



Westsächsische Hochschule Zwickau

University of Applied Sciences

HOCHSCHULE FÜR MOBILITÄT | UNIVERSITY FOR MOBILITY



Identifying Development-Metrics for Use in a Gamified Mobile Web Application to Support Software Development

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Who am I?

Rainer works as a Professor for Mobile Informatics at the Westsächsische Hochschule Zwickau (WHZ). His interests are in the disciplines of HCI, Software Engineering, User-centred design, and mobile computing.

During his career, he has designed, developed, and tested many user-centred systems; led the development of such systems; and taught in the fields of software development and interaction design at multiple Universities across the globe.

Much of his work is focused on mobile and ubiquitous computing (including the Internet of Things).

He is strongly committed to life-long learning and is passionate in applying his skills in teaching and technology to create lasting benefit to the community.



URL: <https://www.fh-zwickau.de/pti/organisation/fachgruppe-informatik/personen/prof-wasinger-en/>

Gamification in Software Development

1. Motivation
2. Gamification
 - General Information
 - An Example in Software Development
3. The Process of Designing the Mobile Web App
 - Development-Metrics
4. The Prototype
 - ... and it's functions
 - ... in action

Motivation

Success and failure in software projects: ⁽¹⁾



~ 19% Failure
~ 52% Partial Success
~ 29% Success

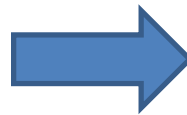


~ **71%** of software projects do not lead to their planned result.

(1) CHAOS Report 2015: https://www.standishgroup.com/sample_research_files/CHAOSReport2015-Final.pdf

Reasons for failure in software projects: ⁽²⁾

- Lack of the end user's input
- Incomplete specifications
- Not enough resources
- Insufficient planning
- Unrealistic expectations
- Psychological reasons
 - Mental pressure
 - **Developer motivation**

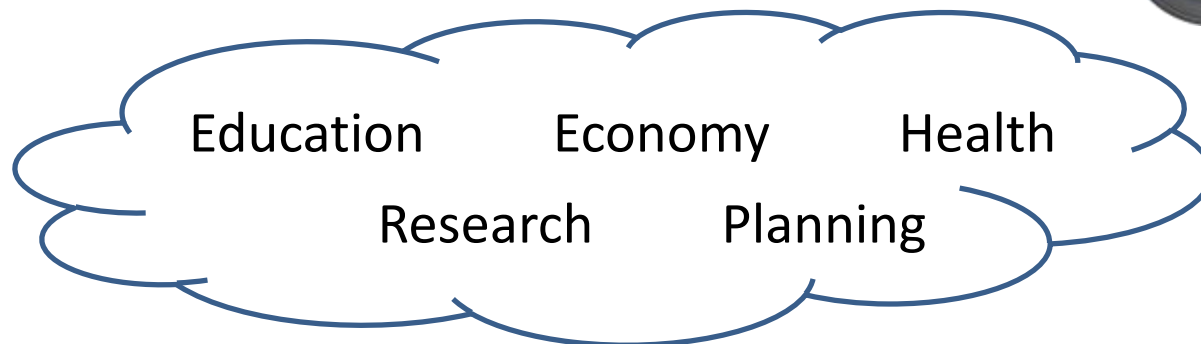


(2) Kotulla, A., "Management von Softwareprojekten: Erfolgs- und Misserfolgskfaktoren bei international verteilter Entwicklung [Management of software projects: Success and failure factors in internationally distributed development], Springer-Verlag, 2002.

Gamification: General Information

The use of game elements in non-game contexts

- Increases the motivation
- Improves the quality
... of the process
... of the result
- Improves the final result



Gamification: An Example in Software Development



• Nice Question

Question score of 10 or more

• Scholar

Ask a question and accept an answer

• Civic Duty

Vote 300 or more times

• Refiner

Edit and answer 50 questions (both actions within 12 hours)

