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Design of business simulation game database for managerial learning

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Abstract. This research is aimed to produce a database design that can be used in business simulation game application to improve decision making ability of industrial engineering students. The method used in this design is SDLC method that begins with simulation modelling, conceptual data modelling, logical database design, physical database design, and database implementation. The results of this design are seven relations consisting of scenario, simulation, period simulation, company, supplier, advertisement, and modes. The design results will be used in the development of business simulation game applications that will be used in the learning process of students.

1. Introduction

The business simulation game has been developed since 1965 which is first known by the name of Top Management Decision Simulation [1]. Since then many simulation games have been used as complementary to theoretical courses with the aim of providing practical experience [2]. This business simulation game can also be used to train student managerial skills especially in planning and decision making. Joseph Wolfe & Gary Castrogiovanni stated that in business simulation game players learn the rules of the game just as they learn how companies run in the real world [3].

Simulation game are used in industrial engineering majors to support many theoretical lectures. Mohsen Jahangirian et al. categorizes 24 types of simulation applications used in manufacturing and business, covering assembly lines, strategy and decision making, facility layout, quality management, financial management and more [4]. Although the research and development of business simulation game has been done in many universities abroad, in Indonesia there is little research on this topic. Some publications of research on business simulation games conducted in Indonesia include the Geneshoes Business Simulation Game in 2004 using MESE software from Hewlett-Packard [5], Production Planning and Control Simulation Game 2005 using Microsoft Excel and ProModel software [6], Operation Management Games 2013 in the form of board games [7]. However, these studies do not use DBMS as a data storage technology for simulation results.

Based on these studies, Department of Industrial Engineering University Computer Indonesia identified the need to develop application program to support theoretical lectures. Michael V. Mannino states the process of developing information systems can be divided into two activities, namely database development and application development [8]. This paper discussed the database development as the beginning of the study, to produce a database design that can be used in business simulation game application to improve decision making ability of industrial engineering students.



2. Methodology

The study was carried out with adopting the steps in the System Development Life Cycle (SDLC) which begins by defining the game philosophy, creating conceptual data model, creating a logical database design, and physical database design as described by Hoffer [7].

The first stage is defining the philosophy of the game, here defined the role of the actors and all use cases needed in the simulation, the business simulation game is developed using Monte Carlo simulation concept by utilizing random numbers to generate variables that cannot be controlled by the player. Players interact with the game through decisions, and the computer will calculate the simulation results at each session. The data needed in the philosophy definition phase are the theoretical concepts to be simulated, all the data drawn from the studies and books related to the theories studied by the students. In the second stage a conceptual data model is created to identify which entities, relationships, attributes and business rules are involved in the simulation process, the data used is the Use Case diagram generated by the first stage. The third stage, developing the logical design of the database by determining the details of transactions, displays, forms, and data and information needs based on the diagram produced by the second phase. In the fourth phase, the physical design of the database, with the steps to establish the DBMS to be used, the physical organization of the data and its processing program, the data required in stage four is the logical design of the database, the diverse characteristics of the alternate DBMS, as well as the dummy data for experiment.

3. Result and discussion

In the first stage the scope of the simulation game was chosen, from 24 categories summarized by Jahagirian, the simulation game to be developed is the category of strategy and supply chain management [4] especially illustrating the planning methodology in product distribution, the philosophy of the game begins with the players being given limited funds which should be allocated to establish cooperation with suppliers, determine pricing strategies, build distribution networks, and select advertising media that will be used to penetrate the market and increase customer loyalty based on loyalty level according to Hill and Alexander include suspects, prospects, customers, clients, advocates, and partners [9]. The next important factor in establishing game philosophy is the learning cycle time that is affected by the meta-compositional element. It requires flexibility to set the level of difficulty that is implemented in different game scenarios, games that are too easy or too difficult will not provide sufficient learning experience in understanding the concepts of theory [10].

In the second phase, the need for data and information in accordance with the prescribed game philosophy begins by defining the external view of the actors, the simulator interacts through the scenario editor menu, player registration, and viewing the simulation results in the form of summary and details, the player interacts through the simulation form and simulation result form. This stage produces conceptual data model in the form of Entity Relationship Diagram as shown in Figure 1. E-R Diagram shows relationship between entities clearly and helps identify the attributes needed in the development of simulation model [11].

