Applying Acceptance Requirements to Requirements Modeling Tools via Gamification: a Case Study on Privacy and Security

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Abstract. Requirements elicitation, analysis and modeling are critical activities for software success. However, software systems are increasingly complex, harder to develop due to an ever-growing number of requirements from numerous and heterogeneous stakeholders, concerning dozens of requirements types, from functional to qualitative, including adaptation, security and privacy, ethical, acceptance and more. In such settings, requirements engineers need support concerning such increasingly complex activities, and Requirements Engineering (RE) modeling tools have been developed for this. However, such tools, although effective, are complex, time-consuming and requiring steep learning curves. The consequent lack of acceptance and abandonment in using such tools, by engineers, paves the way to the application of RE techniques in a more error-prone, low-quality way, increasing the possibility to have failures in software systems delivered. In this paper, we identify main areas of lack of acceptance, affecting RE engineers, for such tools, and propose an approach for making modeling tools more effective in engaging the engineer in performing RE in a tool-based way, receiving adequate feedback and staying motivated to use modeling tools. This is accomplished by performing acceptance requirements analysis (through the Agon Framework) and using gamification to increase the engagement of engineers during the usage of RE modeling tools. Towards this end, we performed a case study, within the VisiOn European Project, for enhancing a tool for modeling privacy and security requirements. Our case study provides preliminary evidence that our approach supports in making RE modeling tools more engaging from the engineer perspective.

Keywords: Requirements Engineering · Acceptance Requirements · Gamification · Goal Modeling · Privacy Requirements.

1 Introduction

Requirements Engineering (RE) aims at eliciting and analyzing requirements to produce a specification that can be used by developers for implementation. RE is a complex, error-prone process, and, especially when it concerns requirements calling for specialized expertise (e.g., privacy and security), many tools have been developed to support the process and to make it more systematic [8, 9, 11]. Moreover, new classes of requirements are becoming even more important for the entire cycle of Software Engineering (SE), since they guide the entire process in a strategic way from the very early stages of the analysis of any software system. For instance, this is especially true for privacy and security requirements, where poorly conducted analysis often leads to poor designed software systems, causing unlawful exploitation of personal data with damages to citizens, and heavy GDPR fines for large corporations [10, 14, 16]. This is often the case because software designers deal with privacy and security in an informal and unsystematic way, even though tool-supported methods are available [4, 8, 9, 16]. For instance, this is particularly relevant when dealing with very complex and huge software systems to be made compliant with GDPR through RE techniques, by modeling privacy and security requirements in a Privacy by Design way. Relevant examples, providing tool-supported solutions, are the VisiOn EU Project[1] [4, 9], addressing privacy, and the DEFeND EU project[2] [14, 16], aiming at building a privacy governance platform to support organizations in achieving GDPR compliance [10, 14, 16]. However, as we detail below considering also VisiOn [4, 9], current tool-based RE techniques, although effective, are not widely adopted because they are still complex and time-consuming, requiring steep learning curves. Accordingly, in this paper we investigate and address the next research questions:

RQ1: What aspects can we consider for enhancing RE modeling tools to be accepted and used, to analyze systematically classes of requirements involved in complex software systems?

RQ2: What can be one of the possible candidate processes that can support in a systematic, and semi-automatic, way the design of RE modeling tools, in a way that analysts can be inclined to use RE modeling tools, according to **RQ1** aspects?

RQ3: How to apply a process, addressing **RQ1** and **RQ2**, to real cases and how the resulting solution is perceived by analysts?

To address such problems, we propose to enhance existing tools for dealing with security and privacy requirements with elements of gamification, intending to keep analysts engaged and willing to use such tools. Gamification is an effective design technique for the engagement of the tool user [17]: it is a ‘‘process of game-thinking and game mechanics to engage users and to solve problems’’ [17]. Gamification can improve a system increasing participation, learning and achievement. Many works [1, 10, 11, 14, 16] from different sectors [5] demonstrate that the use of Gamification can lead to obtain countless benefits for heterogeneous users (and

[1] `http://www.visioneuproject.eu/`
[2] `https://www.defendproject.eu/`

software companies) that can be really engaged by the gamified system and, thus, more motivated to use it, finally meeting the objectives of the software itself, and for companies by increasing profits and user fidelity [11--13, 17].

