Gamification

...or how to amuse people in daily tasks

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Mens, maatschappij en ICT
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Agenda

1. Gamification: basics and cases
2. Design principles
3. Informatiekunde research about gamification
4. Ethical concerns
1. Gamification: basics and cases
1. Gamification: basics and cases

Definitions from the literature

• The application of **game-design elements** in **non-gaming contexts** (Deterding, 2011)

• The use of **game mechanics** and **experience design** to digitally **engage** and **motivate** people to achieve their goals (Burke, 2014)

• Not only software!
1. Gamification: basics and cases

*Why gamification?*

- Gamification is intended to *heighten engagement* by having people enjoying the tasks they are conducting.
- **Examples**
  - I endorse the skills of a friend on LinkedIn, and she will endorse me in return thereby gratifying my ego.
  - By being a highly appreciated contributor on StackOverflow, I can provide a prospective employer evidence about my skills.
  - ...
1. Gamification: basics and cases

Examples of gamification in society

Traffic light in Utrecht
Speed limits in the US
Learning with the Khan academy and Duolingo
Competitions between charities (fundraising) and energy bill saving
1. Gamification: basics and cases

Positive case #1: Microsoft’s translation

- Context: Windows 7 beta
- Challenge: ensure that localized dialogue boxes work well in every language
- Problem: manual testing is extremely boring
1. Gamification: basics and cases

Positive case #1: Microsoft’s translation

• The solution
  
  • A competition for employee teams in different geographic areas
  
  • **Objective:** given a screenshot, find as many errors as possible
  
  • No financial rewards
  
  • **Motivation:** excitement of finding errors, being good corporate citizens, being the most successful team/individual on the leaderboard

• **Results:** over 500k dialogue boxes were translated, and hundreds of bugs/errors could be found
1. Gamification: basics and cases

*Negative case: Google News Badges*
1. Gamification: basics and cases

Negative case: Google News Badges

• Ever heard of these badges?
• What went wrong?
  • Too many badges
  • No meaning (why should one collect them?)
1. Gamification: basics and cases

**Negative case: Google News Badges**

- Ever heard of these badges?
- What went wrong?
  - Too many badges
  - No meaning (why should one collect them?)
- Contrast this with StackOverflow
1. Gamification: basics and cases

**Mixed results: CCRE**

- Crowd-Centric Requirements Engineering (CCRE): *A gamified method to obtain requirements from product users and stakeholders*
  - End-to-end process: from feasibility to development
  - Creates a crowd of users
  - Typical gamification elements: points, leaderboards
  - Most useful users are involved in focus groups

[Snijders 2015]
1. Gamification: basics and cases

*Mixed results: CCRE*

- The REfine gamified tool
1. Gamification: basics and cases

**Mixed results: CCRE**

- Positive outcomes
  
  - Participants found the experience **more engaging** and **more useful** than previous experiences in communicating requirements.

  **Gamification Results**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement</td>
<td>3.88</td>
</tr>
<tr>
<td>Usefulness</td>
<td>4.19</td>
</tr>
<tr>
<td>Difficulty</td>
<td>2.69</td>
</tr>
</tbody>
</table>

- Voting and commenting were much appreciated.
1. Gamification: basics and cases

**Mixed results: CCRE**

- Not-that-good outcomes
  - Forming a large crowd is difficult (only 19 participants)
  - Engagement in the long-term is not easy to achieve
  - Risk of trivial needs (*noise*) with novice participants
1. Gamification: basics and cases

... not a panacea!

• In 2014, Deterding proposes to revisit the foundations of gamification, including
  • Replace focus on atomic game elements with experience design
    • Design a game experience, not just a set of game elements
  • Move away from coercive systems to facilitating good life
    • Gamified experiences should help, not harm

[Deterding, 2014]
2. Design principles
2. Design principles

* A simple framework *

1. Analyze the players
2. Choose game elements
3. Create feedback loops
4. Playtest

Define/adjust the scope

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2. Design principles

Define/adjust the scope

• The **scope** of the gamified experience is essential
  • Define **boundaries** and **aim**
  • Study the **potential** for gamification
    • Are the gamification outcomes be used in some way?

• The scope can/should be **adjusted**!

