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THE DESCRIPTION OF THE MODEL OF A GAMIFICATION-BASED ENVIRONMENT FOR BUSINESS SIMULATION USING THE UNIFIED MODEL LANGUAGE (UML) METHODS

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Abstract

The educational system in Romania in general and, particularly, the university environment has a large potential for developing new learning methods and techniques, especially in the area of simulated disciplines. One of the most useful skills that can be gained using specific tech-based environments is the establishment of an enterprise or, in short, the entrepreneurship, because it is part of the essential skills considered to be primary, according to the national education competences framework. The existing literature is concise regarding the development of methods of modelling business structures and processes, but the immersion in the education is standing at its early stages, related to the relatively low number of novel implementations in education and the potential. If in previous papers we have studied the structure of the intra- and inter-business relationships using system dynamics, this paper is intended to describe a future direction of development based on the study of business processes and their dynamic within the enterprise using specific tools described in the literature, as Unified Model Language (UML) and Business Process Model (BPM) for developing the theoretical model. The result of the study is intended to materialize in a piece of software that will be projected using software engineering based on UML methods and built on the principles of gamification in education. The software will serve as a virtual simulation environment which leads to the understanding of the principles of conducting a business for the formal part of university education.

Key words*: *Unified Model Language (UML), simulated snterprise, business process modeling

INTRODUCTION

Business simulation has significant roots in the need of optimization, of the rational usage of the limited resources [3]. Thus, in the domain, the resources can be classified in three major classes: those related to material needs (materials needed in production, financial assets etc.), those referring to human capacity (human resources) and those reported to time (flows and processes).

The preparation of students for entering in an economy-based workfield must contain the acquisition of these kind of concepts, regardless the domain in which they will work [4]. This is the role of business simulation concepts in the real world.

The domain of business simulation has a huge potential of being modeled using traditional technology-based methods [5, 6]. The literature contains several directions of studying business processes that are projected especially for the field of production. These projections and models are useful for optimizing the activity within the enterprise.

The novelty brought with our approach is based on the domain of application, in education, and the particular structure of the enterprise used in the process of modelling. Thus, we will develop the model for educational purposes with a particular structure given by the departments that base the enterprise.

MATERIALS AND METHODS

In the process of modelling the business processes within an enterprise used in our approach, the most important part is the projection of structures using The Unified

Model Language (UML). It is widely used as a software engineering tool, in the process of planification of the software, but it has also applications in modelling, due to its relatively high capability to project various structures into meaningful models used further in practice.

Unified Model Language

UML relies greatly on the visual part of modelling, the final results of the modelling step of build and development of any application or project being diagrams. From a structural point of view, the language is used for two purposes with two kinds of result diagram classes:

-Structural diagrams, a class that contains diagrams that refer to the architecture of the studied process or entity; the diagram that are used more in practice are the class diagrams;

-Behavioral diagrams, a class that refers to the functional part of the studied process or entity; the most common diagrams are considered the use-case, the sequence and the activity diagrams.

The power of UML diagrams relies in the emphasis of the relations that form between various departments and the big picture that is offered for the entire enterprise.

Business Process Modeling Notation

Business Process Modeling Notation (BPMN) is a method that uses flow charts to model a business process. Due to its strongly visual characteristic, BPMN is used to visualize flows within a business process from the beginning to the final steps.

BPMN depicts these four element types for business process diagrams:

-Flow objects: events, activities, gateways

-Connecting objects: sequence flow, message flow, association

-Swimlanes: pool or lane

-Artifacts: data object, group, annotation.

While UML relates more with the global image and structure of the enterprise, the BPMN approach is more process-oriented, visually representing the steps forming a process within a business.

Gamification

Due to its pervasive and versatile nature, gamification has a large research pool in the literature. Many researches in various domains apply gamification in models or implementations, because its adaptability and easiness in usage.

Structure of business

The departments of the simulated business are presented in the Figure 1.

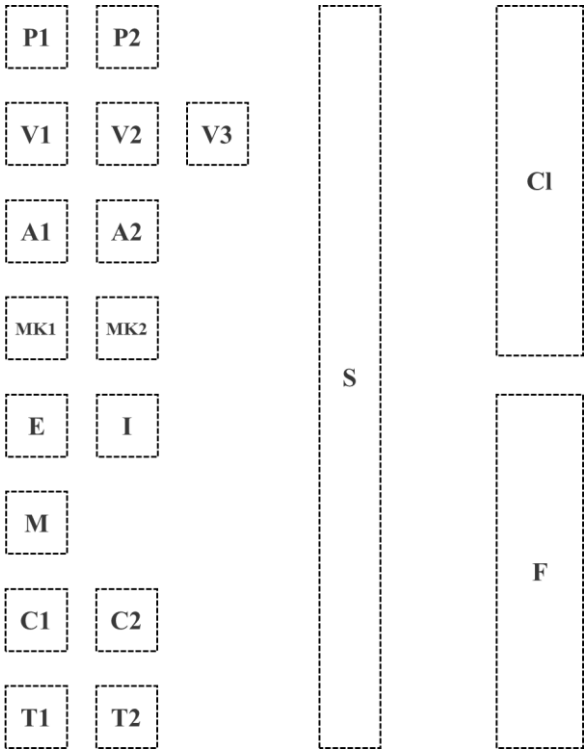

Fig. 1. Essential departments in the enterprise
Source: Original.