In this work, we have identified the potentialities of employing gamification for enhancing modeling RE tools, to be accepted and used by RE analysts for dealing with complex RE problems in a more systematic tool-based way. Specifically, we have first of all studied different RE modeling tools, for instance STS-Tool [9] and Secure Tropos [8], to identify aspects related to lack of acceptance from analysts in using such tools in complex scenarios, within real cases of EU projects. This helped us in addressing **RQ1**. Based on this, to address **RQ2** and **RQ3**, we considered the systematic acceptance requirements analysis based on gamification of the Agon Framework [12, 13] as a potential approach to be considered for enhancing modeling tools through gamification. Thus, we employed Agon in a real case, within the VisiOn EU Project[1] [4], to gamify the STS-Tool [9]. Specifically, within the VisiOn EU Project[1] [9], a lack of acceptance from analysts in using an effective modeling requirements tool, the STS-Tool, has been measured. Therefore, in our case study we revised and enhanced the STS-Tool by proposing a new gamified version of it. Then, we involved requirements analysts in using both the STS-Tool versions (the old and the new gamified one), and we interviewed them to evaluate if the gamified version was more engaging and more useful in performing their RE modeling activities, obtaining positive results.

Next sections are organized as follows. Section 2 addresses **RQ1**, which explains the problems related to the lack of acceptance identified in the STS-Tool within VisiOn, common to other RE modeling tools (e.g., Secure Tropos [8]), and highlights the important aspects considered for improving the STS-Tool through the application of our approach, supported by Agon. Section 3 addresses **RQ2** and **RQ3**, describing our case study by showing how the STS-Tool has been enhanced on the basis of the results obtained in the previous section. Section 4 describes our research method and evaluates the gamified STS-Tool, compared with the previous version, by involving requirements analysts (**RQ3**). Section 5 discusses related works. Section 6 concludes this paper.

2 Tool-Supported RE Issues and Lessons Learned

In this section, we outline the results obtained by addressing **RQ1** in this research, describing the main areas of lack of acceptance reported by analysts in real scenarios within the VisiOn EU Project for the STS-Tool [9]. Furthermore, we have analysed also other RE modeling tools (e.g., Secure Tropos [8]) and their usage within real cases of EU projects (e.g., DEFeND EU project[2]), to confirm that aspects reported below, are common lacks of acceptance from analysts in using RE modeling tools in complex scenarios. To derive the following lessons learned, we characterized the analysts involved, analysed their usage of the STS-Tool, within VisiOn, and interviewed them. We characterized them, according to the Agon method and its context factors (e.g., the user, acceptance subject, goal, task, social structure and nature of the good being produced [12]), through a

questionnaire for identifying types of users, aspects related to the kind of the tool used and the context where it is used. Then, during the observation in using the STS-Tool and interviewing them, we identified lack of acceptance related to the following 3 main categories [2]: **(i)** Support; **(ii)** Training; **(iii)** Collaboration.

Adequate Support. The system supports the user via a help function, which is adequate for a senior user that already knows what to search in a helper, in case they need something specific or just to refresh concepts from their consolidated knowledge. Therefore, this is not adequate to a junior analyst, which needs much more support, above all in relation to the first approaches to the tool, in order to, for example: **(i)** learn how to use the tool step by step or specific functions [2]; **(ii)** having automatic support features guiding the analyst in achieving a result, or to offer ready-to-use solutions in line with the analyst's purposes (elaborated for a minimal effort, and based on info provided in input by the user) [17].

User-Typology-Oriented Training. In addition to the previous category, since the system is used by multiple types of users, it is important to give them growth opportunities, based on their user type, to get them to use the complex RE processes and techniques supported by the tool. This aspect has not been considered in the original system, and is 1 of the critical factors leading a user to abandon a system [11]. In fact, the user finds herself working with a tool requiring strong modeling RE skills from the beginning. To overcome this, it is needed to introduce focused training functions that, based on the specific kind of user, make the user feel engaged, to keep her using the tool by seeing, at the same time, that her familiarity and effectiveness with the tool increase progressively [12].

Tool-Supported Collaboration. The goal of the analyst is to model heterogeneous requirements, and, above all, to produce high-quality models reflecting both socio and technical aspects of complex systems. This depends on many factors and needs coming from elicitation and analysis. In some cases, it is needed to involve stakeholders in verifying, discussing and improving models in a tool-supported way. Other times, this comes directly from collaborating with other colleagues involved in the same task, thus as a team, and having the domain knowledge needed to model specific systems related to specific sectors. Therefore, to produce high-quality, effective models, it is necessary to collaborate with and to involve stakeholders and other analysts in brainstorming activities, where the tool and related RE techniques should support this crucial way of working.