Example: involve the users of our mobile app to figure out what elements of the user interface need to be revised, and why
2. Design principles

1. Analyze the players

- **Determine** who are the potential players
- **Study** the potential players
  - What are their intrinsic and extrinsic motivations?
  - Explore gamer personalities [Bartle, 1996]
  - Compute Reiss profiles [Reiss, 2004]

Example: the players for the user interface’s improvement would be the mobile app users. A survey could be sent out to analyze what motivates them
2. Design principles

1. Analyze the players: motivation

- **Intrinsic motivation**: behavior is driven by internal rewards, self-desires and attitudes
  - Long-lasting and self-standing
  - E.g., one’s desire of learning

- **Extrinsic motivation**: behavior as a means to obtain a desired outcome
  - The influence comes from outside the individual
  - E.g., points-badges-leaderboards

[Ryan, 2000]
2. Design principles

1. Analyze the players as gamers

- Gamer Psychology: character theory chart
  - What is the distribution of your players?
2. Design principles

1. Analyze the players: desires

- Compute Reiss profile
  - Some companies store this data for their employees
  - Focus is on desires in life

![Reiss profile table]
2. Design principles

2. Choose game elements

- So many game elements exist! Some examples

**Rather standard**
- Points
- Badges
- Leaderboard
- Levels
- Challenges
- Activity feed
- Avatar

**More ad-hoc**
- Onboarding
- Game master
- Storytelling
- Video
- Facial animation
- Progress bar
- Quiz
- Timer
- Liking
- Prize
2. Design principles

2. Choose game elements

• Not all game elements are the same!
  • They stimulate different types of motivation (intrinsic/extrinsic)
  • There are formal and dramatic elements
  • Competitive vs. collaborative
  • Suitability for the individual player varies
2. Design principles

2. Choose game elements

- Formal elements define the **mechanics of the game** without looking at the context
  - **Players** (roles, interaction)
  - **Objectives** for the players
  - **Procedures** to reach those objectives
  - **Rules** that constrain the procedures
  - **Resources** (limited in the game)
  - ...
2. Design principles

2. Choose game elements

- Dramatic elements state the context where the game takes place
  - **Play**: what are the ludic elements?
  - **Premise**: a setting/metaphor where the game takes place
  - **Character**: not anonymous entities
  - **Story**: how does the context evolve?
2. Design principles

3. Create feedback loops

- Games are dynamic
- Orchestrating the game elements is crucial
  - You may choose the right elements, but you need to properly combine them
  - See, again, Deterding (2014)
- How to do such orchestration?
  - A few principles, experience, playtesting
2. Design principles

3. Create feedback loops

- **Principle 1: the theory of flow** (Csikszentmihalyi)
- Avoid boredom and frustration!
  - You want your players to be focused
  - But not irritated because of difficulty
2. Design principles

3. Create feedback loops

- Principle 2: create loops at different levels
  - Action-reward
  - For example:

Macro-loop, based on intrinsic motivations

Micro-loop, based on extrinsic motivations

Example: the macro-loop could be based on involving employees in high-level decisions, the micro-loop could be based on a weekly leaderboard.
2. Design principles

4. Playtest

• Perhaps the most important aspect
• Gamification design is not exact science (yet!)
• Use playtest outputs to improve the gamified experience
• Different playtesting techniques exist
2. Design principles

4. Playtest

1. **Discussion of the concept** with experts and potential players can be the starting point

2. **Physical prototypes** come next
   - Small groups can test the basic mechanics before implementing

3. **Digital prototypes**: choose what to test
3. Informatiekunde research on gamification

[Lombriser, 2016]
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Gamified Requirements Engineering

- Requirements Engineering (RE) is, roughly, the process that turns the stakeholders' needs into requirements for a software system.
- RE today is not always successful because of:
  - Incomplete understanding of needs
  - Insufficient domain knowledge
  - Changing requirements
  - Poor stakeholder collaboration
  - Lack of stakeholder participation
  - ...

Improved quality and creativity in RE

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Expressing requirements: 1. User Stories

- Notation used in agile development (Scrum)
  - As a role (who)
  - I want to achieve a goal (what)
  - So that some benefit is obtained (why)

As an Informatiekunde student,

I want to receive the slides of the lecturers

So that I learn the subjects without reading the papers
3. Informatiekunde research on gamification

**Expressing requirements: 2. Acceptance Tests**

- Complement the basic user stories
- Determine when a user story is fulfilled
  - *Given* some context
  - *When* some action is carried out
  - *Then* a set of observable consequences occurs

Given a student with a mobile phone and the UU app

When the student enters a classroom

Then links to the presentations are visible in the app
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Our hypothesis: the Gamified RE Model
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Our formal hypotheses

**H1**: If a diversified gamification RE platform is deployed in alignment with motivation, then stakeholder engagement is significantly increased

\[ \text{gamification} \rightarrow \text{engagement} \]

**H2**: If stakeholders are more engaged in requirements elicitation with respect to their expertise, then the overall performance of the process and outcomes is significantly increased

\[ \text{engagement} \rightarrow \text{performance} \]
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Our gamified requirements elicitation platform

