Mobile Edutainment
and Game Based Education to Enrich Mobile Learning

Diplomarbeit

zur Erlangung des Grades eines Diplom-Ökonomen
der Wirtschaftswissenschaftlichen Fakultät
der Leibniz Universität Hannover

vorgelegt von

Name: Ngo    Vorname: Olaf

Erstprüfer: Prof. Dr. Michael H. Breitner

Hannover, den 17. August 2011
Contents

List of Figures IV
List of Tables V
Nomenclature VI

1 Introduction 1
   1.1 Motivation ................................. 1

2 Foundation of basic terminologies 4
   2.1 History of learning theories .................. 4
   2.1.1 Behaviourism ................................ 4
   2.1.2 Cognitivist studies and Constructivism .......... 6
   2.1.3 Multimedia Learning .......................... 7
   2.2 How do people learn? ........................... 9
   2.2.1 The misbelief of learner types ................ 10
   2.2.2 Self-directed learning ......................... 11
   2.2.3 Learning tools ................................ 12
   2.2.4 Computer-assisted learning methods ............ 13
   2.3 Education in Germany ............................ 16
   2.4 Technological prerequisites ........................ 17
   2.4.1 Mobile Networks ................................ 17
   2.4.2 Mobile Devices ................................ 20
   2.4.3 Supporting services and standards .............. 28
   2.5 Mobile devices for learning ..................... 33
   2.6 Conclusions ..................................... 35

3 Game Based Education 37
   3.1 What is a game? .................................. 37
   3.2 The relevance of games – market view .............. 38
Chapter 1

Introduction

1.1 Motivation

If learning does not “hurt”, it is not effective - this is a well-known point of view among many educators in Germany. Learning has since ever influenced our society, the way how we learn and use the information affects our results in work. Based on the three sector theory in economics, the current state of most industrialised nations has turned from being a producing society to a service society. Newer four sector theories even state that we are located in a knowledge and information society, in which learning has been more important than anytime else. The quick distribution methods to access information as well as new learning technologies, which would have never been possible with the absence of computer and electronic devices, lead to a significant change of use of a computer. Computers are not merely understood as machines, but as working tools and learning facilitator. First, Electronic Learning has emerged to assist a learner. This was followed by Mobile Learning. But what comes next? A point of view could be that E-Learning is impersonal, static and without fun. So learning is no fun - but games are.

An average teenager plays computer games 8.15 hours minutes a week (see [MPFS, 2010, p. 38]) and does this until he\(^1\) becomes a young adult. Learning Games can benefit from the acceptance of young players. Therefore, the symbiosis of games and learning is imaginable.

This work gives an overview and analysis about Game Based Education, which can be realised among others by Games or Entertainment (especially Edutainment) concepts. Research question are such as the scope of usage (Who uses it? Where is it used?) can be widened to a context, which takes consideration of existing Electronic Learning concepts such as Mobile Learning. The question here would rather be if this type of learning games can be successfully adapted into mobile version and what other kinds of learning solutions exist for such mobile context usage. Therefore, Game Based Learning achievements are presented, discussed and evaluated.

\(^1\)the male gender is used through the whole thesis, this work addresses the female subject as well.
For getting started with the presented topic basic knowledge is essential. We first introduce the basic foundations of learning theory, which have been dominating for many decades and have changed until recently, we present some selected and accepted theories. Then, technological aspects are shown, that are crucial for the technological realisation of the presented work. Hardware as well as infrastructure for a viable working relationship, in which additional services fill out the gap.

In the main part, we examine the basics of games\(^2\), giving a categorisation of genres and find out why games are thrilling as well as relevant for learning. We continue to see which connection learning and games share. The fourth part, Mobile Edutainment, then deals with all means of educative games that are able to be played on mobile devices. We differentiate the advantages and disadvantages of such a solution. After the first part, we pre-summarise our findings and recapitulate the key points of our findings. A short discussion about the usefulness and effectivity is given before we start with the second part.

The practically oriented resumption takes care of the application of learning games in a

\(^2\)In this work, we are focusing on Digital Games, not non-digital ones such as cardboard games or sports-related games. Thus, the word digital is sometimes emitted to ease the explanation.
mobile context. As the aspect of mobility gets more and more important, we go wider by putting a business model thoughts on top of a educative game and also think about synergy effects in terms of web based training applications. The UbiLearn system is exemplary for such a system.

The last part concludes all examinations and summarises the efforts made so far. An outlook is given, how Game Based Education might develop and further proceedings are mentioned.
Chapter 7

Final Conclusions

7.1 Critical assessment

Learning by gaming is a desirable solution for learning, but it is not a solution without limitations.

First, what is learning? Learning is a method to acquire knowledge. This becomes more and more important in an environment where people have to work longer, retire later and are required to be more and more mobile as societies and economy globalises and the information worker is being prepared to be more mobile. Electronic learning is a learning method that does not exist on its own but to overcome shortcomings and problem caused by distance and time constraints. Still, learning is a process that is not solely individual, as knowledge is developed and transmitted from external sources.