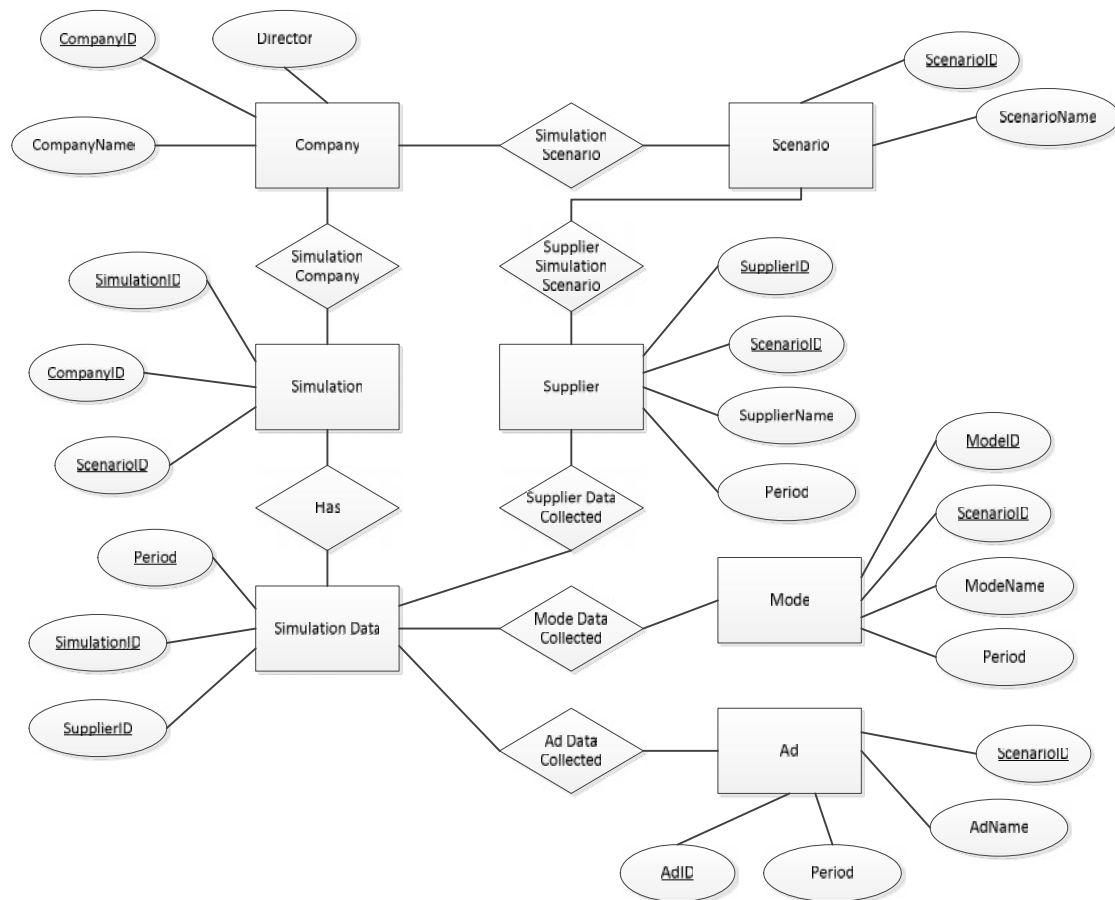


Figure 1. E-R diagram of business simulation game.

Based on the E-R Diagram generated by the previous stage, then developed a logical data model. In this logical data model many new attributes are found iforpplication development, another important finding in this phase is the database design for the simulation is very different from the database design for information systems, the use of various scenarios causes the database no need to apply the concept of normalization, data redundancy between entities tolerated for generating the appropriate information at each simulation session. Furthermore, the physical database design, at this stage reviewed some DBMS application programs that can be used, two alternatives that appear is Microsoft Access and MySQL, but for early development decided using Microsoft Access that has been equipped with the ability to create reports and provide ease in application development because it only needs to use personal computer [12]. Results of physical design as shown in Figure 2.

