Gamification Solutions for Software Acceptance: A Comparative Study of Requirements Engineering and Organizational Behavior Techniques

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Gamification

“The use of game design elements in non-game contexts” [1]

Gamification concepts:
- Core:
  - Points
  - Badges
  - Leaderboards
- Advanced:
  - Levels, paths, challenges, stories, feedback, progress, ...

Case studies:

Success cases:

[Image of case study examples]
Gamification Engineering

- Complex: **Incentive Mechanisms**
  - Which *gamification concepts* should I use?
  - Which *parts* are to be gamified?
  - How could I put together gamification concepts?
  - Which are the *best practices/design patterns*?

User Characterization and Psychological Factors

- Heterogeneous professionals:
  - How could I motivate particular *kinds of Users/Players*?
- Time-consuming
- Not automatized
- High-costs -> **Expensive**
Requirements Engineering and concepts, techniques from other fields

- **Objective**: to help the analyst in conducting a systematic acceptance requirements analysis
- **Focus**: Requirements Engineering
- **Concepts from other fields** -> Human Behavior, Psychology, Organizational Behavior, etc. -> for individuating:
  - Acceptance Factors
  - Acceptance Strategies

By extensively analyzing gamification, behavioral, cognitive, psychological, social/economic studies [2], [3], [11]–[15], we derived context variables relevant for acceptance and gamification.

- **Tools** able to consider these context variables
Gamification Frameworks

Analysis

Agon: an Acceptance Requirements Framework [Piras RE ‘16]

Design

Mobility Gamification Engine [Kazhamiakin ISC2 ‘15]

Development

Enterprise Gamification Platform [Herzig ’12]

Service Oriented Gamification Platform [Sripada ’16]
### Candidate Frameworks

- **Agon [Piras RE’16]**: an Acceptance Requirements Framework -> Human Behavior and Psychological perspectives
- **MAF [Simperl ’13, Tokarchuk ‘12]**: the Motivational Antecedents Framework -> Organizational Behavior perspective

### Our contributions:

1. compare the 2 frameworks concerning their methodology, theories and variables -> **Comparison**
2. merge the 2 in a holistic framework -> **Preliminary Guidelines for integration**
Outline

- Software Acceptance and Gamification
- Case Study
- Comparison Results
- Integration Guidelines
- Conclusions
Case study: the Doodle-Like Meeting Scheduler

- Main objective: obtain **favorite dates** for scheduling a meeting by using doodle
- Target Users: professors
Case study: key elements

- Collect_Preferred_Dates
  - AND
  - Submit_Dates
  - Convince_Participants_To_Compile_Dates

Submit_Dates
Case study

Using Agon, an Acceptance Requirements Framework
Case study: using Agon, an Acceptance Requirements Framework

https://pirasluca.wordpress.com/home/acceptance/

- Base system Requirements modeling
- Acceptance requirements elicitation and analysis
- Context characterization
- Context–based analysis of acceptance requirements
- Acceptance requirements refinement and selection of high-level incentive mechanism requirements
- Context–based operationalization via incentive mechanism (gamification) requirements
- Domain-dependent instantiation of incentive mechanism (gamification) requirements

Gamified Solution
Case study: using Agon, an Acceptance Requirements Framework

Psychological Strategies

Incentive Mechanisms

Gamification Model

Gamified System

User/Player Model

User Characterization

System
Case study

Using MAF, the Motivational Antecedents Framework
Case study: using MAF, the Motivational Antecedents Framework

- **Analysis**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Tasks</th>
<th>Social Structure</th>
<th>Nature of good being produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication level (about the goal)</td>
<td>Variety</td>
<td>High</td>
<td>Hierarchy-neutral</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Medium</td>
<td>Public good (non rival, non exclusive)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Participation level (in defining the coal)</td>
<td>Specificity</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Clarity level</td>
<td>Identification</td>
<td>High</td>
<td>Hierarchical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Private good (rival, exclusive)</td>
</tr>
<tr>
<td></td>
<td>Required skills</td>
<td>Highly specific</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trivial common</td>
<td></td>
</tr>
</tbody>
</table>

- Mechanism Design Theories; analyst’s expertise and experience
Case study

The gamified meeting scheduler in a nutshell
Case Study: the gamified meeting scheduler in a nutshell

- **Acceptance Requirement:**
  - Acceptance[SubmitDates, Participants] ≥ 80%

- **Main solution elements:**
  - **Tour:**
    - Improve Perceived Ease of Use -> Improve System Perception by IT -> Provide Tours
    - Propose Tour Before Compiling
    - Set Skip The Tour
  - **Badges**
    - First Compiling Badge
    - Second Compiling Badge
    - …
  - Leader-board (First Doodle compilers LB)
  - Redeemable points (Win 100 RP points)
  - Gamified market (Real rewards; Redeemable policies)
  - …
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Comparison results

Our comparison covers:

1) the **context variables** used by each framework;

2) how **acceptance and gamification concepts and best practices** are captured and supported by the two frameworks;

3) the **analysis supported** by each framework for each of the gamification phase.
Context variables

- Disjointed variables
- Concept overlaps
- Hidden aggregated concepts (e.g., complexity of the task, individual aspects VS. social aspects)
## Comparison of analysis

<table>
<thead>
<tr>
<th></th>
<th><strong>Agon and its Methodology</strong></th>
<th><strong>MAF and its Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context Analysis</strong></td>
<td>[Supported, Manual, Analyst experience]</td>
<td>[Supported, Manual, Analyst experience]</td>
</tr>
<tr>
<td><strong>Acceptance Analysis</strong></td>
<td>[Supported, Systematic and tool–supported, Analyst experience]</td>
<td>[Not supported, Manual, Analyst experience]</td>
</tr>
<tr>
<td><strong>Gamification Analysis</strong></td>
<td>[Supported, Systematic and tool–supported, Analyst experience]</td>
<td>[Not supported, Manual, Analyst experience]</td>
</tr>
<tr>
<td><strong>Gamification Instantiation</strong></td>
<td>[Supported, Manual, Analyst experience]</td>
<td>[Not supported, Manual, Analyst experience]</td>
</tr>
</tbody>
</table>
Preliminary guidelines for the integration

- Starting from Agon and including MAF concepts

- For the integration, we envision the following activities:
  - 1) design of a **common context model**;
  - 2) collection of **psychological strategies and gamification best practices**;
  - 3) translation of collected elements in **Context Dependant Rules (CDRs)** and application of them in Agon models;
  - 4) **intra-model and inter-model revision** for the entire framework to ensure balance and coherence
Outline

1. Software Acceptance and Gamification
2. Case Study
3. Comparison Results
4. Integration Guidelines
5. Conclusions
Conclusions

- Acceptance through gamification by considering human factors (other relevant fields)
- Most relevant variables for acceptance and gamification
- A systematic acceptance requirements analysis
- Candidate frameworks
- Case study
- Comparison of the frameworks and methodologies
- Preliminary guidelines for integration
On-going and Future work

- **On-going:**
  - Integration
  - Evaluation (PACAS European Project, Vision European project, students, case studies from heterogeneous fields)

- **Future work:**
  - Conclude the integration
  - Additional dimensions/characterizations
  - Alternative operationalizations for acceptance requirements
  - Adaptive gamification solutions


Thanks for your attention

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