- Digital platform that supports requirements elicitation
  - User stories with acceptance tests
- 17 game elements that can be enabled/disabled
  - Extrinsic motivation: points, badges, leaderboards, ...
  - Intrinsic motivation: video premise, avatar, onboarding, storytelling, ...
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Our gamified requirements elicitation platform

![User Story Game](image-url)
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*Our gamified requirements elicitation platform*
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**Experimental context**

- Controlled experiment *in-situ*
  - Treatment group = gamified elicitation platform
  - Control group = same platform without game elements
- *Context*: at MaibornWolff, an IT consultancy company in Munich with 160 employees
- *Business case*: elicitation of the requirements for an efficient video conferencing system for team meetings
  - Two hours to work on the case
- We paid special attention to minimizing interference
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**Experiment setup**

<table>
<thead>
<tr>
<th>Treatment Group (6 Stakeholders)</th>
<th>Control Group (6 Stakeholders)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td><strong>3m, 3f</strong></td>
</tr>
<tr>
<td>6.7</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>4,8</td>
</tr>
<tr>
<td>5.2</td>
<td>4,2</td>
</tr>
</tbody>
</table>

**No significant differences in Reiss profile test results**
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Results, productivity

The treatment group was significantly more productive.
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Results, intrinsic quality of the requirements

<table>
<thead>
<tr>
<th></th>
<th>Treatment Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Negotiable</td>
<td>4.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Valuable</td>
<td>4.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Estimable</td>
<td>3.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Small</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Testable</td>
<td>4.5</td>
<td>4.0</td>
</tr>
</tbody>
</table>

*p < 0.05 for all comparisons.
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Results, stakeholder satisfaction

- **Total Number of User Stories**
  - Treatment Group
  - Control Group

<table>
<thead>
<tr>
<th>Category</th>
<th>Treatment Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must-Be</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>One-Dimensional</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Attractive</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Indifferent</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Reverse</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
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Results, emotion and cognition

![Bar chart showing mean scores for emotions and cognition.

- Emotions: Treatment Group Mean Score: 70%, Control Group Mean Score: 70%
- Cognition: Treatment Group Mean Score: 60%, Control Group Mean Score: 60%

No significant difference was identified.

\[ t(9) = -0.082, p \geq 0.05 \]
\[ t(9) = 1.767, p \geq 0.05 \]
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Hypotheses evaluation

• We retain the null hypothesis for H₁
  [gamification → engagement]
  • Emotions and cognition did not exhibit statistical differences

• We reject the null hypothesis for H₂
  [engagement → performance]
  • Significant variations in all sub-dimensions of performance
    • More user requirements
    • Higher requirements quality
    • Better creativity
4. Ethical concerns
4. Ethical concerns

Is gamification ethical?

- Most literature reports on benefits of gamification from the business and economic perspectives
- But ethical concerns exist as well
  - Social and mental well-being within the workspace are at harm
  - How to check? Empirical study (questionnaire, interviews)

[Shahri, 2014]
4. Ethical concerns

**Main findings: gamification and tension**

- Gamification may create tension at workplace

<table>
<thead>
<tr>
<th>Working Environment</th>
<th>Tension-Problematic</th>
<th>Tension-Acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative</td>
<td>Measurable</td>
<td>Competitive</td>
</tr>
<tr>
<td>Competitive</td>
<td>Non-uniform</td>
<td>Objective</td>
</tr>
<tr>
<td>Uniform</td>
<td>Subjective</td>
<td>Collaborative</td>
</tr>
<tr>
<td>Not measurable</td>
<td>Collaborative</td>
<td>Competitive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>Age</th>
<th>Personality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative</td>
<td>Older generation</td>
<td>Non-competitive</td>
</tr>
<tr>
<td>Competitive</td>
<td>Younger generation</td>
<td>Competitive</td>
</tr>
<tr>
<td>Uniform</td>
<td>Introverts</td>
<td>Extroverts</td>
</tr>
<tr>
<td>Subjective</td>
<td>Comparative appraisal</td>
<td>Individual appraisal</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Destructive criticism</td>
<td>Constructive criticism</td>
</tr>
<tr>
<td>Not measurable</td>
<td>Rarely top performing</td>
<td>Regularly top performing</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Individual competition</td>
<td>Group collaboration to win</td>
</tr>
<tr>
<td>Competitive</td>
<td>Talent-based grouping</td>
<td></td>
</tr>
<tr>
<td>Clustering</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Ethical concerns

