MORE FUN, FEWER RISKS: DEVELOPMENT OF A GAMIFIED WEB APP FOR RISK MANAGEMENT

STUDIENARBEIT

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von

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Abstract

Erklärung

(gemäß §5(3) der “Studien- und Prüfungsordnung DHBW Technik” vom 29.09.2017)

Ich versichere hiermit, dass ich meine Studienarbeit mit dem Thema: “More Fun, Fewer Risks: Development of a Gamified Web App for Risk Management” selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe. Ich versichere zudem, dass die eingereichte elektronische Fassung mit der gedruckten Fassung übereinstimmt.

Ort, Datum

Unterschrift

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Glossary

Item Name description

1. Introduction

context, motivation, aims, purpose, ..

Latex Cheat Sheet: Bildquelle mit Seite:Quelle normal:

Bilder normalerweise: Bild über den Seitenrand vergrößern und mittig ausrichten:

ABB. 1.1.: *Title*
[]

Fancy quotes:

> *cite*

TEXT []

Tabelle:

ABB. 1.2.: *Title*
[]

Spalte1Titel	Spalte2Titel	Spalte3Titel
1	3	5
2	4	6

TAB. 1.1.: *Unterschrift*

LISTING 1.1: *Title*

```
1 print("Hello world")
```

2. Theoretical background

text...

2.1. Risk Management

Fische [**WetterAktuellWettervorhersage2019**]

2.1.1. Unterkapitel

2.2. Gamification

The following chapters aim is to clarify the main theory behind human motivation, gamification and the corresponding patterns and methods. Therefore first of all the term Gamification is defined and explained (chapter 2.2.1), furthermore there is an introduction to human motivation (chapter 2.2.2) and motivational patterns (chapter 2.2.3). TODO REST

2.2.1. Definition Gamification

The term gamification is defined by Kumar and Herger as follows:

> *“ Gamification is the application of game design principles and mechanics to non-game environments. It attempts to make technology more inviting by encouraging users to engage in desired behaviors and by showing the path to mastery. From a business viewpoint, gamification is using people's innate enjoyment of play. ”*
>
> GAMIFICATION [3, P. 8]

Based on the above definition gamification aims to motivate the user to do something. That's why the next chapter provides a more comprehensive introduction on motivation. [3, p. 8]

2.2.2. Motivation

The game design principles and mechanics which are used in the context of gamification are a specialization of motivational patterns used in Human Computer Interaction. [3, p. 59]
Therefore this chapter provides an introduction into the underlying psychology of motivation with the different types of motivation (extrinsic and intrinsic), behavioral psychology and behavioral economics.

Psychology of motivation Human motivation is one of the main areas of psychology. Some questions which arouse are: What motivates humans for doing something? What intentions do they pursue with their doing? Which activities are a pleasure for them? [1, p. 1]

Mainly there are two types of motivation: extrinsic and intrinsic motivation. On the one hand intrinsic motivation is based on an internal drive to do something. The human is doing this task for their own. Possible motivational factors are gained autonomy, mastery or freedom. [1, p. 2, 3, 4], [3, p. 60, 61]
Deci describes intrinsic motivation as follows: "One is said to be intrinsically motivated to perform an activity when he receives no apparent rewards except the activity itself." [2, p. 105]
On the other hand extrinsic motivation is based on motivational factors from the outside, such as money, throphys or the comparison with others through (for example with points, levels or leaderboards). [1, p. 2, 3, 4], [3, p. 60, 61]
==========
TODO: Warum diese Unterscheidung im Folgenden relevant???
TODO: mit den unteren Theorien (B.J. Fogg, Selbstbestimmungstheorie) erklären warum der Mensch Dinge macht (aus Motivation)
TODO: weiter nach bierhoffeditorEnzyklopaediePsychologieSoziale2016 und inproceedings
Selbstbestimmungstheorie nach Deci und Ryan (Autonomie, Fähigkeit, Zugehörigkeit)
B.J. Fogg's Behavior Model

Behavioral psychology Behavioral psychology studies the way how humans behave and tries to find underlying patterns which trigger specific behavior. There's a constant stream of inputs (stimuli) to our body. In the field of behavioral psychology human behavior is seen as a response to these inputs. [4, p. 10]
A concrete application, where behavioral psychology can be observed are learned processes, also known as operant conditioning. Experimental Research in the area of operant conditioning was done by Skinner and his experiments known as Skinner box. For a deeper insight into his experiments, his book "The behavior of organisms" [5] is referred. By rewards for desired behavior and punishment for undesired behavior humans get conditioned for specific desired behaviors. Rewards and punishments are the stimuli causing responses. [4, p. 11]
Moreover the time when rewards are provided, influences how the interaction works. Based on Lewis [4, p. 10] there are four different strategies:

1. Fixed Ratio: After a fixed number of responses rewards are provided (e.g. coffee card: the tenth coffee for free)
2. Variable Ratio: Reward frequency is not firmly defined, the reward is offered on average after a couple of responses (e.g. gambling machine)
3. Fixed Interval: Rewards are provided after a fixed period of time (e.g. coffee machine)
4. Variable Interval: The interval in which rewards are offered is variable (e.g. fishing)

The most response over time is generated by variable ratio strategy. So in case of designing engaging applications, connecting the user with this application one should consider the use of rewards in a variable ratio. [4, p. 11]
So large parts of the gamification principles are based on rewards (e.g. increasing points, levels) and punishments (e.g decreasing points and levels). However the application of these principles should always be done carefully. There is a thought experiment by Schell called "chocofication". First of all there is the fact that chocolate tastes good. Adding chocolate to peanut butter makes it tasting good. But regardless the conclusion that everything tastes good with chocolate is wrong. For example hot dogs with chocolate are a disaster. To conclude you can say, that based on the thought experiment chocolate is not the magic bullet for food, alike gamification is not the magic bullet for application design. [4, p. 12]

Behavioral economics Behavioral economics explores, which effects affect economic decisions. In general whenever a resource (e.g. time, money) is reached or lost it is the consequence of a decision. So behavioral economics could also be seen as the theory behind decision making. Moreover in the context of Human Computer Interaction whenever a user interacts with an application lots of decisions are made. Engaging application design tries to include aspects of behavioral economics to influence the users decisions to spend more time in the application. Human decisions could be rational or irrational. Rational decisions are made to reach a concrete aim such as happiness and can be logically explained. Irrational decisions are not necessarily comprehensible. Nevertheless irrational decisions can be triggered by external influences. For example people tend to use memberships, even if they doesn't profit (e.g. injured people go to the gym to use the membership). Referring to the relationship between behavioral economics

and application design the application can be designed to trigger the user to made an irrational decision (e.g. spend more time inside the application than needed). [4, p. 19]
Patterns which motivate the user to do something by using the theoretical background of motivation, behavioral psychology and behavioral economics are described in the following chapter 2.2.3
==========
Psychologie (was motiviert allgemein) -> übertragen auf die Mensch-Maschine-Interaktion = Human Computer Interaction (Wie agiert der Mensch mit dem Computer/der Maschine)

2.2.3. Motivational Patterns

The theoretical concepts above are used in various motivational patterns.
TODO: Liste der im folgenden vorgestellten Motivational Patterns und Erklärung warum diese ausgewählt wurden Für eine weiterführende Beschreibung weiterer sei auf ... verwiesen

- Flow
  TODO: Beschreibung [1, p. 19, 20, 21] TODO: Die weiteren Punkte von da bierhoffeditorEnzyklopaediePsy
- Feedback loops

Motivational Patterns -> hier auch Flow, ... aus bierhoffeditorEnzyklopaediePsychologieSoziale2016

2.2.4. Gamification best practices and process

According to TODO: SOURCES!!!!! and [3, p. 27, 28] a well established design philosophy is User Centered Design. The center of the whole design and development of the application is the user. With this approach it gets possible to match the users needs. The developed application is intuitively operable for the user and increases the user's productivity.
In the context of gamification the User Centered Design Process can be adapted to be a Player Centered Design Process.
Based on [3, p. 29-32] it consists of five steps:

1. Player
   Firstly it should be clearly defined who is the user, respectively the player. Based on

a profound knowledge of the player and his needs the application can be designed. Therefore user/player personas are created, describing different users/player types, interacting with the application. The following user/player persona template is based on [3, p. 38-45]:

