Organizational development- Lean thinking through the LeanGame Learning Game

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Abstract. This article presents research where organizational change was carried out in the health care organization in Satakunta's Health Care District. In the district´s new strategy, Lean thinking was chosen to support a strategic goal, to increase employee´s and patients´ satisfaction towards the care they received. This development need has been reported in earlier studies to find enhancement ways for operations. LeanGame is an educational game, which combines two distinct elements: Lean, a philosophy and management system, and interactive game that let players get to familiarize themselves the Lean thinking through the game. The LeanGame is linked to the organization's strategic approach for continuous development implementation. This paper introduces the LeanGame piloting in Health Care District. Article handles development of LeanGame and the LeanGame piloting. Article describes results of piloting, reveals the results of testing the educational game in professional development and gives future research suggestions as well as future development needs for Lean Game.

Keywords: Lean · Educational Game · Organizational development · Health Care

1   Lean Thinking in Health Care

Lean is a method that has roots in the Japanese automotive industry and in the quality management of its production processes. It is a philosophy, a management system that can be utilized to organize and manage operations. In the 1990s, the operating model has become part of the health care organizations. In its present form, the aim of the operating model in health care is to improve the value creation for the customer and reduce the waste in the process. These goals involve improvement of the quality of the care, reducing waiting time and streamlining patient flow and fluency in services. [1][2].

Lean is a mode of operation that focuses on flow efficiency. Flow efficiency is at its best when a customer / patient gets the service or product whenever he wants, as quickly and easy as possible. Improved efficiency has been achieved by promoting the precision of processes and reducing waste as time, costs and errors [3]. Lean thinking identifies nine distinctive forms of waste; 1) overproduction, 2) waiting, 3) unnecessary transport, 4) incorrect processing, 5) excess inventory, 6) unnecessary movement, 7) errors, 8) unused employee creativity and 9) environmental waste / resistance to change. Focus should be on the inactivity of the staff's creativity and the resistance to change and to question whether leaders get involved in development and find out from each department the courage to engage in development and new adoption. [4]. Lean is a structured way for operations development and a waste from processes [5]. Waste can be found from e.g. the patient treatment processes and their sub-processes, the flow of information or it can also be seen visually in instruments and stocks. The waste can also mean the time spent waiting for employees as well as the client / patient [6] [7].

Key to the success of change in operations can be considered to be teamwork, successful value analysis and based on successful streamlining of flow efficiency. The introduction of Lean thinking models in the organization needs testing and re-evaluating the existing model's performance. [8][9][10]. Changes in patient treatment processes require that each member of the team commit to action. Team members must be involved in designing a change in functions, processes or operations and commit to further future change. Good communication and systematic planning have great importance when introducing lean thinking. [11] [12].

Once change has been made and it has been shown to have positive effect to developed of the unit, the effects of this development is seen to have increased patient satisfaction, working atmosphere and work satisfaction [3][4][12]. The introduction of Lean thinking and models needs expertise. It needs training and focus on Lean thinking and its implementations. Studies have shown that staff will be more responsive to future changes when they have enough information about Lean. In addition, the fact that the planning of the operations considers the specific features of each unit and the needs of the whole organization is seen to promote change of action [8][11][10]. In some cases, a new approach to Lean thinking can be difficult to approve. Returning to the old model of operation is possible if the implementation of new operations is not encouraged with a positive attitude. [12] In this situation, the role of leaders is important. They need to encourage and support workers as the change progresses. If all of these are handled, the success of the change is more likely, and it will more likely be a permanent change in operation models [11].

2 Organizational development

Organization development is cooperation. In the hospital environment, co-operation can involve activities between different occupational groups to solve problems and to improve patients´ / customers´ service and care. Organizational development needs clarified management structures. It also needs that leaders are committed to develop-

ment personally and have sufficient management skills. Multidisciplinary development activities need strong strategy and leadership for development activities to promote ultimate goal. Development activities should also be led in everyday work. Leadership is especially needed when development activities are integrated to goal-oriented work and the results of development work are implemented in to working practices. [13]

3 LeanGame Learning Game piloting in Satakunta's Central Hospital

In recent years, there has been an interest towards the use of games and in education. At the same time, awareness of their possibilities in education has grown. A good learning game can be considered to be such that its story is interchangeable, even though the progress in the game itself is linked to the subject that is to be studied. The games typically are based on experiential learning and interaction [14]. The possibilities that the virtual world provides, compared to real world situations, can be easily found when allowing mistakes and learning through the trial and error. At the same way, as in simulations, digital learning games can build up so that varied and unexpected situations and problems are occurring, which cannot be met in the real-world situations at the time of education [15][16], or at least not with safe manners. In game development, it is important to recognize that the game will enable an easy transition of subjects of the learning sessions to be implemented into practice. The game must be inspiring, technically adequate and must be motivating the player to learn. The learning games has been compared to the classroom, in sense of the time usage, and it has been found that a learning games are more effective tool for teaching than the traditional class room lecturing teaching method. In this case, we can also discuss about the cost-effectiveness of teaching [17].

