Short paper for the 12th European Conference on Games Based Learning

Exploring the relation between Awareness, Trust and Innovation: A simulation gaming study

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Keywords: Simulation game, trust, innovation, situational awareness, triadic game design

Abstract: The complexity of the worldwide transportation of goods leads to a high demand of innovation in the field. Yet, there are certain barriers against innovation in this highly competitive market. One of these barriers is the lack of trust, both with regard to a new technology as well as in relation to other parties. A second important hurdle that has to be overcome is the lack of situational awareness, or understanding of the actors within the transportation system about the interdependencies within the transportation system. In our work, we propose gaming as a method to increase the situational awareness of actors, as well as to explain the role of trust in innovation processes in the domain. Main aspects of the field and its challenges are already translated into game elements.

Introduction: Awareness, Trust, and Innovation

The field of transport and logistics can best be described as a highly dynamic, interdependent field, or as complex socio-technical system [1]. Such systems change rapidly, due to both technological and social developments [2]. For logistics, mass production and limited product diversity was the norm until the 20th century. Growing customer demand with regard to a higher variety and a larger supply of goods lead to new ways of work, production, transportation and logistic processes [3]. Comparing how goods were handled using small boats and simple mechanics in the late 19th century to the fully automated handling of large container ships nowadays is only one example of how work processes and systems increase in complexity over time. Actors, such as institutions and companies, have to adopt to these changes, which often go along with the introduction of new (technological) innovations, such as smart contracts, or block chain technology. As the introduction of such innovations means also to let loose of familiar procedures, making assumptions on possible effects of the innovation, and related risks, trust is a vital concept in this process.

In our perspective, trust is a concept describing inter-organizational relations [4], or the relation to a certain (innovative) technology [5]. In short, the first one mainly describes the concept of expected behaviour, while the second refers to the believe that a certain technological system will function the

way it is intended to do. When we refer to the concept of inter-organizational trust, we can distinguish between trust in the *ability* of others, and trust in the *intention* of others [6]. In both ways, organizations make use of the concept of trust to minimize complexity and uncertainty, two aspects that can best be used to describe the transportation and logistics system, which is highly dynamic [2]. Another vital concept related to the implementation of innovation is the one of situational awareness. Situational awareness is seen as a prerequisite for decision-making [7]. It describes a process of perceiving what is going on in a certain situation and environment, to comprehend this, and to use this knowledge to predict a future state of a system or situation. Decisions (including decision whether to engage in an innovation process or not) require the situational awareness of the actor(s) involved [7]. In complex, highly dynamic systems such as the transportation and logistics domain, it is often difficult for actors to develop such awareness due to the large number of actors and their interdependencies.

Towards a simulation game on trust, situational awareness and innovation

While the adoption of innovation is described as a competitive advantage, we often see that adoption and implementation of innovation in the logistics field is a slow process. The dilemma between collaboration and competition is seen as one challenge that has to be solved to successfully implement innovation. Other challenges could play a role, too; as how to deal with existing contracts, institutions, laws and regulations, or how to make the users aware of the need for the innovation. Yet, these dilemmas have not been addressed by the scientific field, hence the lack of propositions for practitioners how to deal with this problem.

Our hypothesis is that this is based on a lack of the two aspects described above: first, a lack of trust on inter-organizational level as well as in technology, and secondly, a lack of situational awareness of the actors, especially with regard to their own role in the whole innovation process, but also the role of others. As a means to foster a better acceptance of innovations, we propose a simulation game. Games are an accepted tool in this domain. In earlier work, we were able to show that simulation games can be used to foster situational awareness [8], and enable actors to formulate new procedures [9]. Games are a powerful tool to address the first purpose, as players can take over certain roles, including ones that they do not hold in real life. They also allow for immediate experience of consequences of actions and decisions, and thus serve as a safe environment for experiential learning, and ex-ante evaluation of the actual system and alternative futures.

Simulation Gaming Concept

To develop a simulation game that supports actors in the transportation and logistics domain in their learning about the role of trust and awareness in an innovation process, we adopt the Triadic Game Design Philosophy as introduced by [10]. This approach is based on the idea that every game design has to be balanced along three axes, namely reality, meaning, and play. While the reality aspect relates to the reference system the game addresses, the meaning aspect refers to the purpose and learning goal of the game. The play aspect includes all game elements and mechanics of a game. For the game we envision, we started from the reality aspect and conducted a systems analysis. We used the technique of swim lane diagrams to explore and visualize vital actors in the transport system as well as their relations to each other. Our first focus within this exercise was to identify the information streams between the actors, as we assume that those are crucial for both the

development of trust as well as of situational awareness. The communication streams will be represented as rules and relations in the final game design. Based on the communication streams, we will also decide which of the realistic roles (actors) in the system will end up as playable characters in the game design, and which will be represented as non-playable characters.

As the purpose of our game is to enable players to learn about the role of trust and situational awareness in an innovation process, these concepts have also been studied, conducting a literature review mainly in sociologist and business management literature. Both concepts have strong roots in the field of psychology, too. We take such conceptualizations as a given, as we do not want to focus on the inner processes of individuals, but on the inter-organizational processes in the transportation domain. Thus, we see trust and situational awareness as mediators of actions where a number of actors is involved. In this sense, we will include both aspects to enable players observing the role of trust and situational awareness in an innovation process. The game will be a round-based game, where at the beginning assignments have to be solved in an environment where actors do not yet have trusted relationships and no means to develop situational awareness. After a while, they will be able to invest in trust-building mechanisms such as reputation systems, (smart) contracts, or alliances. In addition, game elements that allow for a better situational awareness, like information sharing, communication means, and tools for systems analysis, will be introduced as representation for a growing awareness of the actors. Players will be enabled to explore the role of trust and awareness, and to develop strategies in order to increase both. A de-briefing phase will round up the game session, in which players will be able to reflect on the actions and decisions in the game, and transfer these lessons learned back to the real system [11].

In order to support both the relation to the reference system, the domain of transport and logistics, and the meaning of the game, we already thought about certain game elements that support the play element of the game. The game will be designed as a physical or a hybrid game. Physical games show a strong potential to foster discussion amongst people, as they provide a very strong collaborative experience. Hybrid games that combine physical game environments with a digital tool, for example to support a certain calculation action, make use of both advantages of physical and digital games. They allow for immediate interaction of the game players, but they also provide formal feedback based on the data processing power of a digital device. An example of such game is shown in figure 1.

Figure 1: Prototype of the hybrid game “Alloy”

Figure 1 shows the prototype of a game called Alloy that will serve as a reference point for the game that will be developed. In Alloy, different actors from the transportation domain, such as shippers and infrastructure managers, have to collaborate in order to create an efficient and robust transportation network. As this game does not explicitly focus on the dimensions of trust and situational awareness yet, but on the development of innovative measures in transportation, we still need to add game mechanics that help us to explore the role of trust and situational awareness in the innovation process. We envision the game to be played by stakeholders in the transportation

domain, such as port authorities, and e.g. shipping companies, who have different roles and interests in the real system. The players will not play their own role, but the role of a different actor in the system in order to learn about their needs and interests. After the game play, they can discuss their experiences and develop measures to increase trust and situational awareness for innovations in the real system. Additional, validated instruments will be used to measure the impact of the game.

Summary

With our game-based approach towards innovation, we aim at exploring the role of trust and situational awareness in an innovation process. We also aim at supporting actors in the transportation domain to being able to better manage the implementation of innovation. We apply the triadic game design process as method to design our game, and will combine it with a de-briefing phase to expand the learning process of the players.

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