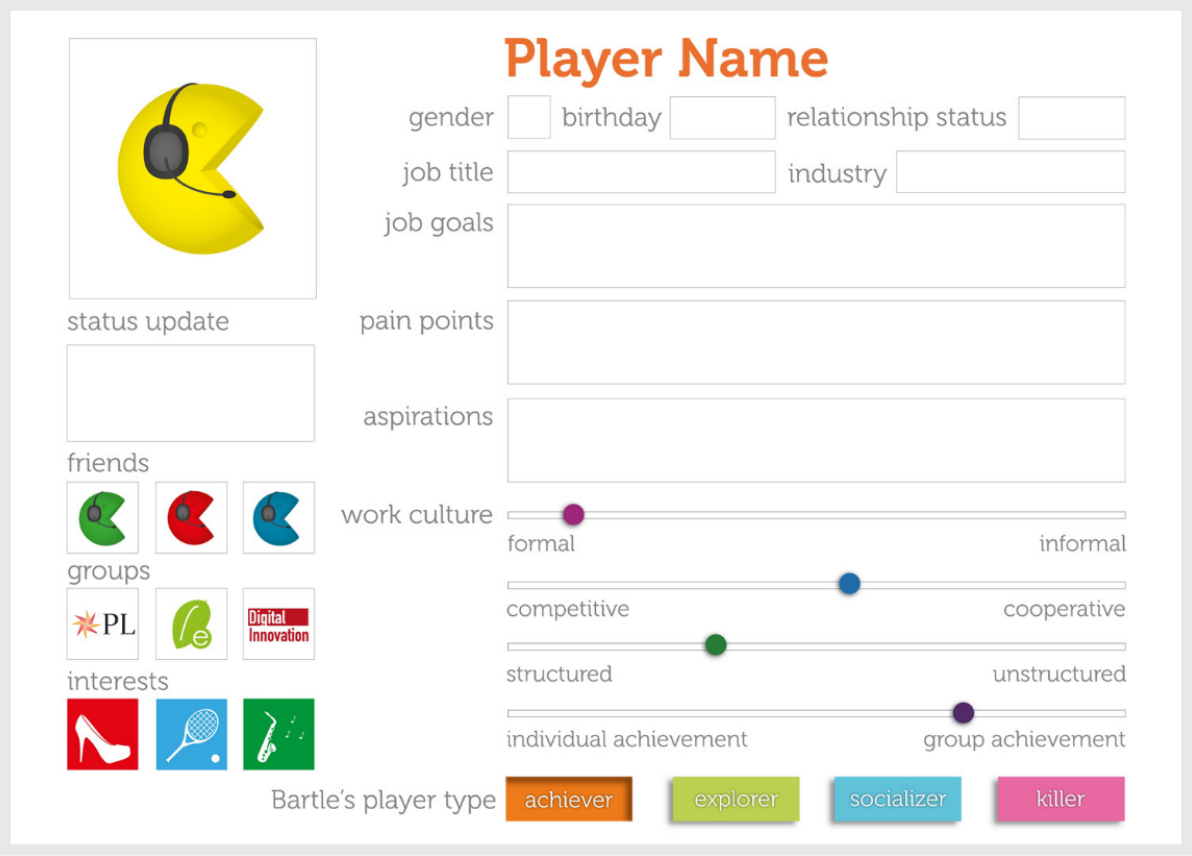

ABB. 2.1.: *Player Persona Template*
[3, p. 46]

TODO: formal, informal, ... -> Glossar TODO: Bartle Player types beschreiben

2. Mission

   Secondly the main goal of the gamification process identified, the so called mission. Figure 2.2 represents the S.M.A.R.T Mission process to identify the mission. First of all the current situation is analyzed and the target business outcome is studied. Based on the gained knowledge a mission for the gamification process is set. It should be specific, measurable, actionable, realistic and time-bound. [3, p. 49-52]