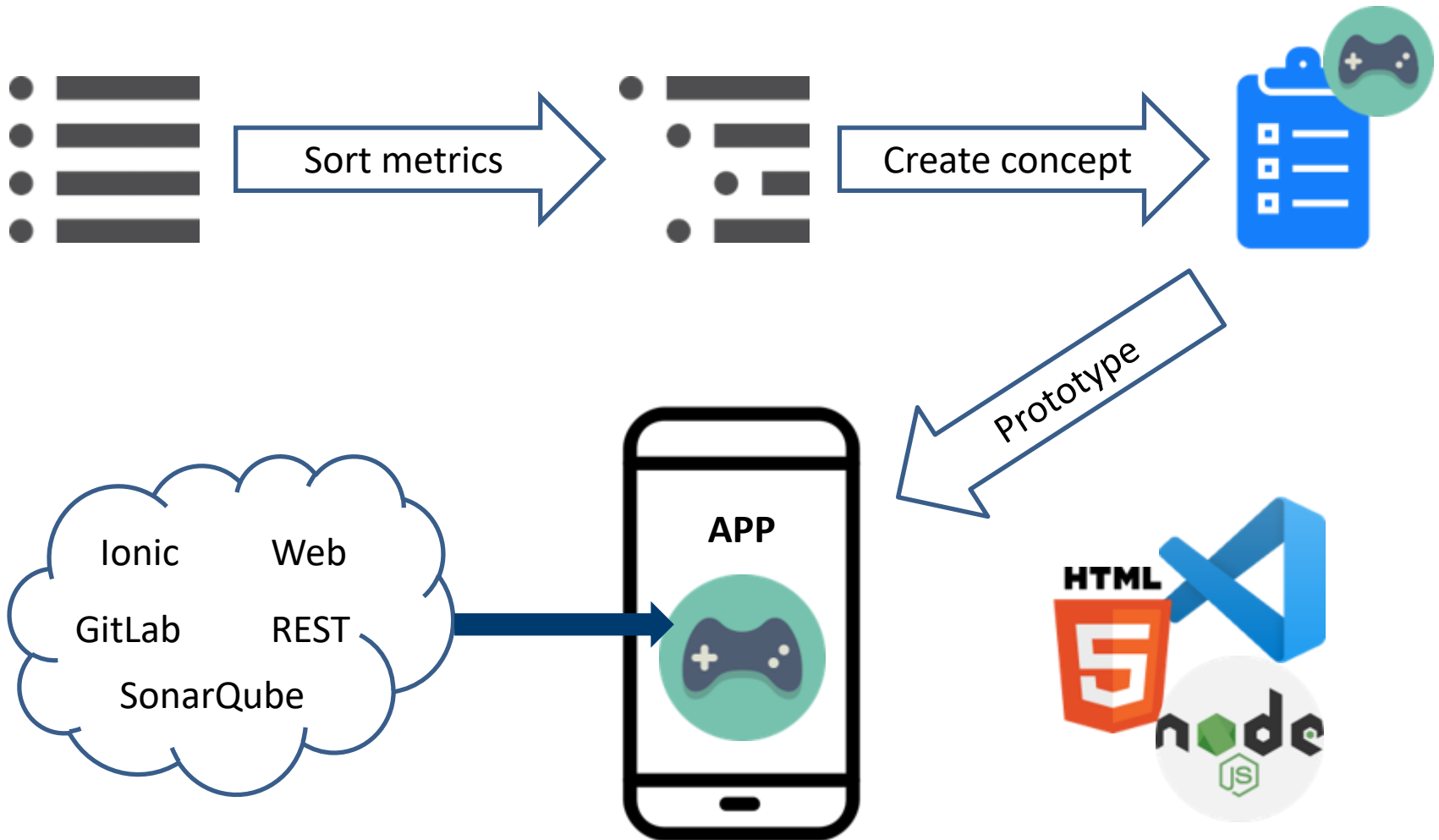
• Famous Question

Question with 10,000 views

• Fanatic

Visit the site each day for 100 consecutive days

The Process of Designing the Mobile Web App



The Process: Development-Metrics

Relevancy of Software Metrics:

- Objective verifiability
- Automated processing
- Direct obtainment from version control systems
- No restrictions for actual work process



Quantitative	Qualitative
Commits	Merges without complaints
Issues / Stories	Solved bugs
Pull Requests	Solved security issues
Milestones	Code smells
Lines of Code	Code duplications
Test Coverage	Complexity