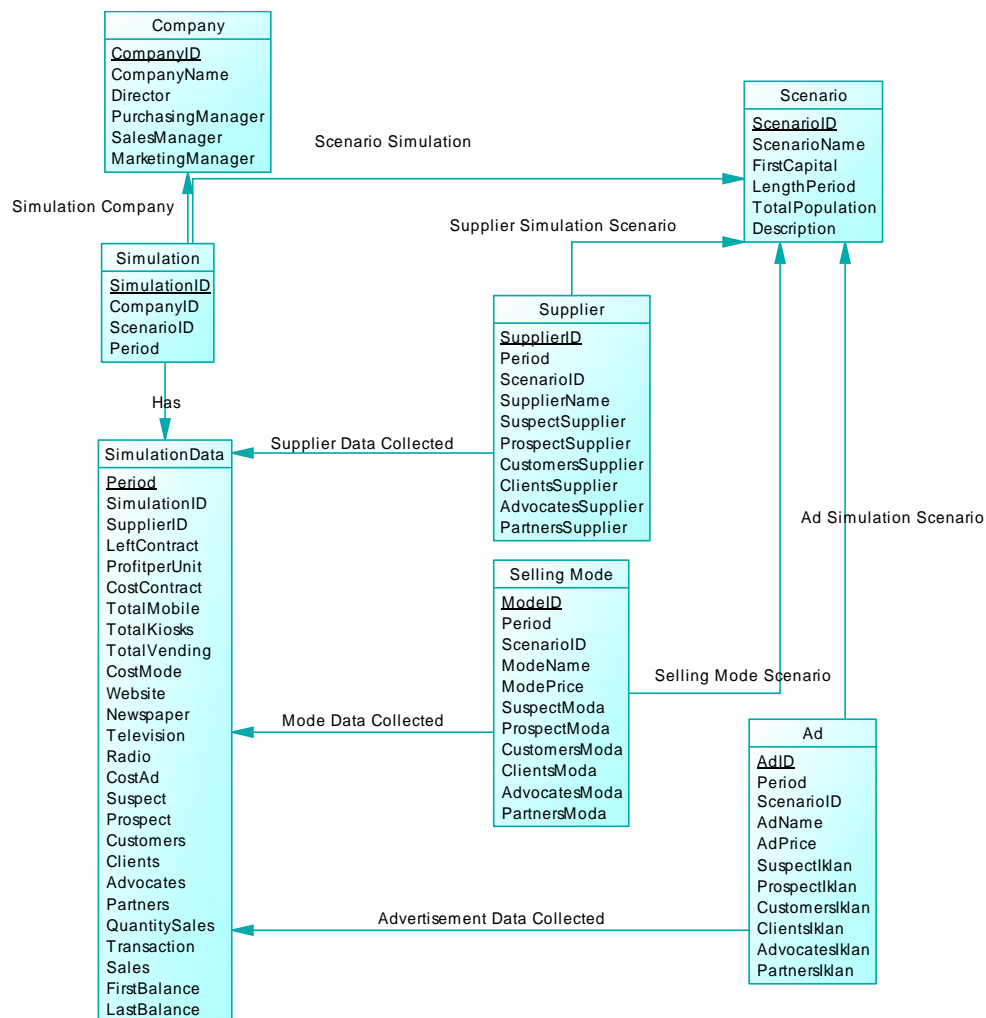


Figure 2. Database physical design of business simulation game.

The physical design results are then tested using SQL commands to identify whether anomalies occur when manipulating data using create, read, delete, or update statements. Test results show that the database works well and is able to produce accurate simulation information in details and summary.

4. Conclusion

The game philosophy stage is the most crucial stage in designing a business simulation game, at this stage the simplification, stylization, ambiguity and granularity of the game are defined. Based on the philosophy identified the role of the actors involved are the simulators and players. The simulator is the one who created the simulation scenario and determines the difficulty level of the game, while the player is the participant who tries to solve the problem from the simulation using the strategy that they think is best. Based on database design, both roles will interact with their respective menus. The designed database consists of seven relationships that are used to record scenarios, player decisions, and simulation results, so as to produce simulated results reports and learning processes experienced by players.

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