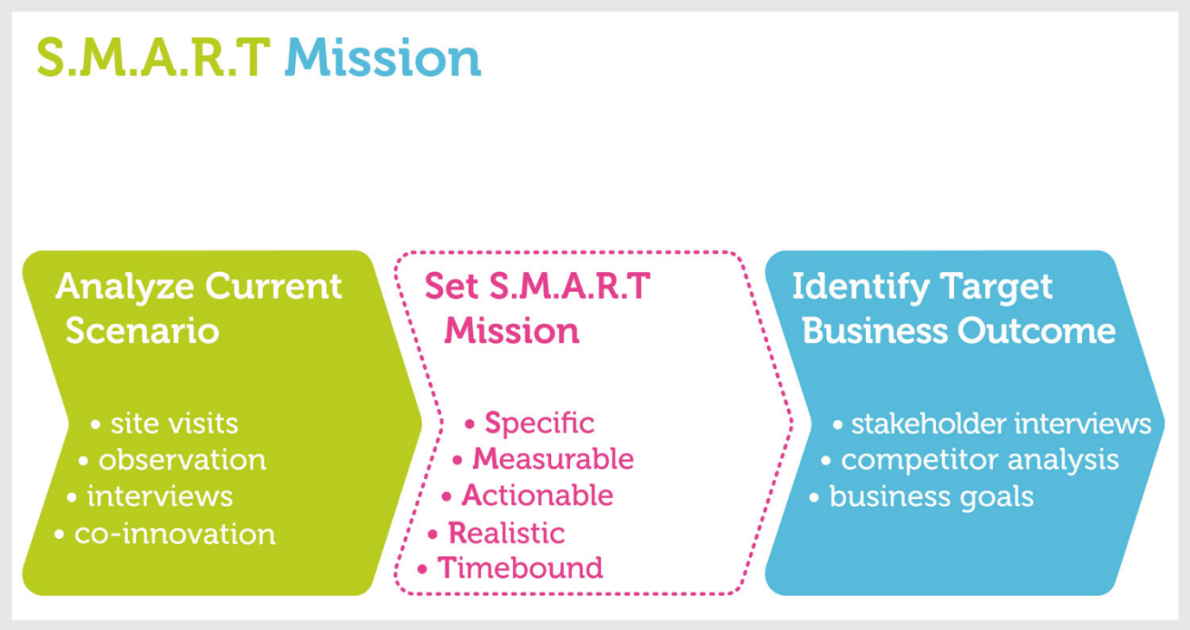

ABB. 2.2.: *S.M.A.R.T. Mission*
[3, p. 50]

3. Human Motivation

   Thirdly a basic knowledge about the theory behind human motivation is needed and is therefore described in chapter 2.2.2.

4. Game Mechanics

   TODO

5. Manage, Monitor and Measure

   After applying specific game mechanics to an application there are few points left,which should be observed in production. On the one hand mission should be managed. Based on the S.M.A.R.T. Mission process the identified mission should be checked frequently and if needed adapted. On the other hand the user/player behavior should be monitored and measured. TODO: weiter Evaluation beschreiben [3, p. 92-96]

2.2.5. Gamification and motivational methods and patterns in business software TODO

(u.a. behavioral economics)

2.2.6. Risks of Gamification

Risks of Gamification (u.a. Korrumpierungseffekt, "Overfitting???", Source: Does Gamification Work? — A Literature Review of Empirical Studies on Gamification)

2.3. PWA

text..

2.3.1. Unterkapitel

3. Domain description

text...

3.1. Survey

3.1.1. Unterkapitel

3.2. Domain Model

3.2.1. Unterkapitel

3.3. Gamification concept TBD

3.3.1. Player Personas

Player Personas based on survey -> Player Centered Design https://www.interaction-design.org/literature/boo
at-work-designing-engaging-business-software/chapter-3-58-player

3.3.2. Mission

Mission

3.3.3. Motivation + Mechanics

not only gamification patterns, but also basic motivational patterns => concrete conception of
used patterns

3.3.4. Evaluation

Evaluation To measure if methods of gamification and motivalinal patterns influence the user's behavior -> Tracking and A/B-Test Version A: gamified Version B: not gamified

4. Software Specifications

4.1. Technologies

4.2. Requirements

4.3. Use Case Specifications

4.4. Architecture

5. Implementation

5.1. Unterkapitel -> Design, Evaluation, Methodisches, PM, ...

5.2. Unterkapitel2

6. Discussion

7. Conclusion and Outlook

List of references

[1] Hans-Werner Bierhoff (editor) and Dieter Frey (editor). *Enzyklopädie der Psychologie: Soziale Motive und soziale Einstellungen - Sozialpsychologie 2*. 1st ed. Vol. 2. 3 vols. Die Enzyklopädie der Psychologie Themenbereich C, Serie VI. Göttingen: hogrefe, 2016. ISBN: 978-3-8444-0564-0.

[2] Edward Deci. "The Effects of Externally Mediated Rewards on Intrinsic Motivation". In: *Journal of Personality and Social Psychology* 18 (Apr. 1971), pp. 105–115. DOI: 10.1037/h0030644.

[3] Janaki Kumar and Mario Herger. *Gamification at Work: Designing Engaging Business Software*. 1st ed. Denmark: The Interaction Design Foundation, 2013. 157 pp. ISBN: 978-87-92964-06-9.

[4] Chris Lewis. *Irresistible Apps : Motivational Design Patterns for Apps, Games, and Web-Based Communities*. Berkeley, CA: Apress, 2014. 179 pp. ISBN: 978-1-4302-6422-4.

[5] Burrhus Frederic Skinner. *The Behavior of Organisms*. 1st ed. New York: Academic Press, 1938. 457 pp. ISBN: 978-0-9964539-0-5.

Appendix

A. Anhang1