Chapter 42
Using Serious Games for Collecting and Modeling Human Procurement Decisions in a Supply Chain Context

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ABSTRACT

Computer simulation is often used for studying specific issues in supply chains or for evaluating the impact of eligible design and calibration solutions on the performance of a company and its supply chain. In computer simulations, production facilities and planning processes are modeled in order to correctly characterize the supply chain behavior. However, very little attention has been given so far in these models to human decisions. Because human decisions are very complex and may vary across individuals or with time, they are largely neglected in traditional simulation models. This restricts the models' reliability and utility. The first thing that must be done in order to include human decisions in simulation models is to capture how people actually make decisions. This chapter presents a serious game called DecisionTack, which was specifically developed to capture the human decision-making process in operations management (the procurement process). It captures both the information the human agent consults and the decisions he or she makes.

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INTRODUCTION

In fast-paced markets, companies try to improve product service level and quality while decreasing costs in order to get high market shares. Whereas some companies implement solutions to improve performance without prior verification, a wiser approach is to use computer simulation to evaluate the impact of potential solutions on the performance of the company and its supply chain. In these simulations, production facilities and planning processes are modeled in order to capture company behavior. However, the main drawback of this approach is that little attention is given to the human decisions that take place in this context. Human decisions are very complex, varying across individuals and even across time for a single individual. Traditional simulation models thus neglect this component. But this in turn limits the models' reliability; in fact, modeled companies often exhibit different behavior than their real-world counterparts.

The challenge is to be able to capture how human decisions are made, use this knowledge to develop reliable human decision-making models, and then implement these models in computer simulations. For this purpose, the first task is to capture human decisions as they *are* made rather than how they *should be* made. Capturing actual human decisions is not straightforward, however, because people are not very good at verbalizing what they know (Vermersch, 2006).

The utility of the conventional simulation approach in studying system behavior in general has been proved (Robinson, 2005) even though it does not involve active user participation during simulation runs. However, for the purpose of knowledge elicitation (Edwards et al., 2004) as well as user training or education, using more advanced simulation technique that integrates visual simulation and user interaction (Van der Zee & Slomp, 2009) should be a promising approach.

This chapter presents a serious game called *DecisionTack* that was specifically designed to capture the human decision-making process in a procurement context. The main motivation for developing the game is to be able to take full advantage of simulations that include active user interaction for the purpose of quantitatively analyzing decision-making behavior.

This serious game captures both the information consulted by the player and the decision he or she makes. This is done repetitively during the game, because an operational decision (procurement) is required from the player on a daily basis. This leads to the capture of a series of *decision versus consulted information pairs* that can later be used to develop human decision-making models. Subsequently, the outputs of the game are analyzed using four metrics that characterize each player's behavior in terms of data consultation and decisions.

In the rest of this chapter, we lay out the basic concepts of Supply Chains, decision-making in a supply chain context, and describe previously developed serious games (*Background*); describe current weaknesses and define the goal of the research (*Motivation & Goals*); describe the details of our serious game (*DecisionTrack Game);* outline our analysis and interpretation approach (*Analysis and Interpretation*); illustrate a case study (*Application case*); discuss strengths, weaknesses and further challenges of our serious game (*Issues & Controversies*); outline potential further development (*Research Directions*) and draw final conclusions (*Conclusions*).

BACKGROUND

1. Supply Chain

In the current global economy, enterprises do not act as isolated companies, but are integrated in complex networks involving many entities (manufacturing, transportation, warehousing, etc…) that are linked by complex material flows (such as products and components) and informa-