orientations are different one can expect that all or some of the antecedents will be perceived differently. In the model, the concept of flow is more refined and can be measured in more detail. With that it can very well be that goal orientation do has an effect on enjoyment. For example two key antecedents for flow, clear goals and feedback are also key aspect for good learning (**see previous chapter**). It can be assumed that goal orientation will have a clear influence on the perception of these antecedents. Based on Finneran and Zhang (2003) within computer-mediated environments (CMEs), the outcomes of flow have the potential to increase the degree of technology use and the enjoyment from using technology. These consequences of flow have wide implications for technology acceptance and adoption, e-business, learning, and training.

It is logical, that if the aim of the game is to increase learning, at least one should take u into consideration the possible different outcome created by the influence of (learning) goal orientation.

IV. OPERATIONALIZATION OF THE CONSTRUCTS AND HYPOTHESES

In this part I will address the building blocks of my model. I will show the operationalization of the constructs and how they will be measured. Based on these constructs and the interrelations I shall form my hypothesis. At last I will address the way how I have gathered my information. In the part after the results will be analysed. Conclusions and advice follow in the last part.

OPERATIONALIZATION

Elements of TAM

In this thesis I will use the TAM model as explained by Davis et. al. (1989) as much as possible. It is wise to do so because the study of Yi and Whang (2003) on which my work is based also uses these measures. Due to the fact that Yi and Whang measure the use of web based information systems and I in this thesis explore the use of a game, sometimes it is needed to use an operationalization used in different research then theirs.

The *usefulness (UFLN)* construct was operationalized by 4 items with two alphas for separate measures in time of 0.85 and 0.82 in the original work by Davis et al. (1989). Since the topic in this thesis is the use of serious games, the word blackboard system has been replaced by "game". The questions are: "Using the game would improve my performance'', ''Using the game would increase my productivity", ''Using the game would enhance my effectiveness'' and "I find the game to be useful when I play."

The *ease of use (PEU)* construct was operationalized also by four questions with reliabilities of 0.95 and 0.92 in the original work by Davis et al (1989). These questions are ''Learning to use the game is easy for me'', ''I find it easy to get the game to do what I want it to do'', "My interaction with the game is clear and understandable'' and "I find the game easy to use."

Behavioral intention (BI) has been measured by asking the following two questions: "It is worth to play the game" and "I will frequently play the game". These questions have also been used by Hsu & Lu (2004). The reliability scores of the items are respectively 0.88 and 0.76 and for the construct itself 0.80.

The actual *use (U)* is operationalized as the actual user frequency recorded by the system just like in the work of Yi & Whang (2004). Also the actual *use (U)* is operationalized by asking the respondents the same questions as Davis et al. (1989) have done. On a Likert scale they could fill out either to use the game frequent or infrequent as adjectives on both ends of the scale. Additional the respondents were asked to check one of the following boxes about

current use of the game: “I do not play the game at all, I play the game less than once a week, I play the game about once a week, I play the game 2-3 times per week, I play the game 4-6 times per week, I play the game about once a day or I play the game more than once per day.

External factors

Since in this thesis I will measure if the influence of a learning goal orientation can have an influence on enjoyment, other than the result in the work of Yi and Whang (2004), I have chosen to keep the measurement of enjoyment he same as theirs.

Enjoyment (E) therefore will be measured by the following questions: “I have fun playing the game”, “using the game is pleasant” and “I find using he game enjoyable”. The internal consistency reliability in their study was 0.96.

For the concept of *flow (F)* I have used again the measurements like Hsu &Lu (2003) have done. The respondents had first to read a small explanation about the concept of flow, so that they understand what this idea means. They were asked to read the following text:

Instructions: The word “flow” is used to describe a state of mind sometimes experienced by people who are totally involved in some activity. One example of flow is the case where a user is playing extremely well and achieves a state of mind where nothing else matter but the game; you engage in an on-line game with total involvement, concentration and enjoyment. You are completely and deeply immersed in it. The experience is not exclusive to on-line game: many people report this state of mind when web pages browsing, on-line chatting and word processing. thinking about you during play of the on-line game.

After having read the text they were asked to answer the following three questions: “Do you think you have ever experienced flow in playing on-line game?”, “In general, how frequently would you say you have experienced ‘‘flow’’ when you play an on-line game?” and “Most of the time I play an on-line game I feel that I am in flow.” The answers were to be rated on a 7 point Likert-schale where 1 is disagree strongly and 7 is agree strongly. The reliability of the tree items in their research are respectively 0.87, 0.97 and 0.78.

The following external factor in the model is *Learning goal orientation (LGO).* I have adapted the measurement of *LGO* again from Yi and Hwang (2003). The five items for that are: ‘I am willing to select a challenging work assignment that I can learn from,’’ ‘‘I often look for opportunities to develop new skills and knowledge,’’ ‘‘I enjoy challenging and difficult tasks where I’ll learn new skills,’’ ‘‘For me, developing my work ability is important enough to take risks,’’ and ‘‘I prefer to work in situations that require a high level of ability and talent.’’ The internal consistency in their study for this construct was 0.88.

Antecedents of Flow

The first antecedent that should lead to flow and that could be perceived differently by users on the basis of their goal orientation is *playfulness (PFL)*. Venkatesh (2000) in his work based his measurement again on work done by Webster and Martocchio (1992) who came with a seven point scale to measure playfulness. Respondents were asked to describe and score themselves on a 7 point Likert scale after having played the game on the computer on the following characteristics: spontaneous, unimaginative, flexible, creative, playful, unoriginal, uninventive. The reliability in the Venkatesh study varied on the three times of measurement: 0.88, 0.85 and 0.81.

The next antecedent of flow according to Kiili (2005) is having *clear goals (CG)*. In a study done by Shin (2006) this antecedent was measured by asking the question: "I have a strong reason to select this course". In this study the question has been changed to: "I have a clear reason why I play this game." Based on the theoretical work done by Sweetser et al. (2006) I have added two extra questions: "The overriding goals of this game are clear to me" and "the intermediate goals during the game are clear."