3 The Process Applied to a Real Case

In this Section, we address **RQ2** and **RQ3** with our real case study, within the VisiOn EU project, and the gamification solution produced by using our approach for making STS-Tool an engaging RE modeling tool. Then, in Section 4 we discuss our research method and the evaluation of the gamified STS-Tool, compared with the previous version, from the analyst's perspective (**RQ3**).

On the basis of lack of acceptance aspects, issues and lessons learned discussed before, we re-engineered the STS-Tool to make it an engaging RE modeling tool. To achieve this, we considered them and used the Agon framework and its

method, a systematic acceptance requirements analysis based on gamification, as a potential systematic, semi-automatic, process for enhancing RE modeling tools by making them more engaging from the analyst's perspective. Next subsections describe the results we obtained by employing the Agon meta-models and the process applied to the STS-Tool. Due to lack of space, we cannot report here complete models obtained by using Agon. However, they are available at [3].

Context Characterization. This phase produces a graphical representation of the user characterization and its context. The analyst has to instantiate the Context Characterization model of Agon: it is a strategic model, because based on this instantiation, Agon, in the next phases, through its reasoning on the other models, individuates the most appropriate elements for the kind of user to engage [11, 12, 14, 16]. Most of the STS-Tool users are young, look for new motivations, prefer to interact and receive support via social networks; they had few chances to use systems similar to STS-Tool, and own low level of expertise regarding this type of system. Furthermore, to be stimulated to use STS-Tool, they need interactive and supported usage experiences. They are keen to improve their professional skills, which are at a low level (junior). They need also to be stimulated by receiving a clear level of communication of the goals, favouring them to learn, in a simple way, how to execute tasks efficiently with the tool.

Acceptance Analysis. The Acceptance Requirements Analysis is guided by the results of the user characterization, and involves the usage of the Acceptance Meta-Model of Agon in a 2 steps guided procedure of Agon. In the first step the analyst defines the acceptance problem as a goal model for the system to enhance, in this case STS-Tool [9]. This model [3] represents functions and goals of STS-Tool. Agon, by performing reasoning based on the user characterization, indicates functions candidates to be improved for further engaging and stimulating the user. The analyst considers them interactively. We selected in particular the ones suggested by Agon related to aspects where it is needed to improve the STS-Tool, concerning Technological Support, Training and Collaboration functions. The second step, Context-Based Analysis for individuating Acceptance Requirements, is semi-automatic and interactive. In fact, Agon, on the basis of the characterization, reasons over the Acceptance Meta-Model, and identifies the most suitable acceptance requirements, called needs, for the kind of user to engage. The analyst can then take decisions over the reasoning results, i.e. needs to fulfil and related strategies suggested by Agon, and the tool functions identified in the previous step where to apply those strategies. Some of the acceptance requirements we elicited are: `Improve Perceived Usefulness`, `Increase Outcome Expectations`, `Improve Perceived Ease of Use`, `Increase Social Influence` and `Improve Perceived Compatibility`.

Tactical Refinement. In this phase, based on previous choices and characterization, Agon, by reasoning over the Tactical Meta-Model, suggests tactics that can refine needs and strategies identified in the previous step. For instance, in our case, most important tactics selected are related to: social contributions, which encourage users to receive and provide support to the others, leading also to the

creation of a virtuous internal competition, and at the same time, collaboration, allowing to create reciprocal interaction, support and surprise among users.

Gamification Operationalization and Gamification Solution. Based on all the elements identified in the previous steps (e.g., characterization aspects, needs and tactics), in this phase, Agon supported us through reasoning over its Gamification Meta-Model. Thus, we were able to identify gamification concepts and strategies that helped us in designing a gamification solution for the STS-Tool. Based on the user and context characterization elements, needs, tactics, gamification concepts and strategies elicited and analyzed by using the Agon Framework, we designed a gamification solution for the STS-Tool that is based on the next main points: **(i)** *Individual Path and Multi-Roles Team Solution;* **(ii)** *Supported Goal-Oriented Path*; **(iii)** *Three-Levels Community*. In the next subsections, we describe point 3 that is the most complex and complete one, which includes - and allows us to introduce - concepts related to the other two [2].

