Thesis Title

DEVELOPMENT OF SUSTAINABLE SUPPLY CHAIN MANAGEMENT GAMES

Thesis Summary

Serious Games (SG) in Sustainable Supply Chain Management (SSCM) is an under researched area. Since the inception of the term SG up to the year 2009, a total of 2218 SG have been developed in all knowledge areas. After the year 2009 and only considering SG around SCM a total of 12 new SG have been developed to have a grand total of 2230 SG. From those 2230 SG 32, that is 1.41%, are related to Supply Chain Management (SCM). As impressive as the 300% increase in the development of SCM SG may be, which indicates the growing interest in this area, the area of SSCM SG has been completely neglected. A total of 0 SSCM SG have been developed, verified, and publicly validated.

The purpose of this research is reducing the complexity of SCM to properly integrate the 3 dimensions of sustainability and risk to create a SSCM game that increases the awareness of SSCM in beginners. This is achieved through the following originality: (1) Eliminating market fluctuation and communication among stakeholders in SCM (2) Simplifying the time delay in the SC by decreasing the amount of stock locations. This research develops successful SSCM SG. There is a lack of SSCM SG, the complexity of integrating the three dimensions of sustainability (environmental, economic, social) and risk management into a SG is rarely tackled by SG developers and researchers, resulting in an underdeveloped area. SG are simpler representations of reality that are used to teach specific solutions to problems or widen the user's perspective towards a topic.

The challenge lies in creating a SG that is not too complex as to not overburden the player with an excessive amount of options but have just enough options to allow for the interaction of the different dimensions of Sustainability. Existing SG in SCM primarily focus on one or two dimensions of sustainability and on very specific concepts within that dimension. Integrating the three dimensions of SSCM in a single SG and achieving an appropriate balance between them poses a challenge. Each dimension provides a specific SG mechanics challenge. The complexity of developing SSCM games is tackled several methods such as the Complexity Reduction and Integration Method (CRIM) for serious game design. CRIM maps simplified SSCM concepts into simple SG mechanics that are affected by player-controlled variables (PCV's) that in consequence generate SG dynamics to create SG that can successfully integrate all dimensions of SSCM and risk management.

Two SG are developed Chain of Command and Looper. CoC is more complex than Looper but still manages to merge all the dimensions of SSCM into a single SG. Looper, in contrast, is a single player SG that allows for better understanding of SSCM. On the other hand, CoC is a multiplayer SG that provides the players with more person to person engagement and understanding of competitive supply chains. Prior to this study no SSCM SG had been tested, verified, validated, and published in research journals.
This research is intended to develop a Sustainable Supply Chain Management (SSCM) game capable of integrating the 3 main dimensions of sustainability and risk. Researchers have developed several games in Supply Chain Management (SCM), however, seldom do these games incorporate and integrate more than 1 dimension of sustainability, before this research there were a total 0 SSCM games publicly validated and published in journals. To address this issue, this thesis develops two SSCM games, Chain of Command (CoC) and Looper. CoC is partially successful at integrating the three dimensions of sustainability and risk, nevertheless, the level of complexity present in the representation of SCM in the game diminished its educational, enjoyment value, and resulted in a complex and difficult to understand game. Looper is then developed to address the previously mentioned problems.

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This dissertation consists of 8 Chapters. Chapter 1 describes the purpose, goals, and structure of this research. The chapter begins with a research background on serious games and the establishing the fact that there are no SSCM games. The literature review reveals that games in conventional studies focus only on one or at most two dimensions of sustainability. Chapter 2 describes the quantitative and qualitative methods used during the research. Chapter 3 provides insight into the game design process, the complexity reduction method, systems engineering technical processes, the stealth serious games model, and the serious game cube. Chapter 4 regards the development and testing of the Origami SG a single dimension SC game focusing on economics, developed to gain insight into serious game design and test systems engineering technical processes in the design of serious games. Chapter 5 introduces the reader to SSCM and SSCM games. In addition to displaying the development of CoC and Looper. Chapter 6 contains detailed descriptions of the verification and validation, this includes test setups, data gathering and results for CoC and Looper. Test results show that Looper is more educational and enjoyable to play than CoC and succeeds were CoC failed. Chapter 7 contains a discussion on the validation results from CoC and Looper, along with observations and insights obtained from the games testing. Important findings for Looper include players investing in green technology as a retroactive approach to government regulations, short leads times and SC robustness is valued over the environment and corporate social responsibility is an activity players are not willing to engage in if there is no incentive to do so. Chapter 8 contains the conclusion of the study for CoC and Looper related to our research goal and the academic contribution. It additionally provides the direction for future research: (1) Develop a SSCM game that teaches solutions to current SSCM problems, (2) Develop a SSCM game for SSCM professionals.

Key Word (5 words) Games, interactive learning, supply chain management, sustainable supply chain management, serious games development