The third antecedent in this study is *control (CTR)*. Kiili actually means that the user or gamer should have the control over the game, perceived behavioural control as Skadberg en Kimmel (2004) like to call it, or according to Csikszentmihalyi (1975) a sense of control over the environment. I have used the following measure also used by Chen et. al. (1999): "have you even had the feeling of 'being in control' during the game?", "I am able to successfully navigate" and "I am confident in my ability to play". In the results presented by Chen et. al. with these items 81.3% of the people who had a sense of control have been described.

Feedback (FB) has also been tackled by Chen et. al. (1999) and also Kiili (2005) referred to that article. Other scholars have also tackled the importance of feedback. For example Chen and Michael (2005) refer to the fact that feedback as form of assessment can go in three ways, either as completion, as in-process or by teacher evaluation afterwards. They state that feedback serves for example as a tool for users to learn from previous actions. It gives them the possibility to correct their actions. Scoring for example is an important feature in this, either in a numerical score, graphically, orally and tactile. Letting the user know the result of their actions is key. In the previous chapter I have already highlighted the role of goal setting and feedback in the learning process in general and with games especially. It is interesting to see that feedback also has a role in achieving flow according to many scholars. To measure the antecedent the following items have been used: "I feel that I have had immediate information about the result of my actions", "I get immediate and appropriate feedback when I play the game", "I receive information in the game about the progression that I make toward achieving the goal" and "I am aware of my status and score of the game".

Kiili in his article also mentions *focussed attention (FA)* as being part of the antecedents that lead to flow. Focussed attention according to Hoffman and Novak (1996) is "a centring of attention on a limited stimulus field". Shin (2006) also has measured this antecedent in his work. In the work focussed attention was defined as “the extent to which one gives full attention to the task involved”. This was measured by using the following questions that I will also use in an adapted form for SGs in this thesis: “when playing the game I am not distracted”, “when intruded by someone while I play, I get annoyed”, “When I play the game I am nut busy doing other things”, “when playing the game, I have a feeling of concentration” and “when I play the game I am not aware anymore what is happening around me.” These items had a reliability of 0.83 in the Study of Shin.

For the antecedent *challenge (CH)* I have also used the measures of Shin (2006). The items used in that study had a reliability of 0.83. Challenge is the idea that the task at hand fits the capability level of the user / player of the game. Enough to stay in a zone of comfort and not to get anxiety, but also not too little either to get bored. Again the roots of this idea stem from Csikszentmihalyi (1975) who introduced the match between the task at hand and the skills, a concept and antecedent that will be addressed next. Many other scholars, when talking about the concept of flow have adapted this approach. The items for this study are: “this game is too demanding for me”, “it is difficult for me to understand the game”, “it is difficult for me to make progress in this game” and “it is hard for me to complete the tasks in this game”.

Skills measurements also come from Shin (2006) with a reliability of 0.71. The questions mainly aim to make clear the perceived level of capability and competence a person has compared to the level that the task demands. Questions are: “I have sufficient computer skills to play the game”, “I have sufficient intellectual skills to understand the game” and “I would be able to play the game on a higher and more difficult level”.

Usability I have decided to leave out of the research although Kiili (2005) refers to the importance of the antecedent. In his article he refers to Skadberg and Kimmel (2004) and with that he defines usability as a combination of speed and ease of use. Since I already measure ease of use in TAM, I do not want to mix up constructs. Another reason is that Kiili refers to Jarvinnen et al. (2002) where he also compares usability with playability. Since I also measure playfulness I find measuring this again not needed.

HYPOTHESIS OF THIS RESEARCH

The basic research question for this thesis will be: **"what is the influence of a Learning Goal Orientation on the influence of antecedents of Flow?"**

Following the basic assumptions of TAM research, this research predicts that:

- **H1:** Enjoyment will have a positive effect on Usefulness. **E has a positive effect on UFN.**
- **H2:** Enjoyment will have a positive influence on Perceived ease of use. **E has positive effect on PEU.**

Based on the other literature presented before, this leads to the following other hypothesis:

- **H3:** High levels of Flow lead to high levels of Enjoyment. **F will have a positive effect on E.**
- **H4**: People with a learning goal orientation are more focused on development and learning then people with a performance goal orientation. Therefore people with a high learning goal orientation will find clear goals more important. **The higher LGO, the more important will CG be as influence on flow.**
- **H5:** For people with a learning goal orientation to be able to know the result of their efforts is less important as for people that have performance goal orientation. **For that, for people that have a high LGO, having FB is less important as influence on the perception of flow.**
- **H6:** Since people with a learning goal orientation have a focus on development, having skills is less important for them than people with a performance goal orientation. **People with high LGO will find SK less important as influence on flow.**
- **H7:** People with a learning goal orientation will find a challenge more rewarding than people with a performance goal orientation, as the latter group is more focused on the result. **For that people with high LGO will perceive CH as a more positive influence on flow.**
- **H8:** Since control says something about the ability to do something and is not so much focused on development, people with a learning goal orientation will find it less important to have control. **High LGO will lead to less influence of CTR on flow.**
- **H9:** For playfulness (PFL) it is to be expected that a learning goal orientation will have positive influence on flow, since it is about discovery, fun and not so much about results. **A high LGO will lead to more influence of PFL on flow.**

- For focused attention (FA) no effect of LGO is expected. FA is needed for achieving a good result but also for learning.

I have chosen not analyze the remaining of the TAM model, although all constructs have been measured. I believe that the model throughout the years has proven its worth. Where I am concerned to show that enjoyment will have a positive influence on TAM legitimizes the research on other factors that lead to enjoyment as in flow.

V. METHOD, MEASUREMENTS AND RESULTS

In this chapter I will first explain the way I have tried to gather data, and I will tell a bit about the game involved. After that I shall share the measurements I have used in order to come to my results. Then the results will be presented.