First Level (Personal-Private). This level concerns the `Personal Path` of the user, as a professional individual, for progressing in learning how to use tool-supported RE techniques and functionalities, improving her skills in a guided way. This allows to obtain `Real` and `Virtual Benefits` through the use of the system according to her `Progression` in the `Individual Learning Path`. For example, real benefits mean either to obtain promotions at work or to improve a skill, while virtual benefit is the creation of a progressive achievement `Status` in the system, which initially is private, and later, by reaching other levels, becomes public (at the company level), improving her status and, at the same time, creating fair competition and promoting collaboration with other users.

Second Level (Team). This level concerns groups of users competing and collaborating each other. Here, the main aim is on building the `Status` for the `Team`. A user has the possibility to create a new team on-the-fly to: **(i)** receive/give support concerning specific working aspects; **(ii)** continue improving their skills; **(iii)** contribute to the skill improvement of their colleagues; **(iv)** create a long-term, focused team to work on a project. The creation of groups is based also on `Points` earned when the user completes successfully actions for: **(i)** promoting collaboration and interactions in the system; **(ii)** supporting other colleagues; **(iii)** increasing the overall skills of users.

Third Level (Management). At this level the user has more decision-making power concerning creating groups and involving the most suitable users for the achievement of project objectives. They recruit collaborators based on their personal and team statuses. Furthermore, having a more central role in the overall progress of her colleagues, they are responsible to make their collaborators improve their skills, inline with project objectives. For instance, they can start by individuating colleagues to support her, as a small team, to learn certain aspects, and to achieve small incremental objectives, or they can propose a colleague to use `Gamified Helps, Tours` and `Tutorials` to learn advanced ways of using tool-supported RE techniques. These activities are rewarded with `Points` and `Badges`, which can be used to redeem `Real` and `Virtual Benefits`, which in turn can be also donated to virtuous collaborators; this depends also on related

`Individual/Team Rankings` or `Progress Bars`. Moreover, users at this level are the main source of *Expertise Mentoring*, based on the creation of a `Community` allowing problem-sharing with other colleagues and to receive automatically, from the tool, ready-to-use solutions devised previously by other users for the same problem. This promotes collaboration, solution-sharing and professional development among users, by introducing also `Behavioural Improvements` with `Altruistic Actions`, motivating and stimulating the users also by obtaining, for these interactions, both `Real` and `Virtual Rewards`.

4 Evaluation and Research Method

In this section, we discuss our research method and the design, execution and results related to the evaluation of the gamified STS-Tool, compared with the previous version of this tool, from the analyst's perspective (**RQ3**).

Planning and Context of Use. In our research, due to the fact that most of the functionalities of RE modeling tools are related to semi-automated human-activities, we followed an adapted Human-Centred Design approach [7]. Specifically, as described in previous sections, in relation to the Planning and Context of use phases [7], we considered human feedback (from requirements analysts within the VisiOn project and the ones outlined in the next) at different stages, starting from the very early ones, characterizing the users and the related context [7] by using a questionnaire based on the Agon characterization [12] and its context factors (e.g., the user, acceptance subject, goal, task, social structure and nature of the good being produced [12]). According to this, as described in previous sections, we have been able to identify lessons learned regarding lack of acceptance, by requirements analysts, related to the use of RE modeling tools.

Requirements and Design. For the adapted Requirements and Design phases [7] we used Agon, which encapsulates well-established: **(i)** concepts, aspects and strategies from Human Sciences (e.g., psychological, sociological, human behaviour fields) and technology acceptance models, useful for understanding and finding solutions for overcoming lack of acceptance problems, as well as **(ii)** RE, software engineering best practices and gamification patterns, inline with the former (thanks to the Agon framework design), supporting the resolution of the same problems, but from different perspectives and levels of abstraction. Thus, in these phases, we considered the lessons learned we derived and used Agon to perform a systematic acceptance requirements analysis and design for enhancing, via gamification, a RE modeling tool, STS-Tool, making it an engaging RE modeling tool. We implemented also a prototype of the gamified tool.