The Prototype: Functions

Dashboard:

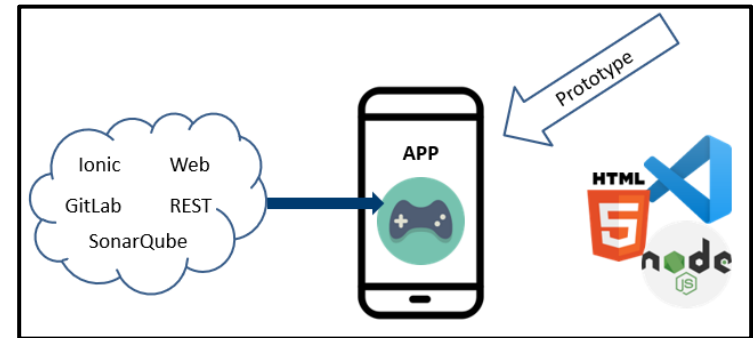
- User specific settings
(Tokens, Challenges)
- Items
(Amount, Icon, Name, Value)

Progress view:

- Overview of metrics with explanations
(Sorted by the previously determined categories)
- Detailed statistics for each metric
(Progress bar, rewards)

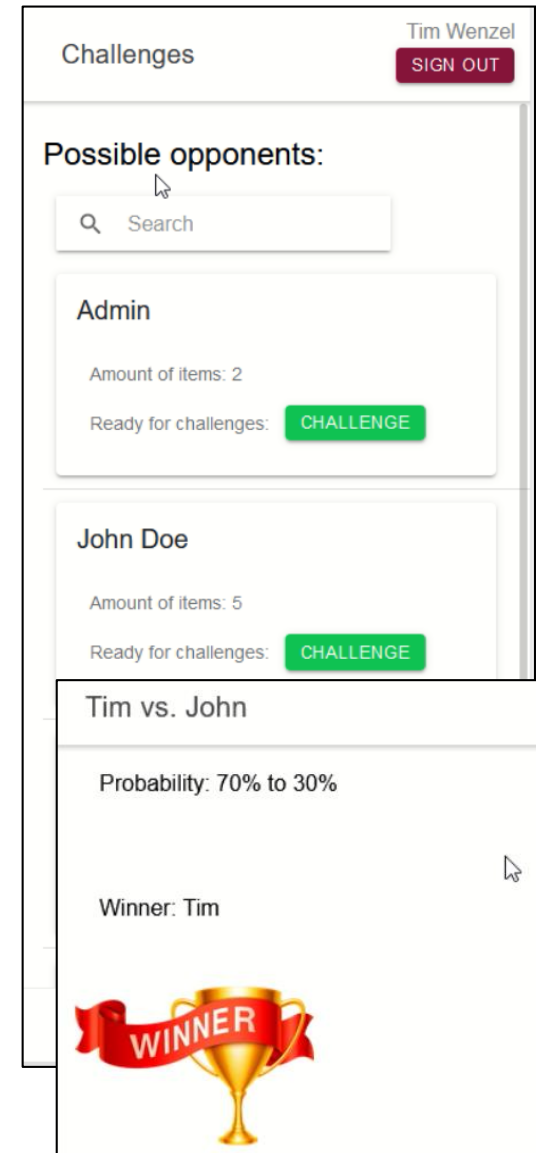
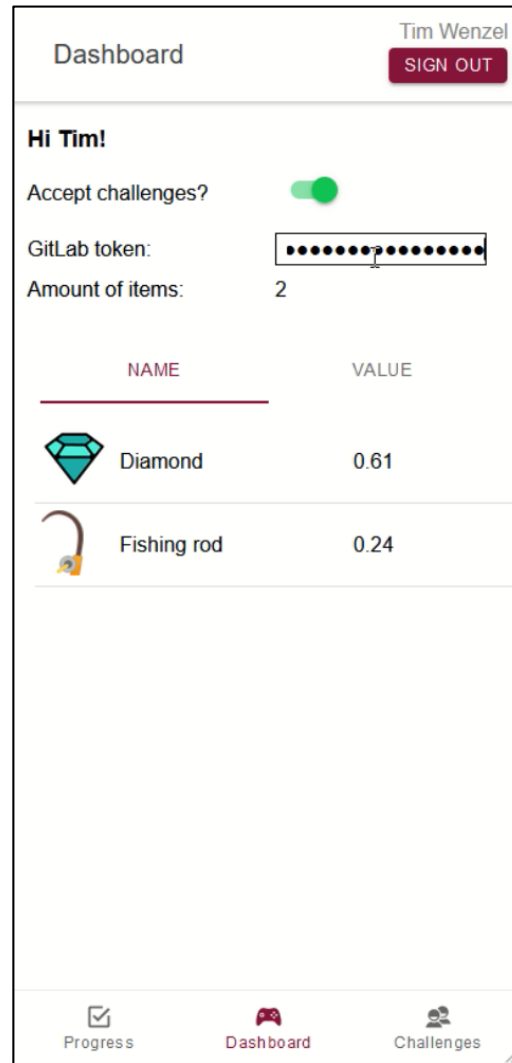
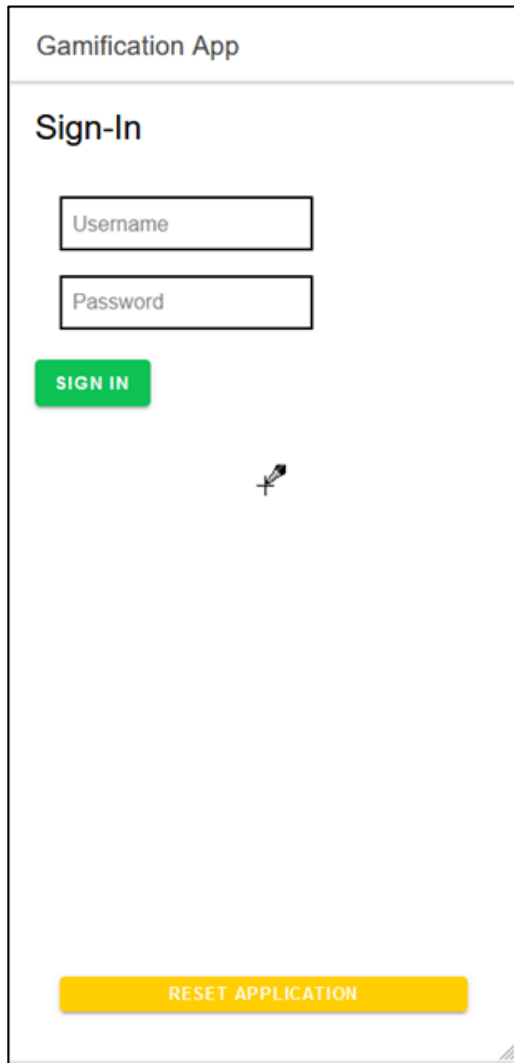
Competition view:

- List of users / colleagues
(Amount of their items, Ready to compete)
- Competitions only available after confirmation

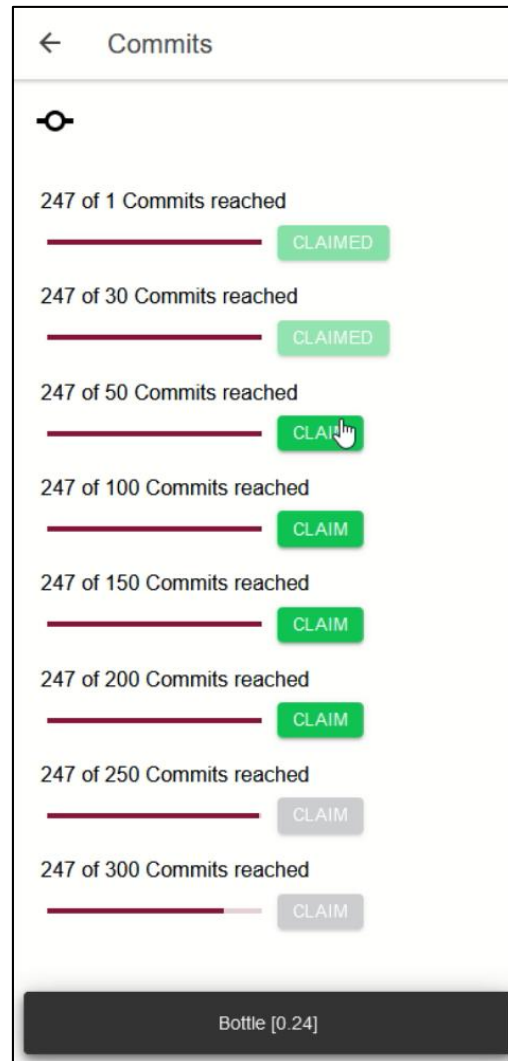
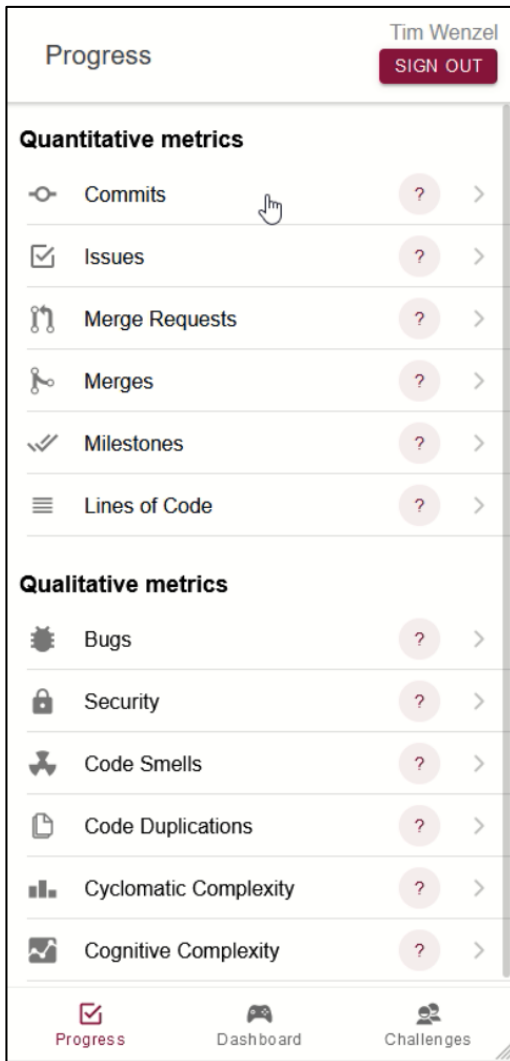


The Prototype: in Action

Video: <https://wwwstud.fh-zwickau.de/raw17hkw/Video-GamificationInSoftwareDevelopment.m4v>



The Prototype: in Action



Calculation of Competition Winner

Sum of a player's rewards (item values):

$$\text{SumPlayer}_X = \sum_{i=0}^n \text{ItemValue}(i)$$

Overall sum of item values:

$$\text{SumRewards} = \text{SumPlayer}_1 + \text{SumPlayer}_2$$

Chance to win in percent:

$$\text{ChancePlayer}_X = \frac{\text{SumPlayer}_X}{\text{SumRewards}}$$

Calculation of Competition Winner (Code)

```
1 // Basic winning probability for player 1 (50%)
2 let chancePlayer1 = 0.5;
3 // Summation of item values for player 1
4 player1.items.forEach(item => chancePlayer1 += item.value);
5
6 // Basic winning probability for player 2 (50%)
7 let chancePlayer2 = 0.5;
8 // Summation of item values for player 2
9 player2.items.forEach(item => chancePlayer2 += item.value);
10
11 // Calculation of overall reward sum (player 1 and player 2)
12 const sum = chancePlayer1 + chancePlayer2;
13
14 // Calculation for chance of winning for each player
15 chancePlayer1 = chancePlayer1 / sum;
16 chancePlayer2 = chancePlayer2 / sum;
17
18 // Round chances
19 this.chance1 = Math.round(chancePlayer1 * 1000) / 10;
20 this.chance2 = Math.round(chancePlayer2 * 1000) / 10;
21
22 // Determination of winning player by random value and calculated chances
23 return Math.random() < chancePlayer1 ? this.user1 : this.user2;
```



Thank you for your attention!