METHOD

The game

In order to collect data it was necessary to find a serious game that was in actual use. Preferably this would have been a game that is being used by a company or organisation with the aim to learn the users of the game something. Second the game needed to have the interactivity, look and feel of a game with features there like scores, high scores, chat-rooms, different levels, goals to reach, a storyline, background music, just like any other interactive SG; a static e-learning tool would not have been sufficient and also a popular "fun" game would not do. For this reason I have been in contact with various producers of games who make SGs like that, and who again in their turn have contact with end user companies and their users/gamers/players. I have tried to contact only Dutch producers. Many multinationals actually use already SGs like that, but unfortunately none of the producers where either interested to participate, or they were interested but did not want to bother their clients out of commercial reasons. Due to time restrictions I have in the end decided to find a SG that was internet based, had free access, and indeed has all the qualities abovementioned. After looking and comparing various internet based free SGs I have concluded that ENERCITIES www.enercities.eu was the best suited game in order to collect data.

Enercities is a pan European initiative and was created by the Dutch producer Paladin Studios. The goal of the SG is to build a city for 200 people. You have to take into consideration the economy, make enough money, you want to keep your inhabitants happy, you need to create sufficient levels of energy in order to produce and heat the houses, and you must not run out of natural resources. When you have reached level 5, and with that are able to actually build a city for 200 inhabitants, the game is finished, or the game is finished because you have no more resources. The idea behind the game is to keep natural resources by using green energy sources, but in such a way that all parameters remain on good levels.

The respondents

I have again contacted the producer of the game and I have asked if it was possible to tap into their user-base, but that seemed technically not possible as the game does not track user's emails. For me it was impossible to contact users and also to add a questionnaire to the website was not possible. In order to still be able to collect data I have then contacted people by LinkedIn, a social media website. In total I have send emails to 126 people. I was able to ask all contacts in person if they wanted to participate in the research; also I have asked them to invite people they know to participate. Attached to the request was a questionnaire, 65 questions long and all on a 1-7 Likert schale. Also attached was a letter that explained to them what to do. In total I had a response of N=37 usable questionnaires that were send back to me within a period of two weeks. Since the respondents were people throughout Europe (Netherlands, Belgium, France, Germany and England) all questions were in English.

MEASUREMENTS

All the received questionnaires have been analysed in a quantitative manner by using the statistical program SPSS, version 19. and SmartPLS version 2.0 M3. The constructs that have been measured by the 65 questions have been mentioned in chapter IV. (For the questionnaire, the scoring and labelling see the Addendum).

Reliability

The first step was to analyse all constructs on their reliability. To begin I have tested the constructs within the TAM model. Perceived Ease of Use (PEU) was measured with four questions, resulting in Cronbachs alpha of 0.847. Usefulness (UFLN) was measured also by four questions, resulting in Cronbachs alpha of 0.872. Behavioural Intend (BI) was measured by two questions, alpha 0,788 and actual Use (U) was also measured by two questions leading to alpha 0,823.

After that I have measured the reliability of the external factors. Cronbachs alpha for Enjoyment (E), measured by three questions, was 0,943. Also Flow (F) was measured by three questions, resulting in alpha 0,913. For Learning Goal Orientation (LGO) I used initially 5 items resulting in an alpha of 0.642. In order to try to get a better reliability I checked the inter item scores by using Kendall-tau, see figure 9. After leaving out the score of item 4, I have been able to obtain a reliability score of alpha 0.747.

Correlations

			lgo1	lgo2	lgo3	lgo4	lgo5
Kendall's tau_b	lgo1	Correlation Coefficient	1.000	.376**	.559**	-.017	.343*
		Sig. (2-tailed)	.	.006	.000	.906	.013
		N	37	37	37	36	36
	lgo2	Correlation Coefficient	.376**	1.000	.360**	.123	.269
		Sig. (2-tailed)	.006	.	.008	.371	.050
		N	37	37	37	36	36
	lgo3	Correlation Coefficient	.559**	.360**	1.000	-.114	.470**
		Sig. (2-tailed)	.000	.008	.	.406	.001
		N	37	37	37	36	36
	lgo4	Correlation Coefficient	-.017	.123	-.114	1.000	-.056
		Sig. (2-tailed)	.906	.371	.406	.	.684
		N	36	36	36	36	35
	lgo5	Correlation Coefficient	.343*	.269	.470**	-.056	1.000
		Sig. (2-tailed)	.013	.050	.001	.684	.
		N	36	36	36	35	36

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Figure 9, Kendall tau for LGO

Next I have measured the reliability of the seven antecedents. The first is Playfulness (PFL). Initially I used seven items, but since two were negative, I left these two out of my initial reliability test. Even then for PFL I was able to obtain an alpha of 0.817. For Clear Goals (CG) the initial three items scored an alpha of 0.642. Again by using inter item relations with Kendall tau, figure 10; I have decided to leave out item 1, resulting in a better alpha, 0,745 for CG.

Correlations

			cg1	cg2	cg3
Kendall's tau_b	cg1	Correlation Coefficient	1.000	.285*	.188
		Sig. (2-tailed)	.	.034	.158
		N	37	36	37
	cg2	Correlation Coëfficiënt	.285*	1.000	.528**
		Sig. (2-tailed)	.034	.	.000
		N	36	36	36
	cg3	Correlation Coëfficiënt	.188	.528**	1.000
		Sig. (2-tailed)	.158	.000	.
		N	37	36	37

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
Figure 10, Kendall tau for CG

The third antecedent measured was Control (CTR). With the original three items only having an alpha of 0,489 also for this construct I had to do a inter item analysis with Kendall tau. Figure 11 shows the results of that:

Correlations

			ctr1	ctr2	ctr3
Kendall's tau_b	ctr1	Correlation Coefficient	1.000	-.146	.430**
		Sig. (2-tailed)	.	.271	.001
		N	37	37	37
	ctr2	Correlation Coefficient	-.146	1.000	.270*
		Sig. (2-tailed)	.271	.	.042
		N	37	37	37
	ctr3	Correlation Coefficient	.430**	.270*	1.000
		Sig. (2-tailed)	.001	.042	.
		N	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Figure 11, Kendall tau for CTR

After leaving out item two for CTR, I was able to obtain a reliability score of Cronbachs alpha 0,655.