Evaluation and Results. For the Evaluation phase [7], we aimed at comparing the 2 versions, and involved 12 master students in Computer Science at the University of Trento (Italy), with junior RE competences, because they have similar characteristics and skills to junior analysts of IT companies (i.e. real potential users of STS-Tool for RE modeling activities). We performed a Participatory Evaluation, with Post-Experience Interviews and a Satisfaction Questionnaire [7]. During the Participatory Evaluation [7], we made them to use the non-gamified

and gamified STS-Tool, with 3 tasks related to the areas of the lessons learned we derived, by guiding the sessions and observing the participants. After that, we had Post-Experience Interviews and asked them to compile a Satisfaction Questionnaire [7] to compare the 2 versions in relation to their impressions on using functionalities related to the 3 tasks indicated above [2]. Fig. 1 shows the results of the participants' answers, where F1, F2, and F3 are respectively related to the functionalities used within the 3 tasks concerning the areas of the lessons learned we derived (Fig. 1). Participants voted in a Likert scale: 1 indicated

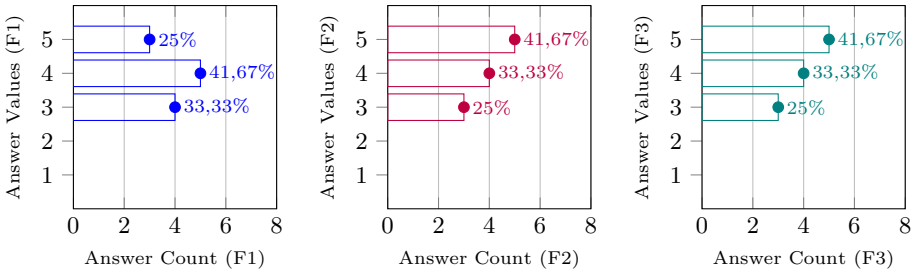

Fig. 1: Questionnaire results for (F1) *Adequate Support*; (F2) *User-Typology-Oriented Training*; (F3) *Tool-Supported Collaboration*

their preference for the original version, and 5 for the gamified version. Our observations, interviews and questionnaire results demonstrated that participants preferred the gamified version. In particular, this is confirmed for functionalities related to F2 and F3, however the ones of F1, even being slightly lower are still positive and tending towards the gamified version (Fig. 1).

5 Related Work

Below, we compare our research with others, from the research literature, concerning the gamification of RE tools, and the resulting gamified tools.

Snijders et al. propose REfine [15], an interactive platform for gamified, crowd-centric RE. The evaluation shows that the users find the process more useful, and are motivated to use it, although some gamification aspects are considered as neutral, meaning that the user does not find particular advantage in gamifying some functions. In comparison to our work, this is oriented towards a particular aspect of RE, crowd-centric RE, while ours is related to RE modeling tools. Additionally, participants of our study confirm that all the gamified functions are appreciated, while their study [15] obtains it partially. This is probably due to the fact that our work uses techniques that are more systematic and context-oriented, by considering in detail the different kinds of users, and, therefore, the gamification proposed is appropriate for them. Same considerations and comparison apply for the study of Lombriser et al. [6], which is related to the creation of a gamified platform for requirements elicitation, and a model for measuring the impact.

Alami et al. [1] gamified the STS-Tool calling it *STS-Tooltorial*. STS-Tooltorial provides the definition of a Story, or a Narrative, which allows the user to learn and at the same time to obtain points determining their position on the rank. The approach followed is very different from ours. In fact, we carried out our research by using systematic acceptance and gamification techniques (via Agon), considering lessons learned we derived from EU projects and modeling tools, by designing solutions based on the characterization of real analysts of modeling tools, obtaining user-kind-oriented solutions. Furthermore, [1] focuses mainly on one of the areas of lack of acceptance we identified from our study, i.e. training.

6 Conclusion

To deliver successful software it is necessary, from the very early stages of Software Engineering (SE) and for the entire cycle of SE, to perform Requirements Engineering (RE) activities such as elicitation and analysis in a systematic, precise way. This is even more critical when dealing with complex software systems, where it is necessary to take into account many heterogeneous classes of requirements such as acceptance, privacy, security requirements, and more. Therefore, to perform these activities in a quality way, considering all these requirements, and to deliver a successful system, above all in complex and large scenarios, tool-supported RE techniques are needed. Effective RE modeling tools have been developed for this aim. Unfortunately, after studying real cases where RE modeling tools are used, for instance the one that we describe in this work, which is the STS-Tool from the VisiOn EU Project, we obtained evidences that requirements analysts abandon the usage of those tools, putting the success of the final software at risk.