One should not forget that learning is a social interaction process between a learning facilitator and the learner. Learning processes are depending on the commitment of the teacher and the willingness to learn from that person. But if there is no suitable balance between technology based learning and offline learning, learning gets ones-sided and may stuck in a dead end. The category of tacit and explicit knowledge dominates in organisational learning, but tacit knowledge, i.e. a situation when knowledge can be turned into explicit knowledge without any restriction (see [Nonaka and Takeuchi, 1997, p. 84]), can not be taught as long as there are no conventions to turn it into explicit knowledge. The same restriction is valid on a individual teacher-student situation. In Mobile Learning or Game Based learning, this facilitator is either virtualised or replaced by game mechanisms. Learning can be improved didactically in a great way by using technology, in which playing learners experience fascination and motivation due to the high degree of interactivity. This is a helpful and value adding feature, but learning is still the main goal and should not be tried to overstimulate with games. Not all teaching content is fitting for Edugames; some business disciplines or natural science topics are hard to imagine as a simulation game. Whether the technology gets accepted or rejected, depends on the learner. Demography and growing up with technology influences the behaviour as well.
as the attitude towards learning technology. For this reason, not every learner will accept the fact that the learning environment changes through technology.

Although it might be appealing to think that E-Learning, Mobile Learning and therefore Mobile Edutainment is easily and cheaply to implement, many other preconditions have to be met.

Similar to a video game production, producing a learning game involves a value chain of actors, which increases complexity the more features and contents are put into the game. This is the reason why many learning games do look well-produced, but feature only a limited range of interaction. For Mobile Learning, games cannot have the same feature set as mobility is connected with time-constraints and hardware limitations. Many device platforms, heterogeneous terminal hardware and network infrastructure has complicated a rollout of a one-fits-all solution. Intensive testing of such a product is mandatory to ensure that concepts are applied well and raise the effect that was intended. Often serious learning games are only subject to a special target group, while Edutainment oriented products do not come up with the expectation of the learning purpose due to the passive presentation aspects. Mobile Edutainment is often criticised because of the missing didactical design, a missing coherence with education itself and the possible problem to over-stress Entertainment. If a mobile learning game should be produced in accordance to the concept Serious Games, a high budget and much expertise is to be supplied. Therefore the rise of additional costs can not be excluded. Such productions are hardly realisable for smaller projects, especially in academic isolated approaches.

For a university lecture, the effort put into a learning game would only pay off if a model is developed that allows flexible change of learning content and possibilities to update the existing content. Simultaneously, the game must still meet the requirements of a game, which is often an enclosed concept. As a result, a lack of openness hinders learning Games to be reused; in fact we can see that many game based products were designed as a one time use solution and are not constantly developed. This opposes the idea of reusable and continuously used E-Learning as it should accompany a user in a life-long learning principle. In addition, how can these games be integrated without having media disruption? Educational Games and Mobile Learning can be seen as two separate ways of mobile teaching right now. Bringing them together is not only a challenge, but would result in differences of learning concepts and sequences. Game Based Learning is an enclosed product and so is Mobile Edutainment. Adapting a mobility feature would be possible, but is often not done due to limitations, as device restrictions occur and the extensive, deep-going usage can not be guaranteed.

Lastly not to forget, gaming is one alternative to enrich Mobile Learning but many others exist. The Augmented Reality Learning trend is emerging thanks to newer device features and some argue that Mobile Learning might be a concept that is inferior to even smaller pieces of learning, such as Micro-Learning. As Learning is also a social process, the integration of other people has not put forward, learning and communication on the internet seems stil to be a separated concept even though social, mass communication is nowadays no neglectible trend.
7.2 Summary of the results

This work has taken Game Based Learning and Mobile Edutainment into the centre of the
examination. Learning is the key feature that has been driven through these constructs. There-
fore, the second chapter presented the results of learning theories that have been acknowled-
ged over the past centuries and on which didactical methodologies are based. Technology
was presented in order to enable Mobile Learning itself first, which is not possible without the
coopration of hardware, software and networks.

Games as hosts for learning were analysed and categorises were presented and reviewed. A
theory why games are motivating and keep the players go on playing was headed by the flow
theory. After that, the linkage of Games and Learning was examined through Game Based
Learning and to be more precise, Serious Games. They represent the connection between
games and learning. No matter if it is played on a computer or on a mobile device in an
adapted way, these kinds of games can provide knowledge and the ability to transmit attitudes,
knowledge and raise awareness. Such games lighten up learning, as supporting functions such
as narration, graphical interfaces have motivational effects on the learner. The adaption of
such game to a mobile environment is however not unproblematic, as the game depth, the
mobile usage behaviour and the goals of Serious Games tears the adaption apart.