Correlations

			fa1	fa2	fa3	fa4	fa5
Kendall's tau_b	fa1	Correlation Coefficient	1.000	.239	.294*	.045	.146
		Sig. (2-tailed)	.	.073	.025	.733	.275
		N	36	36	36	36	35
	fa2	Correlation Coefficient	.239	1.000	.160	.099	.293*
		Sig. (2-tailed)	.073	.	.231	.463	.032
		N	36	36	36	36	35
	fa3	Correlation Coefficient	.294*	.160	1.000	.248	.347**
		Sig. (2-tailed)	.025	.231	.	.059	.009
		N	36	36	37	37	36
	fa4	Correlation Coefficient	.045	.099	.248	1.000	.302*
		Sig. (2-tailed)	.733	.463	.059	.	.025
		N	36	36	37	37	36
	fa5	Correlation Coefficient	.146	.293*	.347**	.302*	1.000
		Sig. (2-tailed)	.275	.032	.009	.025	.
		N	35	35	36	36	36

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
Figure 12, Kendall tau for FA

For Feedback (FB), I could use the response of all four initial items since together they gave alpha 0,837. Also for Focussed Attention I have decided to leave out two initial items in order to obtain a higher reliability score, although the difference is marginal. With the original five questions FA has alpha 0,646 and by leaving out item 1 and 2 this resulted in an reliability score of 0,65. See figure 12. For Challenge (CH) again the initial items had a Cronbachs alpha that was too low: 0,466. But after inter item correlation analysis, figure 13, I have left out item 1 for CH resulting in a reliability of alpha 0,711.

Correlations

			ch1	ch2	ch3	ch4
Kendall's tau_b	ch1	Correlation Coefficient	1.000	.376**	.277*	.240
		Sig. (2-tailed)	.	.007	.041	.075
		N	37	37	37	37
	ch2	Correlation Coefficient	.376**	1.000	.317*	.394**
		Sig. (2-tailed)	.007	.	.018	.003
		N	37	37	37	37
	ch3	Correlation Coefficient	.277*	.317*	1.000	.443**
		Sig. (2-tailed)	.041	.018	.	.001
		N	37	37	37	37
	ch4	Correlation Coefficient	.240	.394**	.443**	1.000
		Sig. (2-tailed)	.075	.003	.001	.
		N	37	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Figure 13, Kendall tau for CH

For the last antecedent Skills (SK) I have obtained a Cronbachs alpha of 0,599 by using the initial 3 items. By leaving out the last item I also for SK have been able to obtain a higher alpha. In this case the reliability score for SK went up to 0,839. For the underlying scores see figure 14.

Correlations

			sk1	sk2	sk3
Kendall's tau_b	sk1	Correlation Coefficient	1.000	.519**	.182
		Sig. (2-tailed)	.	.000	.198
		N	37	37	37
	sk2	Correlation Coefficient	.519**	1.000	.362**
		Sig. (2-tailed)	.000	.	.008
		N	37	37	37
	sk3	Correlation Coefficient	.182	.362**	1.000
		Sig. (2-tailed)	.198	.008	.
		N	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 14, Kendall tau for SK

Kolmogorov-Smirnov Test

The next step was to compute new variables that would represent my model based on the mean scores of the above mentioned items. After that I have conducted a Kolmogorov-Smirnov test on these new variables, see figure 15:

Kolmogorov-Smirnov test	**significance**
External Factors	
Flow	0,513
Enjoyment	0,961
Learning Goal Orientation	0,811
Antecedents	
Playfulness	0,889
Clear Goals	0,417
Control	0,587
Feedback	0,811
Focussed attention	0,261
Challenge	0,423
Skills	0
TAM	
Usefulness	0,511
Perceived Ease of Use	0,552

Significant when $p < 0,05$

Figure 15, KS test

Regression analysis

Based on the outcomes of this test I have been able to conclude that all measurement have more or less a normal distribution expect Skills. The explanation of this can be in the fact that the game was designed for high school students and people in general up to an age of 35 years old. The group of respondents was probably older than that, although than should not have made a difference, but in in general respondents do have a high educational level or at least are skilled professionals: LinkedIn is a network for professional contacts and business.

For that reason I have been able to use linear regression analysis for most constructs and hypothesis in order to test the outcomes. I have done this analysis by using the Smart PLS analysis program, version 2.0 M3.For the outcomes see figure 16, where the central construct is Flow in the middle. The antecedents are projected as ellipses in the left upper corner and the moderator effects between Learning Goal Orientation and the antecedents are represented by the circles at the bottom. At the right of the figure the two parts of the TAM model, Usefulness and Perceived Ease of Use can be found:

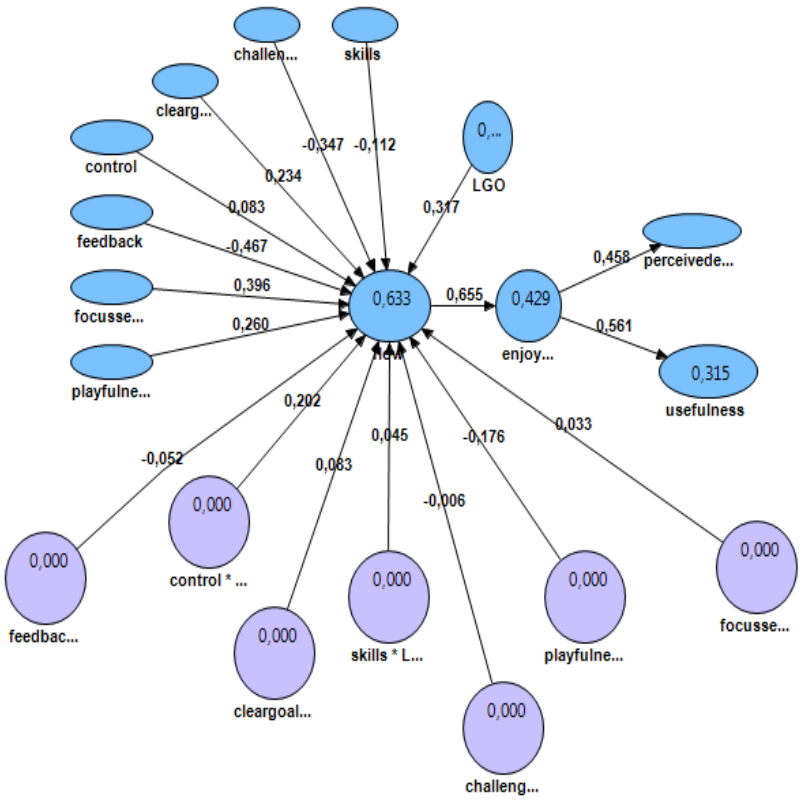

Figure 16, SmartPLS model for the effect of antecedents on flow and interaction effects with LGO on flow, resulting in enjoyment and effecting the TAM model.

