

A Game Toolbox for Process Improvement in Agile Teams

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Abstract. This paper demonstrates the use of game techniques for Software Process Improvement. InnoBox, a game toolbox for process improvement and innovation in agile teams is presented. Authors selected 12 collaborative games to be used in team meetings. Each game card in InnoBox has been created and classified based on a design thinking approach and team maturity level. InnoBox is a ready to use tool designed for agile teams to facilitate, innovate and improve communication, cohesion and their way of working.

Keywords: Process improvement · Retrospective games · Design thinking · Group development stages · InnoBox

1 Introduction

Commitment and engagement of the people is one of the most important factors for a successful deployment of agile methods in teams and process improvement in organizations. In order to implement a process model, companies should be aware of available tools and techniques that may be used in order to obtain the expected outcomes. Agile methods are increasingly used by software development organisations, and according to agile values and principles [1], development team should be proactive in defining, implementing and improving business processes affecting the organization as a whole or specific project. Engaging project stakeholders and providing a context where positive and innovation driven discussion would be conducted, while having fun at the same time, is crucial to continuously improve the established processes [2].

Significance of agile process tailoring is well recognized, but exact steps of the process tailoring highly depend on situational context in the company, and team and the process itself is described to a limited extent in the research literature [3]. Agile process tailoring involves as disciplined and well organized endeavour as any other plan driven method [4]. Agile practices and methods often have to be customized and tailored to accommodate specific situations in order to be integrated in the already established company processes [5, 6].

In this paper we demonstrate a toolbox named InnoBox, a set of ready to use game and behavioural techniques designed for project teams. The toolbox offers various solutions which can be used by team members for Software Process Improvement (SPI) and implementing innovations in their way of working. Collaborative games can be helpful in certain aspects of agile methods deployment in software development organizations. These games can be considered as a good example of tools to be used for facilitating the implementation of the techniques recommended by process reference models. Our research objective was to facilitate SPI in organizations and teams, and to create a ready to use tool that can be used quickly without time consuming preparation. Organizations are interested to adopt new techniques but often their time is limited to explore available tools in the market, or to analyse their current situation at the organizational or project level. Having this in mind we propose a toolbox that is mainly oriented for practical use in industry in project teams. Having a pre-planned set of collaborative games (toolbox) helps in bringing business value out of retrospective [7]. The research conducted in this paper presents a continuation of a previous research where game techniques for SPI in retrospectives were classified according to team development stages [8], and in this paper we propose additional classification based on game design method.

The paper is structured as follows. Section 2 presents the related work used for developing InnoBox - use of games in process improvement, group development stages and design thinking. Section 3 presents the research conducted to develop InnoBox and the results obtained - description and classification of the collaborative games in InnoBox. Section 4 concludes the paper and brings up the potential research initiatives to be undertaken.

2 Research Background

In this section, theoretical concepts important for development of InnoBox are demonstrated. Possibility and positive impact of using game elements in SPI is commented, followed by the group development stages proposed by Tuckman and the design thinking concept.

2.1 Game Elements in Software Process Improvement

Project leader together with project team members, should select the appropriate set of the games depending on their previous (individual and team) background and current phase or context of the project. Team maturity, size, distribution, time boxed meetings are important factors influencing proper game selection. Different aspects may be taken into account when selecting games for SPI like comprehensive framework of situational factors for software development process [9] or criteria affecting process tailoring [10].

Integrating gamification approach in software development process positively influences motivation of team members, and supports resources to be task and object oriented [11]. Various game thinking approaches in software development may be found in the research such as: theory of drama – used to define an SPI game [12], software development process can be perceived as a game where project resources act as a limitation

[13], or it may be observed as a balancing game depending on skill decision making in software [14]. Gamification approach in the company using Scrumban method can be used to guide SPI [11].

Retrospective meeting, agile practice for product and process improvement, provides endless insight and help teams to continuously improve [15]. Games used in agile retrospectives are made of basic game elements, but they help teams to improve and be motivated, have an important impact on social behaviour, team building and help organizations to become more lean and agile [7, 16].

2.2 Group Development Stages and Software Process Improvement

Agile software development is people centric, conducted through projects, and project members are organised in small groups-teams. Depending on situation in the company, one team might be working on several projects in parallel, or one bigger project may “consume” more teams with fully dedicated resources towards project objectives.

In the year 1965, Tuckman proposed four general sequential stages of group development: *Forming*, *Storming*, *Norming* and *Performing* [17]. Each sequential stage of group development consists of two types of activity: social or interpersonal and group/task related. Tuckman identified changes in group behaviour typical for each of the four stages [17]: (1) *Forming* is the phase of orientation, testing and dependence in the terms of social behaviour and group structure, (2) *Storming* represents the phase of intragroup conflicts and in terms of tasks emotional response of group members is expected, (3) *Norming* starts when group member’s resistance is replaced with sense of group belonging and open discussion and increased communication among group members is expected, (4) *Performing* phase starts when group members care about efficiency, group roles become flexible and energy is focused on successful task completion.

