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# Design Gaming for Learning Systems Intelligence in Socio-Emotional Systems

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The goal of this research note is to point out two new developments, Systems Intelligence and gamification, which can enrich the practice of systems thinking interventions. Introduction of the concept of Systems Intelligence brings in an actor focused perspective to systems thinking in organizational and social systems. Design games provide new ways to improve learning in systems settings. These new approaches are successfully tested in an extensive case study on organizational development in early childhood education.

**Early approaches to learning systems thinking by gamification**

Interactive computer simulation of systems has been a well known approach for long in the field of industrial systems engineering. The seminal book by Peter Senge ( 1990) brought systems thinking into the focus also in the world of management. Simulation using the system dynamics modelling approach became early on a tool to visualize and understand the dynamics of systems and the phenomena related to delays and feedback in organizational, policy and management problems. Simulation and gaming for teaching systems thinking began soon after, building upon the long tradition of business gaming (see Keys and Wolfe, 1990; Senge and Sterman, 1992 ). The important role different ways of modelling can play in learning were identified early on (Isaacs and Senge 1992 ). Since then the field has expanded extensively. The implementations of systems-related learning games such as the well known beer game, described in Senge (1990), can use simple board game settings. This tradition of systems thinking games has focused on the improvement of the understanding of dynamics in explicit time related settings. Knowledge creation and the cognitive perspective have been in the foreground.

However, Senge (1990) already emphasized the need to understand human behaviour that is not driven by cognition only. Today, in organizations, people dynamics involving socio-emotional systems including interaction in teams are increasingly important. There is a growing need to find new ways to simulate behaviour in social systems for the purposes of improvement. The early management flight simulator approach (Bakken et al. 1992) was based on the system dynamics modelling tool and intended to be used independently by the manager. It would also be beneficial to have a tool for the learning and improvement of social systems of teams which could be used by the teams themselves. Here we describe one approach based on design games and on the concept of Systems Intelligence originally introduced by Esa Saarinen and Raimo P. Hämäläinen (2004). SI brings the socio-emotional parameters into the foreground and extends the possibilities of gamified systems learning into complex human systems.

**Systems intelligence**

SI is a concept inspired by the five disciplines of Senge (1990) and seeks to capture intelligent human behaviour in the context of complex systems involving interaction and feedback, such as organizations (Hämäläinen and Saarinen 2008, Luoma, Hämäläinen and Saarinen 2011). SI is based on the conception that in everyday life we are always part of systems whether it is a family, team, meeting or an organization. When seeking improvements in the system we cannot separate ourselves from the system and take an outsider's perspective. We always need to act from within the system and as part of the system. SI extends the systems perspective to incorporate invisible socio-emotional systems. SI recognizes that structures can create behaviour. It is important to work for improvements from within the system and take into account the structures related to the situation. SI is a skill that can be improved by learning (Jones and Corner, 2012 ; Hämäläinen,Törmänen and Saarinen, 2018). SI has already been found to be useful in numerous contexts, for examples see the Systems Intelligence group (2020) web-site.

The Systems Intelligence Inventory (Törmänen, Hämäläinen and Saarinen, 2016 ) provides a way to evaluate our capabilities in SI. The inventory consists of 32 evaluative items which describe behaviour and thinking in everyday life. The inventory brings up eight characteristic factors of SI:

- Systemic Perception: Our ability to see the systems around us
- Attunement: The capability we have to feel and tune into people and systems
- Reflection: Our capacity to reflect on our thoughts and think about our thinking
- Positive Engagement: The character of our communicative interactions
- Positive Attitude: Our overall approach to life in systems
- Effective Responsiveness: Our talent at taking timely, appropriate actions
- Wise Action: Our ability to behave with understanding and a long time horizon

- Spirited Discovery: Passionate engagement with new ideas

Hämäläinen, Jones and Saarinen (2014) provide a practice-oriented introduction to these factors. The concept can also be extended to organizational SI (Törmänen, Hämäläinen and Saarinen, 2020).

**Design games for systemic learning - The Topaasia Design Game Approach**

Design games is a kind of umbrella term for a heterogenous class of games that can be used for the co-creation of organizational advantages. Many design games have emerged from communities working within various traditions of service design, and typically involve stakeholder groups for processes of inventing new services or improving existing ones (Harviainen, Vaajakallio, and Sproedt, 2016) Their form can vary radically. They can be card games, digital games, role-plays, or games of many other types (Brandt, Messeter and Bindner, 2008; Vaajakallio and Mattelmäki, 2014). What they essentially do is become boundary objects that enable shared ideas, structured discussions, and more room for the voices of each participant (Hannula, 2020). In these ways, such games enable expansive learning in the organizations where they are used (Hannula and Harviainen, 2018). SI can also be an approach for the planners of design games (Harviainen, Hämäläinen and Saarinen, 2020)