Z and P score calculations

Since figure 16 only shows de Beta values and with that not the actual significance of the influence, with the dataset and model I have also done a bootstrapping analysis, again with the statistic program SmartPLS like above. The bootstrapping analysis enables me to extract Z values and with that I am able to compute the *p-value* later. Therefore it is a necessary step in order for me to be sure about any significance in the model whatsoever. The results are shown in the next figure:

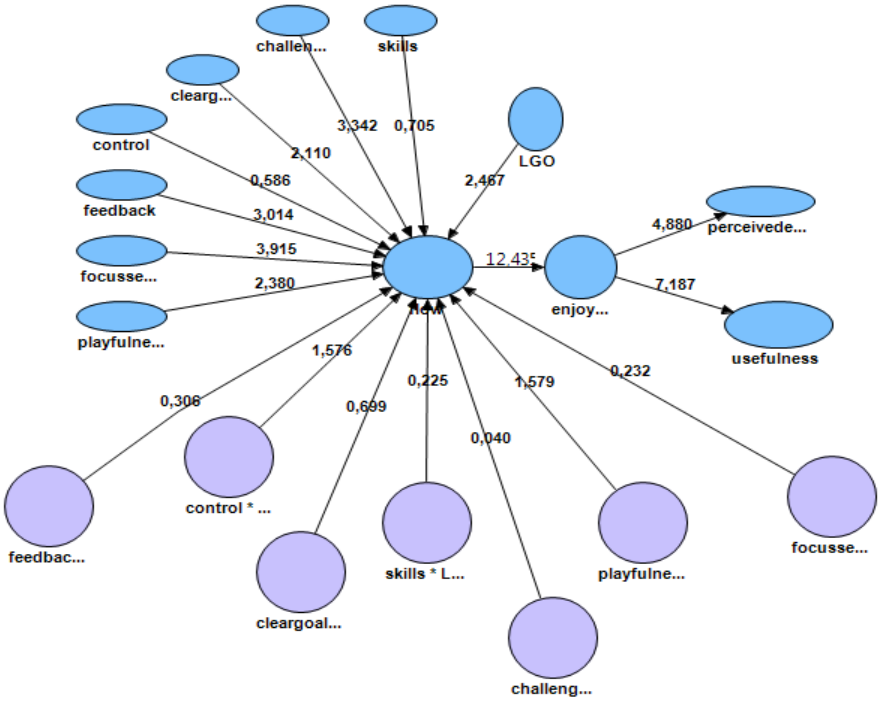

Figure 17, bootstrap with SmartPLS for z-scores on construct level change

In the next table, **figure 18,** the results of the Z-p score calculations are presented:

Antecedents and path to flow	**z-score**	**P-one tailed**	**P-two tailed**
Skills	0,705	0,2404	0,4808
Challenge	3,342	0,0004**	0,0008**
Playfulness	2,38	0,0087**	0,0173*
Control	0,586	0,2789	0,5579
Feedback	3,014	0,0013**	0,0026**
Focussed Attention	3,915	0**	0,0001**
Clear Goals	2,11	0,0174*	0,0349*
Moderator effects of LGO			
Skills / LGO	0,225	0,411	0,822
Challenge/LGO	0,04	0,409	0,9681
Playfulness/LGO	1,579	0,0572	0,1143
Control /LGO	1,576	0,0575	0,115
Feedback /LGO	0,306	0,3798	0,7596
Focussed Attention/LGO	0,232	0,4083	0,8165
Clear Goals / LGO	0,699	0,2423	0,4846
LGO on Flow	2,467	0,0068**	0,0136*
FLOW to Enjoyment	12,43	0**	0**
Enjoyment to Perceived Ease of use	4,88	0**	0**
Enjoyment to Usefulness	7,187	0**	0**
Significant when $p < 0,05$ *			
Significant when $p < 0,01$ **			

RESULTS

As expected **Hypothesis 1** can be accepted. There was a positive effect between Enjoyment and Usefulness with a Beta of 0.561., $p < 0,01$.

Also **Hypothesis 2** can be accepted. With a Beta of 0,458 the positive effect of Enjoyment on Perceived Ease of Use is also significant. A bit less strong than Usefulness but still valid at $p < 0,01$.

These two outcomes are of importance since this result follows with the work done by other scholars. With that the other outcomes of this research gain importance because it is safe to focus on that, since the connection with TAM and external factors is stable and in the same positive direction.

Hypothesis 3 can also be accepted. The effect of Flow on Enjoyment is also positive with a Beta of 0.655 with $p < 0,01$.

Hypothesis 4, about the positive moderation effect of LGO on the influence of CG on flow is not being accepted with a beta of just 0,083. The effect of CG by itself on Flow is positive and significant with Beta 0,234 and p=0,0174, but I did not want to measure that although this remains interesting.

Hypothesis 5 is also not accepted either with a Beta of -0,052. The sign is in the expected direction, but that can also be because FB by itself has a significant negative influence on flow, Beta -0,467. The effect of Feedback on Flow by itself again is significant with a p=0,0013 score lower than 0,01.

Hypothesis 6, the negative moderating effect of LGO on the influence of skills on flow could not be tested due to the quality of the data-sample (see KS test). An interesting observation to make though is, that although the initial influence of skills on Flow is negative, the observed but not valid moderation effect is positive. This could mean that the idea that LGO indeed makes the influence of skills on flow smaller is in at least a thought the right direction.

Hypothesis 7, the relationship and moderation of LGO on the influence of Challenge on Flow again is not significant with a very small Beta of just -0,006. Also for this antecedent the initial effect on Flow is significant at the $p<0,01$ level, so the higher the Challenge, the lower the flow, but LGO does not have any expected influence on the relationship.