In this paper we have individuated problems related to this, and derived lessons learned to consider for enhancing RE modeling tools to be accepted and used, by RE analysts, to systematically analyze classes of requirements involved in complex software systems. We considered such lessons learned and identified one of the possible candidate processes, which can support in a systematic, and semi-automatic way the design of RE modeling tools in a way that analysts can be inclined to use RE modeling tools. Specifically, in this work we propose an approach that is able to cover this gap through RE modeling tools enhanced via gamification. Especially, with our approach, it is possible to enhance RE modeling tools with gamification by making their functionalities and techniques more effective in engaging the requirements engineer in performing related activities in a tool-based way, receiving adequate support and staying motivated to use such RE modeling tools. We obtained this by carrying out acceptance requirements analysis (through the Agon Framework) and using Gamification to improve the engagement of the users during the usage of RE modeling tools. We applied our approach to a RE tool for modeling privacy and security requirements (i.e. the STS-Tool) within the VisiOn EU Project. Our case study provides preliminary evidence that our approach produces RE modeling tools able to captivate the analyst in performing RE modeling in a more engaging way.

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References

1. Alami, D., Dalpiaz, F.: A gamified tutorial for learning about security requirements engineering. In: IEEE 25th Inter. Requirements Eng Conference (RE) (Sept 2017)
2. Calabrese, F.: Gamification with the Agon Framework: A Case Study on Privacy Requirements Modeling. Bachelor thesis, University of Trento, Italy (2018)
3. Calabrese, F., et al.: Applying Agon Method: Resulting Dataset (Goal Models). `https://data.mendeley.com/datasets/6s4c87c494/4` (2018)
4. Gharib, M., Salnitri, M., et al.: Privacy Requirements: Findings and Lessons Learned in Developing a Privacy Platform. In: Int. Req. Eng. Conf. (RE). IEEE (2016)
5. Koivisto, J., Hamari, J.: Demographic differences in perceived benefits from gamification. Computers in Human Behavior (2014)
6. Lombriser, P., Dalpiaz, F., Lucassen, G., Brinkkemper, S.: Gamified Requirements Engineering: Model and Experimentation. In: Inter. Conference on Requirements Engineering: Foundation for Software Quality (REFSQ). Springer (2016)
7. Maguire, M.: Methods to Support Human-Centred Design. International Journal of Human-Computer Studies (2001)
8. Mouratidis, H.: Secure Software Systems Engineering: the Secure Tropos Approach. JSW (2011)
9. Paja, E., et al.: Specifying and Reasoning over Socio-Technical Security Requirements with STS-Tool. In: Int. Conf. on Conceptual Modeling (ER). Springer (2013)
10. Piras, L., Al-Obeidallah, M., et al.: DEFeND DSM: A Data Scope Management Service for Model-Based Privacy by Design GDPR Compliance. 17th International Conference on Trust, Privacy and Security in Digital Business (TrustBus) (2020)
11. Piras, L., Dallagiacoma, D., Perini, A., Susi, A., Giorgini, P., Mylopoulos, J.: Design Thinking and Acceptance Requirements for Designing Gamified Software. IEEE Inter. Conference on Research Challenges in Information Science (RCIS) (2019)
12. Piras, L., Paja, E., Cuel, R., Ponte, D., Giorgini, P., Mylopoulos, J.: Gamification Solutions for Software Acceptance: A Comparative Study of Requirements Engineering and Organizational Behavior Techniques. In: 11th IEEE International Conference on Research Challenges in Information Science (RCIS). IEEE (2017)
13. Piras, L., Paja, E., Giorgini, P., Mylopoulos, J.: Goal Models for Acceptance Requirements Analysis and Gamification Design. In: 36th International Conference on Conceptual Modeling (ER). Springer (2017)
14. Piras, L., et al.: DEFeND Architecture: a Privacy by Design Platform for GDPR Compliance. In: Int. Conf. on Trust, Priv. and Sec. in Dig. Busi. (TrustBus) (2019)
15. Snijders, R., et al.: REfine: A Gamified Platform for Participatory Requirements Engineering. In: Int. Work. on Crowd-Based Req. Eng. (CrowdRE). IEEE (2015)
16. Tsohou, A., Magkos, M., et al.: Privacy, Security, Legal and Technology Acceptance Elicited and Consolidated Requirements for a GDPR Compliance Platform. Information and Computer Security Journal (2020)
17. Zichermann, G., Cunningham, C.: Gamification by design: Implementing game mechanics in web and mobile apps. O'Reilly Media, Inc. (2011)