A Topaasia game session uses a specific SI card deck (for details visit the Topaasia (2020) website). One game typically takes 30 to 45 minutes.The deck has point-of-view cards and topic cards which correspond to the items in the SI inventory. The session starts by dealing 5 topic cards to each player. Participants first pick up one point-of-view card, such as “most exciting” or “most frustrating”, referring to an angle from which to view a given topic. Then each player places one topic card upside down on the table as a suggested topic to be discussed. The cards on the table then are shuffled, so that it is not possible to see who played which card. This is an important feature of the game as it helps to raise sensitive topics. The players then have a limited time (the 3 min timer is on the table) for discussion on the topics and select the most appropriate or important one at the moment. This stage is repeated for three times after which the players summarize in a so-called crystallization step the improvement actions to be taken along with who is responsible for taking the actions or is the whole group. If the sessions are repeated regularly it is also possible to track whether earlier ideas have actually been acted upon (Hannula and Harviainen, 2018).


TOPAASIA®
TOPAASIA®
Systems Intelligence


*Figure 1. Topaasia Systems Intelligence deck, cards and the 3 minutes hourglass for timing the discussions.*

**Positive experiences from a large scale intervention in early childhood education**

The Topaasia approach with the SI deck was used in an extensive intervention study aiming to improve the everyday practice of early childhood professionals . One of the goals was to study the impact of introducing systems intelligent thinking on the behaviour of the professionals´ occupational wellbeing (Nislin et al., 2016). The intervention lasted for five months. During this time the teams had SI game sessions four times. The intervention included 27 teams from 13 different early education units in the Helsinki metropolitan area. The total number of people involved was 134. All the teams joined the study voluntarily. This intervention aimed to find improvement possibilities rather than to solve any predefined problems. The motivation given to

the participants was that the process studied could benefit the teams in their daily work. The main concern of supervisors who allowed the research to take place was the time allocation needed. The short time required for one Topaasia session (Hannula and Harviainen 2018) helped to get the permission of the supervisors.

In the first training session the approach was introduced by the researcher and the subsequent sessions were run independently by the teams. Only the game rules were discussed but the concept of SI was not introduced. The relevant benefits of the game are its user-friendliness and the effectiveness in decision making without an external counselor.The sessions took place once a month in the beginning of the regular team meetings. With the benefit of the game, the teams could create a reflective working mode for their meeting. A major advantage of the Topaasia procedure is that it is very simple and it is also easy to review the rules while playing. In this way the participants can keep their focus on the questions and ideas that the game raises. Only one of the 27 teams made a minor mistake in the following of the Topaasia game procedure. The basic instruction in the game is that the team first selects a topic for each session and then uses the perspectives that the systems intelligence card deck raises during the playing for the team discussions. The game thus creates a dialogical reflection session on the topic and helps to identify and possibly decide about improvement actions. The topic could be, for example, a concern or a developmental challenge. Interestingly the teams independently decided to play the SI deck in two different ways, either with or without a specific topic. This suggests that the sessions using systems intelligence vocabulary provides people a way to engage with the other team members which is perceived valuable. In these two ways of playing the one with a specified topic is more action oriented whereas the other one is more oriented towards reflective dialogue in which the invisible social systems become visible and to shared consciousness. A major general indicator of success was that the teams ran the sessions very eagerly. The sessions were completely voluntary and not enforced in any way. Most teams appeared highly motivated when running the sessions. The overall reactions and evaluations of the participants and their supervisors were very positive. Interestingly, in the follow-up interviews the teams that chose not to play turned out to show essential challenges inorganizing their daily work.

Possible changes that the intervention caused in the participants´ and teams´ systems intelligence behaviour and thinking were evaluated with the SI Inventory. Moreover, the SI factors were used in the teams´ group and supervisors´ individual interviews in pre-, end- and post intervention measurements. The data collection included video recordings. Preliminary analysis of the results suggests that the game sessions did indeed have a positive impact on the participants' engagement towards conversation, increased shared consciousness and made teams´ decision processes more efficient. Complete findings of the intervention will be published later in education research journals.

**New gamified approaches have potential in small and large scale interventions**

Computer simulation based approaches have been successful in helping managers to understand phenomena related to complex dynamics in systems on themes such as supply

chains. Improvements of systems thinking in organizational learning should also cover personnel development and organizational conflicts.The socio-emotional dynamics are typically invisible but create complex systems. The success of organizations critically depends on how people act together. We need naturalistically realistic systems thinking tools to help people see the systemic whole that they create and to learn how changes in their own behavior can help to improve the performance and wellbeing of the workplace. One agent-based simulation approach using the ideas from positive psychology and systems intelligence is the PosiTeams simulator (Tiinanen et al. 2015). The new design games approaches like the SI Topaasia card deck provide easy independently usable tools to support systems thinking in small groups as well as in large scale interventions at a low cost and limited needs for technical expertise. The digital version of the SI card game offers further possibilities to support work groups whose members are based in distributed locations, which is an increasing trend today in many industries.

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