Hypothesis 8, the moderating effect of LGO on the influence of Control on Flow is striking with a Beta of 0,202. Although almost significant with p=0,0575 it still not is. Control by itself has also no significant effect on Flow with Beta 0,083 and for that the outcome is a very interesting one. It seems that LGO does change the impact of this antecedent.

The last hypothesis**, hypothesis 9**, that assumes a positive moderation effect of LGO on the influence of Playfulness on Flow can also be rejected. With p=0,0572 again the effect almost significant but still not with a Beta of -0,176, and second the sign is in the other direction than expected. Also an interested a possible useful observation is that Playfulness by itself is a significant positive influence on Flow with Beta 0,260 and p=0,0087.

VI. DISCUSSION, ADVICE AND FUTURE RESEARCH

In this chapter I will address possible implications of the outcomes of this research and I will give advice on how to proceed in future research. I want to do this by addressing both the significance for the academic world and second to stress the importance for more business related environments. I will start though by highlighting limitations observed while conducting this research.

Limitations

One of the first limitations that needs to be mentioned is the sample size. In this research I have only used a sample size of N=37. It is well advised to try to find ways to have a larger pool of respondents, especially if one would like to measure LGO, since this is a trait that people have or not have in more or lesser extent. For that it will help outcomes if the pool of respondents has the largest chance of being a normal distribution. Actually the current outcomes could have been more significant and others might have become significant. Also I can state that because of the medium used to obtain the questionnaires, I used LinkedIn.com, a social medium for professionals, the type of respondents and with that the demographic features of the sample set could be influenced. Most of the respondents are professionals who work with computers, are well educated, and are in general over thirty years old. For example the Skill measurement was probably highly influenced by this.

Regarding the population, also a second limitation can be mentioned in comparison to the game, which although a SG, is more aimed at educating high-school children in the end. I did find the game suitable for research since the makers have a target group that goes till the age of thirty-five, but still, this can be a point of attention.

Also the language this research was conducted in was English. For most respondents this is not their native language. This might have compromised the outcomes although I have not measured this.

Although in this set up it was possible to measure the moderating effect of LGO on the antecedents of Flow, the main aim of this work, the fact that people needed to play a game that they would probably normally never play by themselves, can have had an influence on the results also. Due to the limited timeframe that people where invited to participate, two weeks, I believe that it would be better to try to find an environment that will elicit a more natural way of use of the SG. Responses can have been influenced by this.

Implications for the academic world

I would like to start to say that since this field of research is still very innovative, and with that the experience within the use and experience on SG limited, there is still a lot to win.

For example to get the actual antecedents of Flow very sharp is very important in my opinion. About the level of research on which this needs to be done I will say something in my conclusions that will follow later also. At the moment it is not completely clear what antecedents make Flow. This research has shown that Challenge, Playfulness, Feedback, Focussed Attention and Clear Goals do influence Flow significantly, but more research on this field is needed.

Second, more research is needed in order to find out in how far Flow and Enjoyment are actually the same or not; and what the implications might be if they are.

Third I would like to stress the importance, based on the outcomes of this research, to also find out if a Learning Goal Orientation and a Performance Goals Orientation are completely different constructs that can or cannot exist next to each other, or if the two are on one continuum. LGO does have a very interesting effect on both Playfulness and Control, so to understand the interplay between these construct better seems advisable.

The effects that were expected between Feedback, Clear Goals and LGO were not observed. The question remains, since the two factors are important for learning, why this did not happen. Perhaps it was again the "artificial" set up of this research, respondents not being in a "natural user environment", and it can be very useful to continue research in an environment that is truly aimed at learning.

Implications for business

For business, both on the user side and the developers' side this research has also implications.

To start, this research has strengthened the idea at least that when using a SG for learning attention needs to be given to Feedback and Clear Goals. Ideally this should indeed be incorporated into the game design. If not, the attention still should be focussed on giving that outside the game in the learners setting.

Other antecedents of Flow like Challenge, Focussed Attention and Playfulness also need to be incorporated. It is good news for developers to know that they are on the good way, especially if one sees the development form static e-learning environments toward more interactive SGs.

Based on the fact though, that it was not easy to obtain data form standing organisations and actual learning environments, information that could really boost insight and improve development, it is strongly advised to companies to be more open to this. One of the key

issues is the high development costs of the SGs. By sharing data at least the components that will deliver the wanted outcome can be made clear. Furthermore, since most research so far has been conducted on the level of experience of the user, it can be very valuable to find out on what level these constructs can be shared in different environments and where they cannot be shared. This will boost modular design and with that the initial development costs. So by sharing data on a basic level, all organisations can profit on their "individual corporate" level.
In my search for information and a possibility to use a standing actual SG that is being used for learning purposes in a live environment, I have encountered a lot of enthusiasm but also a lot of misunderstanding. In that perspective I would strongly advise businesses to first learn more about this topic and again, make clearer to a general users public what a SG actually is about and why and how they use it. By taking away misconceptions the road to data sharing and improving our insight in this matter will benefit a lot. With that the best use of SG and all benefits that go with it come more in our reach. At the moment the concept of a SG is not always clear. Hopefully this paper will help to change that.

VII. CONCLUSIONS

In this chapter I would like to come to some conclusions. I would like to share my personal experience and findings, I would like to highlight the possibilities within this field of research and also I would like to reflect on the way research is being conducted at the moment: I want to include into my conclusions a different possible perspective on the SG research that could have a future next to the approach that has been presented in this paper.

The research presented here has shown me the almost unlimited possibilities that SGs can have. It is truly an innovative field of research that can be explored a lot further without a doubt. Undoubtedly there also is still a market to win for business. The latter can truly use a more profound and professionalized basis on which to act and decide, although knowledge in the academic world and the insight that the actual producers and developers have still is closely related. I do not talk about the users. I strongly believe that keeping tight links will help the valorisation of new insight and with that all parties involved could be a symbol of sharing knowledge; if I would say co-creation I guess it is that what I mean.

It is a field of expertise where truly various disciplines need to work together. In many ways the contribution from Information Management professionals has been very necessary in order to understand the interaction between information systems and people. For that the research on TRA and especially TAM cannot be ignored. Furthermore it is clear that out of the discourse of social science and psychology many important constructs have been introduced in order to understand SGs.

