

A Collaborative Serious Games Model for Urban Mobility Planning



Serious games (SGs) are developed for non-entertainment purposes. Games have potential to empower learning even if playing a game is not an obvious solution for high-level learning. The linkage between both game and learning objectives is not practically coupling in some cases since players can play without learning anything.

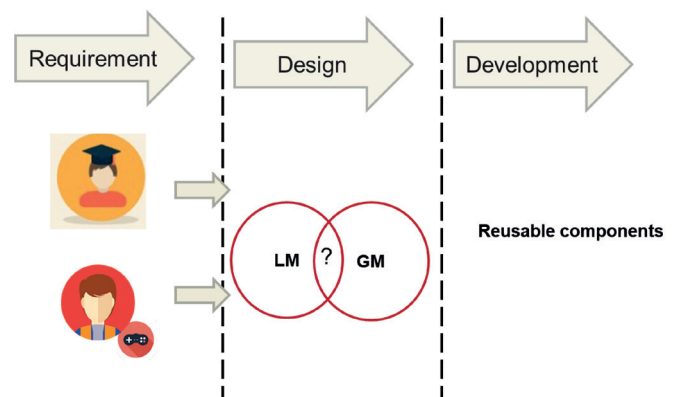
In addition, the design and development of SGs demand high production cost and is a time-consuming process. These two main reasons lead to the challenge of improving SGs' design and development process.

Challenges of Serious Games

In the aspect of software development, SGs are considered as a type of software that has its own specific requirements and design processes. This is because design and development of SGs require a team consisting of both game designers and education experts. However, the team members usually do not share a common vocabulary as well as the domain viewpoints. Therefore, to improve the method of the SGs' design, the pedagogical contents have to be translated and implemented into the game mechanics, which lead to one of the biggest challenges in the SGs' design in identifying the relationship among learning mechanics (LM) and game mechanics (GM) in order to improve the game design process.

Technically, game development process consists of complicated tasks, and it is usually complex in the lower levels, especially in the programming stage. Therefore, reusing SGs' components requires a clearly defined documentation of the original game and the relationships between its components. Then, any modification of SGs has to consider the original requirements of the game in both education and game design aspects. Otherwise, a special effort is required, for example, to modify a part of the game, such as time or an object in the game, which can affect the original learning objective of the game.

Furthermore, developers have to deal with an enormous number of the original lines of code during the modification process. Hence, practically, it is easier to develop and design a new game than to reuse the developed ones. This leads to the low potential for reusability of the final products or components of SGs. Therefore, challenges in reusability of game products and identification of components of SGs become a more crucial concern.



Challenges in Serious Games Design and Development

Collaborative Serious Games for Urban Mobility Planning

Since various stakeholders are involved, urban logistics systems are pretty complex. Each member has individual requirements. The improvement of awareness in collaboration and involvement among them is an important issue. To improve collaboration and the interaction between stakeholders in urban logistics activities, such as policy establishing, urban mobility planning, policy evaluation, it requires an effective tool acting as a mediator. Collaborative SGs have the potential to apply group learning to the case as it can provide an environment (through the game) for each player to complete their learning process and the game missi-



Supara Grudpan
M.Sc.

Production Engineering

Chiang Mai, Thailand
gud@biba.uni-bremen.de

International Graduate School for Dynamics in Logistics
Contact: Dr.-Ing. Ingrid Rügge

Universität Bremen
Hochschulring 20
28359 Bremen, Germany

www.logistics-gs.uni-bremen.de
info@IGS.LogDynamics.de

on together. The players can share goals and the tasks of solving problems together. They can build new knowledge on others' ideas and through the group activities (in-game scenarios). Through sharing perspectives, experiences, and understanding, the complexities, concepts and skills of each team member are developed.

According to the mentioned potential of collaborative SGs, they can be used for engaging players to come together to solve problems or create new ideas while playing a game. Therefore, it can also be applied to improve the awareness of collaboration among stakeholders in urban logistics activities. The stakeholders in an urban area can play different roles in the game in order to learn to make decisions under the conditions of their roles as well as to understand the requirements of the others. The activities corresponding to the interaction between the stakeholders can be used as various scenarios in the game.



Involvement of Stakeholders through the Collaborative SGs
(Icon Created by Macrovector – Freepik.com)

For example in urban mobility planning, the city authority has to select a proper location for bicycle parking to increase the number of cyclists and decrease air pollution. Public transportation companies have to provide enough bus stations to serve residents' demand under the cost concern, etc. The games require mechanics, which are used not only for engaging players to solve a problem or create knowledge together, but also to show the consequences of their decisions. This research will use the urban mobility planning as a test case for evaluating the usefulness of the collaborative SGs' design model.

Design Challenges

Collaborative SGs are more difficult to design due to the complexity of the collaborative characteristics. The players have to make decisions or solve problems together for maximum team utilities. Hence, the case that one of the players can solve the task individually is considered as a failure in learning, because the knowledge of the task is not shared with the other players. To complete players' studies and the game missions, the game should provide an environment for engaging the whole group of players.

The learning process occurs during their interactions towards the gameplay. Therefore, the environment should be designed to support interactions among players, particularly, their collaborations should align with characteristics of the collaborative game. This leads to the question of how to identify a set of concrete game components for the development of multiplayer in collaborative SGs. Then, the deeper relationships among components of game and education, such as player interaction and group engagement can also be defined.

Recently, there are studies exploring the architecture of SGs in order to identify the components as well as the relationships between game mechanics and learning mechanics both in high-levels (principle/conceptual design) and low-levels (game architecture and component) of the game design and development. However, they still lack the study in game mechanics' underlying process of social interaction, which is an important element of the collaborative SGs. Therefore, the objectives of this research are: firstly, to identify the relationships among learning mechanics (LM) and game mechanics (GM) for multi-users in collaborative SGs; secondly, to implement a guideline for collaborative SGs' design and development.

The current research considers the scenario of urban logistics in Thailand as a case for evaluating the developed system. Moreover, the suggested system can also be applied to support the design and development of the Collaborative SGs in other fields.