3.1 Lean Game Learning Game piloting

LeanGame is an interactive Learning Game, so called serious game, designed to introduce players to Lean thinking and philosophy. The hospital districts of Southwest Finland, Satakunta and Vaasa have developed the Leangame Learning Game in co-operation with the students and experts of the Business Competence and Process Management Research Group, Healthcare and Well-being Turku University of Applied Sciences and Turku Game Lab. The LeanGame is used as part of the training of hospital staff´s lean training and gives a new interactive way to provide training.

3.2 The purpose of Research

The aim of this study was to evaluate LeanGame's user experience in the Satakunta's Central Hospital. Main task was to assess the playability of the game and how the learning game is perceived as an educational tool for Lean thinking. Research results are used in the Leangame 2.0 development. Research problems were:

1) How did the staff experienced the Leangame as education tool to Lean thinking?

2) How did the staff experienced that the playing the game has increased their awareness of how they can use lean thinking in their work development?

3) How did the staff experience the playability of the Leangame?

3.3 Research method, materials and analysis

In the Satakunta's Central Hospital, the total number of personnel in Department of Emergency, Pediatrics, obstetrics and gynecology was (N = 550). The Study was conducted as a web-based questionnaire (Webropol®). The respondents replied after they had played the LeanGame in computer class. The questionnaire consisted of multiple choice questions, open questions and scale questions. The scale that was used in questionnaire was Likert's scale. The key figures of the scale were from one to four, with four agreeing entirely, three almost agreeing, two slightly disagreeing and one completely disagreeing [17]. Structured sections of the survey were analyzed by statistical methods by calculating the frequencies, percent and averages using Excel® statistical programs and Webropol® graphical methods. Open questions were analyzed by analysis of the content. In the analysis of the content, similar answers were sought from the material (themes), after which the preliminary conclusions could be drawn from the summary.

3.4 Research results

Fifty-seven players answered to questionnaire, which gives the response rate of 11.4%. The players and respondents represented a variety of different professional groups: doctors (16%), nurses (67%) (nurses, midwives) and other professions belonging to the categories (17%), such as administration and the secretaries of the department. The age distribution of the participants is shown in figure 1.
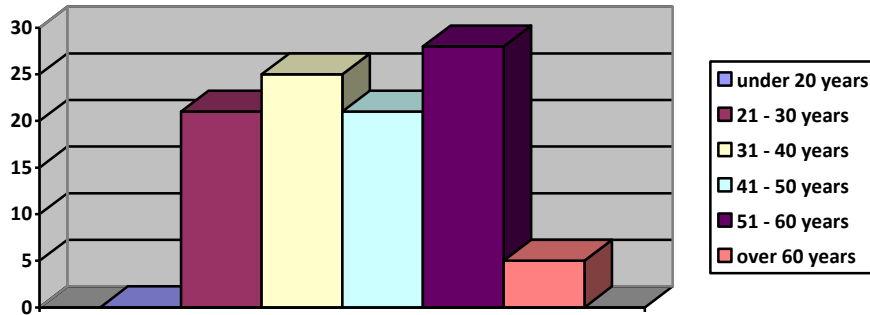
Figure 1 The age distribution of the participants

As can be expected from the age distribution, over 33.3% had a work experience of 20 years. Every respondent have used the computer at their daily work and most of respondents did not play computer games usually (Figure 2).
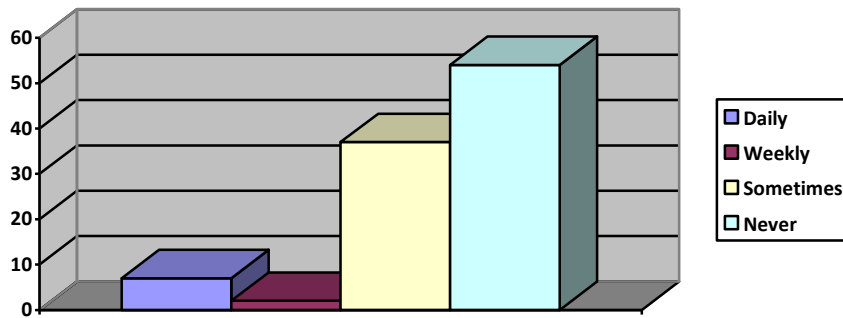
Figure 2 Answers to the question; How often do you play Computer Games?

78% of doctors, 55% of nursing staff and 30% of other staff members had not received any earlier lean education or training (Table 1).

Table 1 Answers to the Question; Have you trained in Lean?