**Main findings: gamification and monitoring**

- Gamification may be perceived as a monitoring tool

<table>
<thead>
<tr>
<th>Rank Visibility</th>
<th>Likely to Raise Issues</th>
<th>Likely to be Accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not in the top list</td>
<td>In the top list</td>
</tr>
<tr>
<td></td>
<td>Frequently shown to all</td>
<td>Occasionally shown to all</td>
</tr>
<tr>
<td>Level of Details</td>
<td>Fine-grained details</td>
<td>Overall performance</td>
</tr>
<tr>
<td>Nature of Task</td>
<td>Creative</td>
<td>Classical</td>
</tr>
<tr>
<td></td>
<td>Quality-based</td>
<td>Quantity-based</td>
</tr>
<tr>
<td>Management Style</td>
<td>No direct contact</td>
<td>Direct contact</td>
</tr>
<tr>
<td></td>
<td>Pressurising for more profit</td>
<td>Improving self-productivity</td>
</tr>
<tr>
<td>Personality</td>
<td>Doing the task as any job</td>
<td>Genuinely interested in the task</td>
</tr>
<tr>
<td></td>
<td>Moderately ambitious</td>
<td>Ambitious and self-motivated</td>
</tr>
</tbody>
</table>

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4. Ethical concerns

Main findings: gamification and privacy

- Gamification may violate one’s privacy

<table>
<thead>
<tr>
<th></th>
<th>Likely to Raise Issues</th>
<th>Likely to Be Accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stored Information</td>
<td>Personal, or likely to lead to infer personal information</td>
<td>Work-related information</td>
</tr>
<tr>
<td></td>
<td>Subjective judgement</td>
<td>Objective facts</td>
</tr>
<tr>
<td>Information Accessibility</td>
<td>Public/non-relevant peers</td>
<td>Managers/relevant peers</td>
</tr>
<tr>
<td></td>
<td>Real names</td>
<td>Anonymised or translucent</td>
</tr>
<tr>
<td>Personality</td>
<td>Introvert</td>
<td>Extrovert</td>
</tr>
<tr>
<td></td>
<td>Non-competitive</td>
<td>Competitive</td>
</tr>
<tr>
<td></td>
<td>Ambitious</td>
<td>Happy where they are</td>
</tr>
<tr>
<td>Right to View Information</td>
<td>Actual collected data and their interpretation are hidden</td>
<td>Both are available</td>
</tr>
</tbody>
</table>
4. Ethical concerns

**Main findings: gamification and exploitation**

- Gamification may be perceived as exploitation-ware: motivating staff to do more than their job requires

<table>
<thead>
<tr>
<th></th>
<th>Likely to Raise Exploitation Issues</th>
<th>Likely to Reduce Them</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rewarding Strategy</strong></td>
<td>Comparing to others progress</td>
<td>Comparing to self-progress</td>
</tr>
<tr>
<td><strong>Nature of the Reward</strong></td>
<td>Intangible costs</td>
<td>Tangible costs</td>
</tr>
<tr>
<td><strong>Policy</strong></td>
<td>Non-transparent, unexplained</td>
<td>Transparent, explained</td>
</tr>
<tr>
<td><strong>Tasks</strong></td>
<td>Non-concrete/subjective</td>
<td>Concrete/subjective</td>
</tr>
<tr>
<td><strong>Underlying Mechanism</strong></td>
<td>Seen negative</td>
<td>Seen acceptable</td>
</tr>
<tr>
<td><strong>Personality Type</strong></td>
<td>Online “ultras”</td>
<td>Balanced</td>
</tr>
<tr>
<td></td>
<td>Looking to compensate online</td>
<td></td>
</tr>
</tbody>
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Main findings: gamification and values

- Gamification may violate one’s personal and cultural values

<table>
<thead>
<tr>
<th></th>
<th>Raise Ethical Issues</th>
<th>Likely to Reduce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Sensitive Design</td>
<td>Not-aligned with personal values</td>
<td>Aligned with personal values</td>
</tr>
<tr>
<td></td>
<td>Forced to participate</td>
<td>Participation is an option</td>
</tr>
<tr>
<td>Quality Standards</td>
<td>Drive people to be fast</td>
<td>Quality first</td>
</tr>
<tr>
<td></td>
<td>Create clear competition</td>
<td>Soft competition</td>
</tr>
<tr>
<td>Honesty</td>
<td>Difficult to win</td>
<td>Everyone can get something</td>
</tr>
<tr>
<td></td>
<td>Consequences on losing</td>
<td>No serious consequences</td>
</tr>
<tr>
<td>Culture of the Place</td>
<td>Incompatible</td>
<td>Compatible</td>
</tr>
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4. Ethical concerns

**Main findings: gamification and values**

- Gamification may violate one’s personal and cultural values

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<td>Incompatible</td>
<td>Compatible</td>
</tr>
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Conclusion

1. Gamification is a serious thing!
2. Design principles exist for gamification
3. Research about the potential of gamification is going on
4. Gamification may be unethical if not properly designed

Questions? F.Dalpiaz@uu.nl
References


References


