

A Gamified Prototype for Software Requirements Engineering

Helen Partou^{*}, Catherine Menon, Trevor Barker and Vito Veneziano

Department of Computer Science, University of Hertfordshire, UK

**corresponding author: h.partou3@herts.ac.uk*

Communication gaps remain a challenge for stakeholders involved in software Requirements Engineering (RE). Use of ambiguous emotive language is one example of complexity when eliciting requirements, which can lead to costly revisions if misrepresented. This paper presents the design of a gamified prototype application, which allows stakeholders to document and manage requirements. It includes customisation of De Bono's 'Six Thinking Hats' as a mechanism for gamification, and an emotive word bank to support stakeholder communication. The next phase of research proposed is an empirical study to assess impact of the prototype's features for RE.

Keywords: software requirements engineering; cognitive psychology; gamification; emotions; communication

Introduction

For software Requirements Engineering (RE), there remains ongoing challenges in eliciting and managing requirements for a development project. This is, in part, due to diverse stakeholders, such as the customer, requirements engineers, etc. Whilst there are communicative challenges with language and colloquialisms, there are also issues with ambiguity. For example, the use of emotive language, such as "surprise", has both positive and negative connotations. If this causes a communication gap in the context of RE, this can lead to costly revisions to requirements.

One technique which might help reduce communicative challenges is gamification. Whilst games are a fictional means of escapism, gamification refers to immersing game components into the real-world. This can spark competitive-collaborative dynamics into the everyday world of work, a concept which has been popularised in media, such as a song from Disney's 'Mary Poppins' [1]: "In every job that must be done / There is an element of fun / You find the fun and snap! / The job's a game".

Empirical studies [2] compared gamification with traditional (non-gamified) methods of requirements elicitation, suggesting that gamification might help elicit more requirements, though there were no major differences in emotions noted between methods. This paper presents a prototype application which allows stakeholders to document and manage requirements. It includes gamification, and an emotive word bank, to assess possible impact of these features for RE.

Prototype design elements I: De Bono's 'Thinking Hats' for RE gamification

In early prototype drafts, one stakeholder's home screen is in *Figure 1a*, and the requirements management screen in *Figure 1b*. Gamification features include stakeholder avatars, points with high scores and unlockable achievements. De Bono's 'Thinking Hats' [3], from the field of cognitive psychology, has been adapted as a means of gamifying RE and exploring its effects on cognitive load.

Stakeholders earn points from tasks linked to six coloured metaphorical hats: the **green** hat, representing creativity, for eliciting requirements as agile-based user stories; **yellow** hat for positive benefits and **black** hat for issues with requirements; **blue** hat for requirements prioritisation; **white** hat for neutral facts on the project and the **red** hat, symbolic of intuition, for expressing emotion.

Prototype design elements II: emotive word bank for communication

Another design element is the inclusion of a non-ambiguous emotive word bank based on the OCC (Ortony, Clore, Collins) ‘Model of Emotions’ [4], with the aim to support stakeholder communication.

In the prototype, an emotive word can be chosen (see *Figure 1c*) when sharing a benefit or issue with a requirement. When listed (see *Figure 1d*), these emotive words, such as joy or hate, are designed to help maximise communal understanding of the speaker’s comments and intentions.

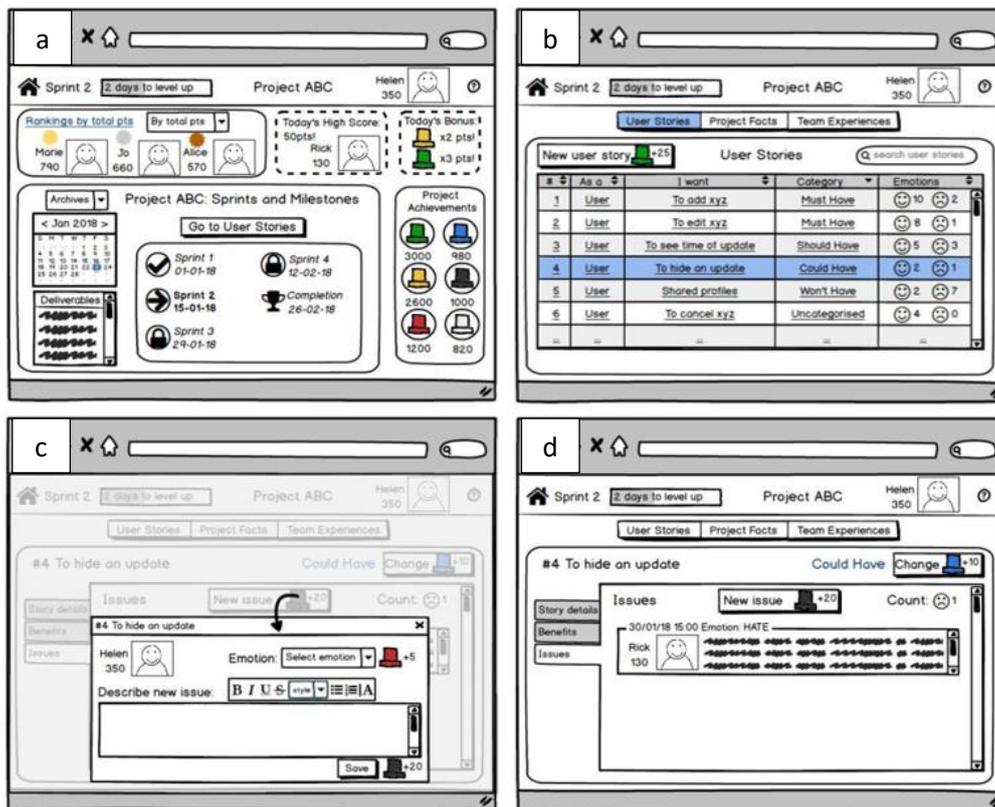


Figure 1. Early gamified prototype screens: (a) stakeholder homepage, (b) requirements management, (c) requirements issue with selection of emotive word, and (d) requirements issues listed with chosen emotive word

Next phase of research

To assess the impact of the prototype’s features, an empirical study is proposed as the next phase of research. The study’s design will need to minimise possible bias and isolate prototype features as a means of comparison between gamified and non-gamified methods. The measurements of impact could be based on two categories: 1) impact on requirements, such as number of requirements and revisions, and 2) impact on personal factors, such as comfortability and compassion.

Conclusion

RE faces ongoing challenges. Stakeholder communication gaps are one example acting against effective requirements validation. A gamified prototype based on De Bono’s ‘Thinking Hats’, and an

emotive word bank, has been designed to explore whether such challenges can be minimised. An empirical study is the next phase proposed to assess impact of the prototype's features for RE.

Reference list

- [1] Walt Disney Music Company, 'A Spoonful of Sugar', Mary Poppins [OST] (1964).
- [2] Lombriser, P., Dalpiaz, F., Lucassen, G. and Brinkkemper, S., 'Gamified Requirements Engineering: Model and Experimentation', in *Proceedings of the Conference on Requirements Engineering: Foundation for Software Quality*, Switzerland: Springer, p. 171-187 (2016).
- [3] De Bono, E., 'Serious creativity', *Journal for Quality and Participation* 18(5), p. 12-18 (1995).
- [4] Ortony, A., Clore, G. and Collins, A., *The Cognitive Structure of Emotions*, Cambridge University Press: Cambridge (1998).