Professional	Doctors	Nurses	The Others
Yes	22%	45%	70%
No	78%	55%	30%
What kind of training?	Lecture	Lecture Lean Training	Lean Training

The first and second research problem were handling the question of the staff's experience of how the LeanGame introduced them Lean thinking and how the game gave

them ideas how they could develop their own work according to Lean philosophy. Most of the respondents felt that the game introduced them to Lean thinking and the game helped them use Lean in their own work. However, half of the respondents felt that the game did not gave them new ideas how to develop treatment processes. (Figure 3). Alleged claims;

1. The LeanGame helps used Lean in your work.
2. The LeanGame helps to develop treatment processes
3. The LeanGame gives to ideas for work development
4. The LeanGame gives to ideas for treatment development
5. The LeanGame helps to notice waste
6. The LeanGame helps to notice waste in treatment process
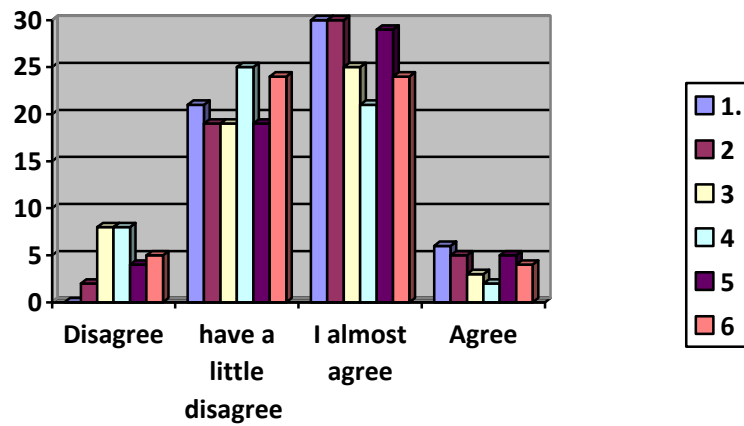
Figure 3 Can LeanGame used to develop work?

When analyzing this, according to respondents´ profession, it can be noticed that 59% of nurses, 43% of doctors, and 60% of the third group felt that the game did not give them ideas for work development. Similarly, considering how the game helped respondents to notice waste in their job, the answers in the different professional groups was as followed; nurses 40%, doctors 56% and the third group 30% (Scale 1= Agree, 2 = I almost agree, 3 = Have a little disagree and 4 = Disagree). The answers are given in Table 2.

Table 2 Comparison of professional groups

	Scale	Nurses	Doctors	The Others
LeanGame help to develop of work	1	8%	0%	30%
	2	55%	67%	30%
	3	37%	33%	40%
	4	0%	0%	0%

LeanGame help to develop of treatment	1	7%	0%	20%
	2	49%	67%	60%
	3	41%	22%	20%
	4	3%	11%	0%
LeanGame gives ideas	1	0%	0%	10%
	2	41%	57%	30%
	3	43%	43%	40%
	4	16%	0%	20%
LeanGame help to recognize the waste at work	1	10%	0%	10%
	2	50%	44%	60%
	3	29%	56%	30%
	4	11%	0%	0%
LeanGame help to recognize the waste at treatment process	1	7%	10%	10%
	2	45%	50%	30%
	3	37%	30%	50%
	4	11%	10%	10%

The third research problem was to find answer how the players felt LeanGame as a learning game and how they would want to develop the game. The game had a positive acceptance. More than half of the respondents would like to take part to the lessons with playing through the learning game in future. Most players would recommend learning game to their colleagues. The game was proven to be clear, easy to use, and comfortable to learn. The players wished that the game would be more challenging and that it would have practical problems and issues to solve. Interactivity of the game was asked to be improved. Respondents stated that the feedback from the game to player was not clear enough. The feedback was wished to be developed to be clearer and that feedback would be given right after each game section instead of one feedback after accomplisition of whole game.

On the final question, respondents had the opportunity to write open feedback about their own thoughts and opinions. Statements was e.g. that; "Health Care personnel could be more involved in game development", "A wider game which would include possibly a theoretical part for the expert". It was questioned whether the proportion of supervisors and the level of education is enough? Is the realization of Lean thinking possible at all in the units?

3.5   Reflection on LeanGame Pilot Results

The questionnaire´s response rate stayed relatively low, which means that the results of the pilot cannot be thoroughly generalized. However, the response rate was 11.7 %, which is typically enough, for good results and sample group was quite large for a case study, it might be stated that a few answers can be found with relatively good reliability.

1) The game needs to be more challenging and involve precise practical problems. The solutions to the problems must be based on Lean thinking.
2) Further development of the game should involve more nursing staff. As typically in lean thinking experts and professional who carry operational work as everyday work, know what kind of challenges they need to tackle and how the develop of their own work and care processes should go in daily work.
3) Interactivity of the game needs to be improved. Game should provide feedback right after each learning issue/section.

Improvements should also be made in order to improve playing experience:
1) One round of the game takes about 30 minutes. It is a long time to use for playing during the middle of the day, if game is supposed to be playable in open time slots of everyday work. Short, independent games, focusing to one issue at time were preferred.
2) LeanGame version 1.0 cannot be paused. Ability to pause the game and continue from the game at the same point was highly expected.

3.6 Future research suggestions?

This pilot is the first in this organization and it would be useful to conduct comparative research when a new version of the LeanGame game becomes available. This research would give answers; How has the LeanGame developed? Is the game's interactivity improved from the first version? New research would give answers also, how the organization has developed? What is the current state of Lean in the organization? Have the practices changed? Also very interesting research point of view would be possibility to make comparative study between 1-hour lecture from lean principles and LeanGame.

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