Using games in agile retrospectives may help and improve adoption of team roles, problem solving approach or resolving group behaviour issues in each group development phase. Games to be used in SPI initiatives – agile retrospective meetings, and their classification depending on group development stage is demonstrated in a research study [8]. The results of research propose integrated table of retrospective games classified as a best fit, good fit and possible fit to 4 stages of group development proposed by Tuckman.

2.3 Design Thinking

Even though design thinking has its origins in training of designers, it can be practiced by everyone to every field of activity. Design thinking is not limited to designers only. More recently, this concept has been applied not just to physical products, but also to consumer experience, interaction processes and other disciplines and markets. Practicing design thinking involves a movement from “divergent thinking” which generates alternatives and gives more choices. Following by “convergent thinking”, options are sorted so the best one among them could be chosen. “Analysis and synthesis” are applied for breaking patterns down and identifying a meaningful one [18]. Design thinking is

associated with having a human-centred approach to problem solving and it is less technology or organization centred [19].

3 The Development of InnoBox

InnoBox contains a set of 12 collaborative games to be used by the team members during a meeting with the main objective of improving communication, cohesion and coordination. For each game, a description card describing different aspects of the game (purpose, rules, expected results, etc.) is given. Moreover, the needed assets and materials to run the game are also provided in the box.

The first decision to be made was the selection of the games to be implemented. From past research of the authors on the usage of games for SPI [20, 21], and taking as a basis the integrated list of games provided in [8], 12 collaborative games with different purpose, team dynamic and outcomes were selected.

One of our main objectives when developing the game box was to offer different classifications of the games. One of the groupings is related to the meeting time phase in which the game is most applicable. Derby and Larsen [16] proposed five different stages in a retrospective meeting: set the stage, gather data, generate insights, decide what to do and close the retrospective. Gray et al. [22] propose three different stages: open, explore and close. In our work, we have proposed three different time phases for a meeting: *Warming up*, *Playing* and *Wrapping up*.

As name suggests, the first meeting time phase is the *warming up* people's mind and possibilities. This phase is suitable for brainstorming, proposing new ideas and opportunities but not for critical thinking and scepticism. The following meeting time phase, *playing* is the experimental phase suitable for exploration and trying to see old things in a new way. Lastly, *wrapping up* should be critical and realistic overview, conclusion toward decisions and summarizing tasks to be done before next meeting. In the Table 1, two levels of games "fitting" to the meeting time phase is presented: the best fit games with symbol ●● and possible fit with symbol ●.

1. *Understanding the group knowledge* mostly appeals to the first phase. This activity has an aim to understand the group knowledge by giving statements on the following: "We know that we know", "We know that we don't know", "We didn't know that we know", and "We didn't know that we don't know".
2. *Roles we play* encourages a conversation about all roles played in life. It suits to the first phase but to the second phase also. Especially it is useful for a group that starts working together.
3. *Visual Phone* is an energizer for communication and interpretation improvement. Therefore, this game appeals to the first phase more than to the second phase, but it can be applied in both.
4. *The team is - is not - does - does not* is an activity that reveals positive and negative aspects about the team by explaining the team. Because it involves exploring and discovering this activity is the most appropriate for the second phase, but also for the last phase because it provides answers and explanations to asked questions.

5. *Role expectations matrix* aims to map out the expectations among team members. The goal of this activity is to find out how each member can benefit from each other. It is appropriate for the second phase.
6. *Defining the team principles* is an activity fostering conversation and discussion among participants. It suits better to the first phase, but it can be used in the last phase.
7. *Peaks and valleys timeline* is a visual activity especially useful for the last phase. It is effective way for uncovering interactions among team members as well as “ups and downs”.
8. *Speed Car* is a simple way for helping the team identifying things that makes team moving faster and things that slow it down. It suits best to the second phase.
9. *Starfish* appeals best to the second phase, but also to the third phase. Involves data gathering and helping team members to understand each other’s perceived value.
10. *Lessons learned - planned vs. success* falls in the third phase and refers on seeking learned lessons after a big event.
11. *Future Facebook posts* is best suitable for the second phase, but it can be used during the first phase as well. It motivates team members to be focused on future directions, where they want to go.
12. *Who-What-When steps to action* is helpful for defining commitments among team members by providing a clear action to whole group who is going to do what by when. It best fits to the third phase.

Table 1. Classification of games based on the meeting time phase.

| Game | Meeting time phase | | |
|---|--------------------|---------|-------------|
| | Warming up | Playing | Wrapping up |
| 1. Understanding the group knowledge | ●● | | |
| 2. Roles we play | ●● | ●● | |
| 3. Visual phone | ●● | ● | |
| 4. The team is - is not - does - does not | | ●● | ● |
| 5. Role expectations matrix | | ●● | |
| 6. Defining the team principles | ●● | | ● |
| 7. Peaks and valleys timeline | | | ●● |
| 8. Speed car | | ●● | |
| 9. Starfish | | ●● | ● |
| 10. Lessons learned - planned vs. success | | | ●● |
| 11. Future Facebook posts | ● | ●● | |
| 12. Who-What-When steps to action | | | ●● |

Another categorization of the games is related to the Tuckman’s group development stages. In [8] we provided a classification of games based on the four-stage group development model proposed by Tuckman. The best applicable development stage has been assigned to each game card in InnoBox.