Although this message is very bright, I have gained also additional insight that could help to integrate all parties involved even more. The most important new angle could be the fact that at the moment all constructs are mainly very abstract, deal with experience and feeling and are for that matter difficult to extrapolate to the outside world: Enjoyment, Flow, Playfulness, Perceived ease of use, to name a few, are difficult to quantify and cannot easily be highlighted, even though when scholars have proved over and over again that they are very able to measure these construct in their own way.

Perhaps an approach that has been mentioned by Jarvinen (2009) has a future also. He is an adversary of aiming to measure more toward the actual design features of a (serious) game than to measure lower layers of psychological constructs. It is not the feeling or the experience that he sees as important but more the actual presence of these design features by itself; and it is clear that these actual features are easier to explain to business than the lower layered concepts, partly used in this paper also.

Although perhaps the qualities a-synchronicity, sociability, nativity and spontaneity sound still abstract, they are probably more clear for the actual designer and user to understand, to see, and with that possibly better to measure. The possible overlap of the construct is in first sight not big and if we can find ways to come with an approach that proves viable, like the approach of this paper which is still completely based on previous research, this could be another promising path to discover. It could help us to actually stay on the move to co-create. As he names them “high level design drivers” they could perhaps blend in very well and be additional at the least to the efforts undertaken so far to understand games and SGs in particular.

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ADDENDUM

Questionnaire

You just have played the game Enercities. Additional we would like to ask you some questions about your experience and about the design of the game. In total there are 65 questions. All the questions have the goal in improve the quality of the game! To answer the question will take between 5-10 minutes. All responses will remain anonymous.

Please on a scale of 1 to 7 can you indicate how you would describe yourself when you where playing the game? I felt / I was:

1. *spontaneous*

1	2	3	4	5	6	7
Not at all						very much

2. *unimaginative*

1	2	3	4	5	6	7
Not at all						very much

3. *flexible*

1	2	3	4	5	6	7
Not at all						very much

4.*creative*

1	2	3	4	5	6	7
Not at all						very much

5. *playful*

1	2	3	4	5	6	7
Not at all						very much

6. *unoriginal*

1	2	3	4	5	6	7
Not at all						very much

7. *uninventive*

1	2	3	4	5	6	7
Not at all						very much

Can you please answer the following questions on scale of 1/7:

8. I have fun playing the game.

1	2	3	4	5	6	7
Not at all						very much

9. I am aware of my status and score of the game.

1	2	3	4	5	6	7
Not at all						very much

10. I find it easy to get the game to do what I want it to do.

1	2	3	4	5	6	7
Not at all						very much

11. I find the game to be useful when I play.

1 2 3 4 5 6 7

Not at all very much

12. I often look for opportunities to develop new skills and knowledge.

1 2 3 4 5 6 7

Not at all very much

13. I would be able to play the game on a higher and more difficult level.

1 2 3 4 5 6 7

Not at all very much

14. When I play the game I am not aware anymore what is happening around me.

1 2 3 4 5 6 7

Not at all very much

15. Using the game is pleasant.

1 2 3 4 5 6 7

Not at all very much

16. I feel that I have had immediate information about the result of my actions.

1 2 3 4 5 6 7

Not at all very much

17. I prefer to work in situations that require a high level of ability and talent.

1 2 3 4 5 6 7

Not at all very much

18. I will frequently play the game.

1 2 3 4 5 6 7

Not at all very much

19. I receive information in the game about the progression that I make toward achieving the goal.

1 2 3 4 5 6 7

Not at all very much

20. It is hard for me to complete the tasks in this game.

1 2 3 4 5 6 7

Not at all very much

21. When playing the game, I have a feeling of concentration.

1 2 3 4 5 6 7

Not at all very much

22. My interaction with the game is clear and understandable.

1 2 3 4 5 6 7

Not at all very much

23. I am confident in my ability to play the game.

1 2 3 4 5 6 7

Not at all very much

24. Using the game would enhance my effectiveness.

1 2 3 4 5 6 7

Not at all very much

25. I enjoy challenging and difficult tasks where I'll learn new skills.

1 2 3 4 5 6 7

Not at all very much

26. The intermediate goals during the game are clear.

1 2 3 4 5 6 7

Not at all very much

27. It is difficult for me to understand the game.

1 2 3 4 5 6 7

Not at all very much

28. I find using he game enjoyable.

1 2 3 4 5 6 7

Not at all very much

29. I have sufficient intellectual skills to understand the game.

1 2 3 4 5 6 7

Not at all very much

30. When I play the game I am not busy doing other things.

1 2 3 4 5 6 7

Not at all very much

31. Learning to use the game is easy for me.

1 2 3 4 5 6 7

Not at all very much

32. I get immediate and appropriate feedback when I play the game.

1 2 3 4 5 6 7

Not at all very much

33. It is difficult for me to make progress in this game.

1 2 3 4 5 6 7

Not at all very much

34. Using the game would increase my productivity.

1 2 3 4 5 6 7

Not at all very much

35. I am able to successfully navigate while playing the game.

1 2 3 4 5 6 7

Not at all very much

36. For me, developing my work ability is important enough to take risks.

1 2 3 4 5 6 7

Not at all very much

37. The overriding goals of this game are clear to me.

1 2 3 4 5 6 7

Not at all very much

38. When intruded by someone while I play, I get annoyed.

1 2 3 4 5 6 7

Not at all very much

39. It is worth to play the game.

1 2 3 4 5 6 7

Not at all very much

40. I have sufficient computer skills to play the game.

1 2 3 4 5 6 7

Not at all very much

41. This game is too demanding for me.

1 2 3 4 5 6 7

Not at all very much

42. When playing the game I am not distracted.

1 2 3 4 5 6 7

Not at all very much

43. I am willing to select a challenging work assignment that I can learn from.

1 2 3 4 5 6 7

Not at all very much

44. Please can you indicate how frequent you actually use the game?

1 2 3 4 5 6 7

Not at all very much

45. I have a clear reason why I play this game.

1 2 3 4 5 6 7

Not at all very much

46. Using the game would improve my performance.

1 2 3 4 5 6 7

Not at all very much

47. Have you even had the feeling of 'being in control' during the game?

1 2 3 4 5 6 7

Not at all very much

48. I find the game easy to use.

1 2 3 4 5 6 7

Not at all very much

Instructions: The word ''flow'' is used to describe a state of mind sometimes experienced by people who are totally involved in some activity. One example of flow is the case where a user is playing extremely well and achieves a state of mind where nothing else matter but the game; you engage in an on-line game with total involvement, concentration and enjoyment. You are completely and deeply immersed in it. The experience is not exclusive to on-line game: many people report this state of mind when web pages browsing, on-line chatting and word processing. Thinking about you during the play of the on-line game.