A switch was then made to Mobile Edutainment, as it bases on different assumptions and
on the specifics of Mobile Learning. Unlike computer based learning, the usage behaviour is
such different that the games showed before do not fit into the category. Mobile Edutainment in
contrast for example is very commercially focused. Unlike game based education, Edutainment
uses knowledge and educational background to entertain users. But for a an educational
approach, Mobile Edutainment lacks a didactical level as well as a clear plan to realise learning.
This strength of using it for short-living Entertainment however keep these types of contents
being very popular, as there is no need for a big argument on deep-going educative ways.
Education is by these methods however just exposed superficially, as inquiring knowledge does
not take part in a deep-context. What does this for Mobile Learning mean? It seems that
mobile web based training environments are more suitable of handing over educative contexts,
but to do this, a highly interactive and multimedia presentation is relinquished. Since Mobile
Edutainment does not mean to put together some images and adding them to a web based
training unit, this concept is as Serious Games enclosed.

In chapter 5, we looked at the market for (mobile) games. Aspects were shown up in
which a product could be optimised if a game is pursued to be released to a mass market, not
relying on funding and addressing a wide public to be profitable. Suggestions for the initial
thoughts and steps were given. Single ideas were shown in which dimensions such a game has
to consider before even creating, i.e. prototyping it.

In chapter 6 then, the results of the previous chapters were transferred to Mobile Learning,
but further analyses showed that the adaption of learning concepts to Mobile Learning succeeds
only partly, because Mobile Learning and educative gaming pursue different objectives such as knowledge transfer and behavioural change. An idea for a simple edugame was given and also ideas to enrich web based training systems were shown.

Finally, the degree between a learning game and a game with additional educational content is to be adapted wisely. When expectations are not met, disappointment about the game can lead to no learning effect at all. A bad game-playing experience can turn down the player in his learning attitude, especially when it is too obvious that a game purely chases an educational content. If that is so, the learner would be better off knowing that the game is actually pure education. The right balance between game and education must be met to provide a suitable solution and the choice whether to put this into practice or not can not be done for its own purpose.

7.3 Future work and predictions

Theoretical aspects were noticed as comprehensive as possible, but due to a limitation of this work no deep going and practical experiences were made with the presented games.

To verify results, a prototype has to be written or built beyond mere sketching and implemented either as a standalone application or as an extension for a web based learning system.

Findings from user acceptance can contribute to usability and gameplay experiences, but must be acquired by creating a model, that elaborates the main constructs. This would go beyond this work, as a wrong survey design research affects not only the results, but can lead to wrong conclusions. However for a successful learning game, this is unavoidable and needs testing in such manner. A survey could be set up to do so or alternately studies could be analysed.

As an outlook for Game Based Learning, there are many options beyond the improvement of such kinds. In Game Based Learning, we transfer learning into the world of games. Gamification instead (for example see [Deterding, 2011]) describes a process in which gaming mechanisms and principles are transferred to the real world. Social sites such as Foursquare and Facebook (Facebook Places) and Gowalla have even achieved to build up a sustainable business model by getting participating business in the boat who do the service, while the gamificators serve as service providers.

Augmented reality was a less discussed topic here, but as holographic technology (see [Gadgetell and Hung, 2010]) and 3D displays are debuting for the mass market soon, an eye should be kept on these developments.

Game Based Learning seems to be a powerful way to raise engagement of learners. The extended use in business environments raises the question in which way the results can be measured. [Derryberry, 2007, p. 12] suggests that in terms of existing learning management systems, “[…] there will be both a call to rethink the purpose and design of LMSs for the E-
Learning 2.0 world and beyond, as well as a push to examine the internal activities of a game as a way to monitor learner progress. There will be an equal and louder call for standards that will address these issues.” In practical application this means that gaming feedback methods have to be implemented and data interchange methods become important to access the game data and connect them with existing learning management information to ensure that performance learning is monitored.

The idea of mobility always was deeply connected with interaction and information accessibility. Communication standards and methods were per definition included into Mobile Learning. But in reality, a communication between learners does not happen in a learning environment or games, instead many learners are performing their exercises independently. Modern Game Based Learning therefore has to address this paradox, as most conventional games features collaborative playing, that is enriched with text and voice chat and collaborative gaming strategies.

Mobile Edutainment on the basis of learning games is a potential field of growth. Education gets more and more important, as it one factor to develop a knowledge society. It seems that Serious Games are settled in a pedagogical and educational setting, where they fit in very well. Considering a commercial potential, it is able to build up a product, but one has to keep in mind that educational products are only directed to a limited field of interest. If one pursues profit orientation, this might be hard to achieve as production and marketing can turn out is more costly than for conventional Mobile Learning. Examples from delayed game publications always remind that a game is a complex product, this complexity does not get smaller by the enrichment of didactical features. Mobile Edutainment is competing with other mobile products and the prices for such are not as high as they could be for computer-based edutainment. Serious Games’ budgets are rather low. The situation is amplified by a smaller audience, which means that often non-government organisations or initiatives have to do fundraising to finance such a project.

To overcome implementation problems, more standardisation is needed, not only in terms of learning content processing, but also in game engines. For example many game engines are already released for free, which can be used to lower costs in the process of making games.

However, the work for Game Based Learning does not end here. As we see, for educational purpose this is a very interesting and suitable way to motivate learning, but also a very sophisticated one.

Finally, Game Based Learning and Mobile Edutainment feature rich methods for making learning more feasible and enjoyable, but learning itself is always dependent on an individual basis.