3.1 InnoBox Game Description Cards

With the aim demonstrating the structure and contents of each game description card in the InnoBox, this section shows the card of one specific game. The collaborative game selected (from the list of twelve) is *Role expectations matrix*. This is a team-forming game that aims to map out the expectations among team members. It helps the team to better define their roles and avoid future conflicts due to hidden or unknown expectations.

Figure 1 shows the appearance of the front and back sides of the card.

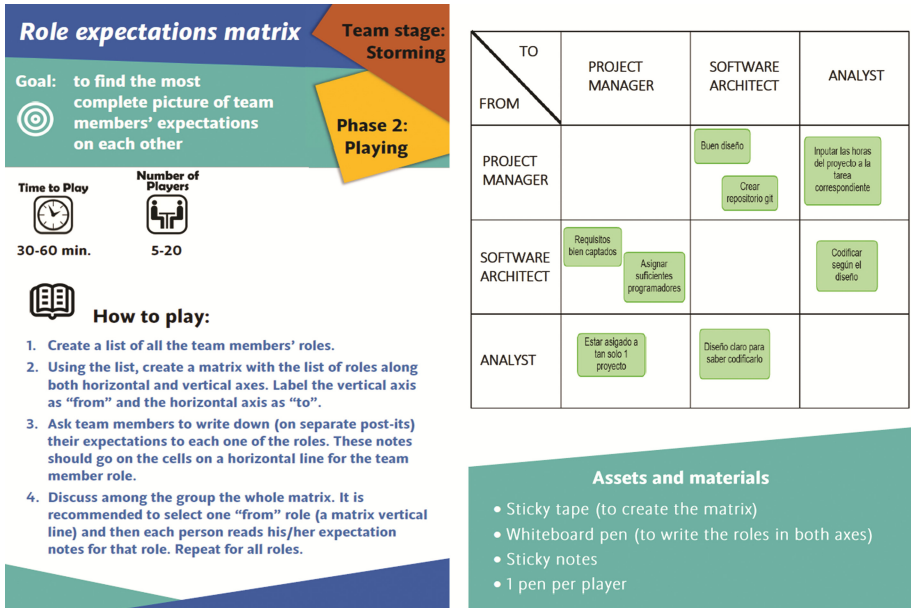


Fig. 1. Example of a card game in InnoBox (front and back).

Each card contains the following fields, which are described in continuation for the selected game.

- *Name of the game:* Role expectations matrix.
- *Goal of the game:* to find the most complete picture of team members' expectations on each other.
- *Classification of the game based on the meeting time phase in which it is most applicable:* Phase 2 - Playing.
- *Classification of the game based on the Tuckman's group development four-stage model:* Storming.
- *Number of players:* 5–20.
- *Time to run the game:* 30–60 min.
- *How to play:*
 1. Create a list of all the team members' roles.

2. Using the list, create a matrix with the list of roles along both horizontal and vertical axes. Label the vertical axis as “from” and the horizontal axis as “to”.
 3. Ask team members to write down (on separate post-its) their expectations to each of the roles. These notes should go on the cells on a horizontal line for the team member role.
 4. Discuss among the group the whole matrix. It is recommended to select one “from” role (a matrix vertical line) and then each person reads his/her expectation notes for that role. Repeat for all roles.
- *Graphical presentation of the game being played.*
 - *Needed assets and materials:* Sticky tape (to create the matrix), Whiteboard pen (to write the roles in both axes), Sticky notes and one pen per player.

4 Conclusion and Future Work

This paper presents the creation and contents of InnoBox, a game toolbox used for process improvement in agile teams. Positive feedback from practitioners demonstrates positive influence of game techniques in agile retrospectives – process and product improvement and innovation in agile teams. InnoBox creation was motivated by usual problems in organisations – limited time to investigate which techniques of many available to use in their retrospectives. Therefore, the proposed game toolbox is a fun and ready to use tool created for agile teams. Only 12 collaborative games were selected and designed for InnoBox, in order to keep it simple. Keeping it simple also presents a limitation of the research, but in the future, more games will be added. All the rules of the games are demonstrated on cards so no previous education or training is needed to start using the toolbox.

InnoBox was tested in one IT service organization, where it was used on five retrospective meetings. Also, a group of 30 students simulated an agile Sprint and a retrospective meeting in which they used all the games. Proposed improvements from the gathered feedback are embedded in the current version of InnoBox. Unclear games were removed and design was improved. As future work we will continue testing the game box in both academic and industrial setup. Also, it is planned to add some more games, but in a balanced manner, to saturate each group development stage or meeting phase.

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