After having read the text can you please answer the following three questions?

49. Do you think you have ever experienced flow in playing on-line game?

1 2 3 4 5 6 7

Not at all very much

50. In general, how frequently would you say you have experienced ''flow'' when you play an on-line game?

1 2 3 4 5 6 7

Not at all very much

51. Most of the time I play an on-line game I feel that I am in flow.

1 2 3 4 5 6 7

Not at all very much

52. Can you please indicate with a number which of the following statements of your actual use of the game is true?

1. I do not play the game at all
2. I play the game less than once a week
3. I play the game about once a week
4. I play the game 2-3 times per week
5. I play the game 4-6 times per week
6. I play the game about once a day
7. I play the game more than once per day

Can you please indicate on a scale from 1/7 in how far you feel about the design of the game and the features that are present or not in your opinion?

53. Persuasive inviting messages to play.

1 2 3 4 5 6 7

Not at all many

54. On and off line affiliation with others.

1 2 3 4 5 6 7

Not at all a lot

55. Information about your or other profiles.

1 2 3 4 5 6 7

Not at all a lot

56. Having friend as a game commodity.

1 2 3 4 5 6 7

Not at all many

57. Symbolic contact with others; high fives, parties, etc.

1 2 3 4 5 6 7

Not at all many

58. Game reward that you can share or give way.

1 2 3 4 5 6 7

Not at all many

59. Clear time units to play.

1 2 3 4 5 6 7

Not at all very much

60. Exploration through single clicks.

1 2 3 4 5 6 7

Not at all very much

61. Information about standing and progress in the game.

1	2	3	4	5	6	7
Not at all						a lot

62. Ability to share data and information.

1	2	3	4	5	6	7
Not at all						very much

63. To be able to tell and hear tales of action.

1	2	3	4	5	6	7
Not at all						very much

64. The notification of scores and achievement of others.

1	2	3	4	5	6	7
Not at all						a lot

65. The possibility to decide and influence your own pace of play.

1	2	3	4	5	6	7
Not at all						very much

Thank you very much for your participation!

Item labelling and position on questionnaire

construct	code	Position question list
playfulness	poll 1	1
playfulness	poll 2	2
playfulness	poll 3	3
playfulness	poll 4	4
playfulness	poll 5	5
playfulness	poll 6	6
playfulness	poll 7	7
clear goal	cg 1	45
clear goal	cg 2	37
clear goal	cg 3	26
control	ctr1	47
control	ctr2	35
control	ctr3	23
feedback	fb1	16
feedback	fb2	32
feedback	fb3	19
feedback	fb4	9
focussed attention	fa1	42
focussed attention	fa2	38
focussed attention	fa3	30
focussed attention	fa4	21
focussed attention	fa5	14
challenge	ch1	41
challenge	ch2	27
challenge	ch3	33
challenge	ch4	20
skills	sk1	40
skills	sk2	29
skills	sk3	13
learning goal orientation	lgo1	43
learning goal orientation	lgo2	12
learning goal orientation	lgo3	25

learning goal orientation	lgo4	36
learning goal orientation	lgo5	17
Flow	flw1	49
Flow	flw2	50
Flow	flw3	51
usefulness	ufn1	46
usefulness	ufn2	34
usefulness	ufn3	24
usefulness	ufn4	11
perceived ease of use	peu1	31
perceived ease of use	peu2	10
perceived ease of use	peu3	22
perceived ease of use	peu4	48
Behavioural intention	BI 1	39
Behavioural intention	BI 2	18
actual use (use)	u1	44
actual use (use)	u2	52
enjoyment	joy1	8
enjoyment	joy2	15
enjoyment	joy3	28
sociability	jsoc1	53
sociability	jsoc2	54
sociability	jsoc3	55
symbolic physicality	jsp1	56
symbolic physicality	jsp2	57
symbolic physicality	jsp3	58
spontaneity	jspo1	59
spontaneity	jspo2	60
spontaneity	jspo3	61
narativity	jnar1	62
narativity	jnar2	63
narativity	jnar3	64
asynchronity	jasy1	65

Request letter for data collection

Amsterdam 23/7/2011

Dear friends / colleagues,

Herewith you receive my request to participate in my research about serious games (SG) and the use of SG. This research is part of my final thesis at University of Amsterdam, Information management department.

The reason I ask you to participate is that I have a deadline at the 30st of August. I am not able to find a standing organisation that uses SG at the moment in order to work on data collection in that professional environment. For that reason I ask you to give me a little of your time; I promise it shall be fun☺.

I would like to ask you to do the following:

- Send me a reply if you will participate or not. (My list of participants is not endless so just to know if I will have to take more action in order to get sufficient data).
- If yes, go to http://www.enercities.eu/game.php at a time of your liking.
- Enlist there and then play the game for at least 1 hour in total.
- Then after you have played the game, please fill out the questionnaire. When you have the feeling after the first time that you will play the game again later, then please fill out the questionnaire later but send it back to me **before 5/8/2011!!!.** It is important you do not answer the questions two weeks after you played the game for the last time, as you will have forgotten your experience; it's exactly the experience and perception that I want to measure.

Please contact me with any questions about enlisting, playing, sending or opening the documents. Also if you would like to know more about the research let me know and I will explain to you the set up afterwards. To tell you more at the moment could influence your experience and answers.

Feel free to share this with a friend or with your partner, the more respondents, the better for me and the research! Also, all your data will be processed anonymously!

Thank you very much in advance, you are helping me a lot!

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