The departments are explained as follows:

-the P department refers to human resources: P1 relates to salary management and P2 to the actual HR department (training, development, work security etc.)

-the V department refers to orders: V1 relates to internal offers, V2 to internal orders and V3 to invoice management;

-the A department refers to acquisitions: A1 to relates to internal acquisitions and A2 to external acquisitions;

-the MK department refers to marketing: MK1 relates to marketing research and MK2 to promotions;

-the EI department refers to commerce: E relates to export and I to import;

-the M department refers to warehouse;

-the C department refers to accounting: C1 relates to financial accounting and C2 to management accounting;

-the T department refers to cash: T1 relates to cash register and T2 to bank relations.

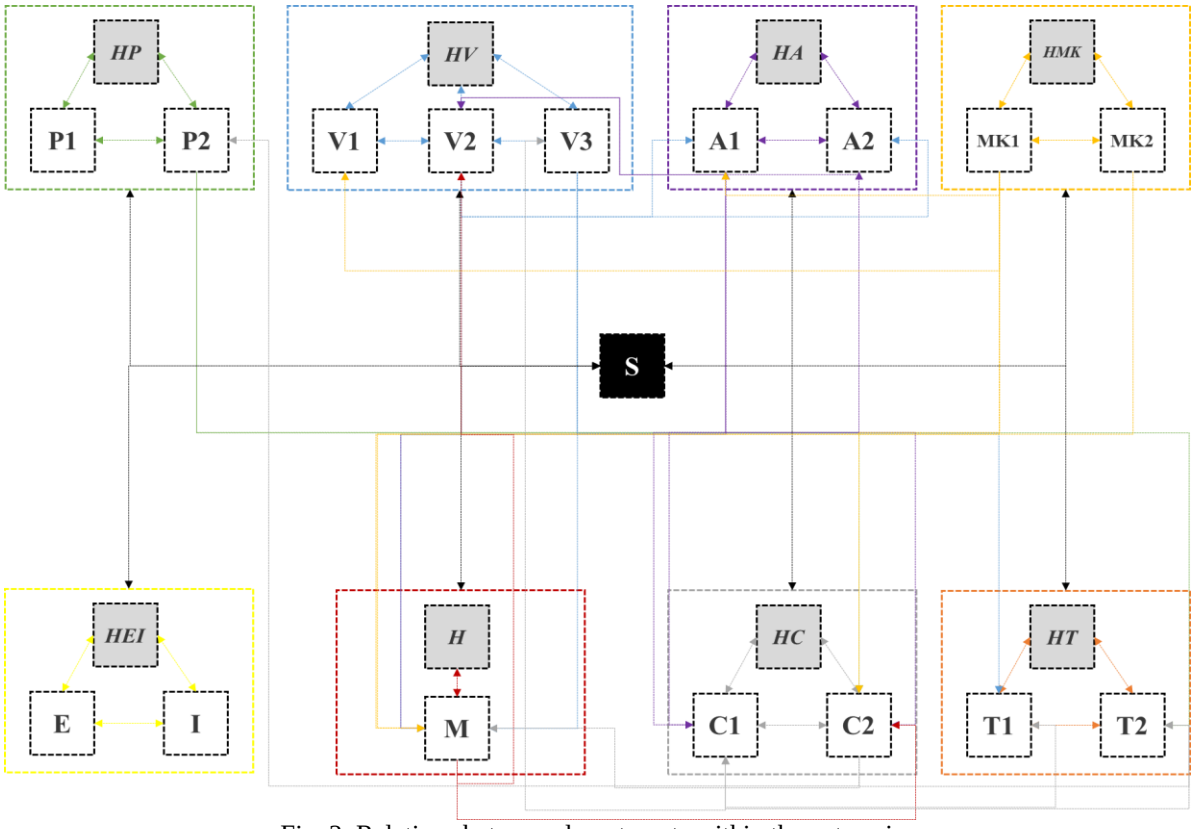

Fig. 2. Relations between departments within the enterprise
Source: Original.

As shown in Figure 2, every department is run by a head (H) which organizes the activity within the department and creates a link with the secretary department.

RESULTS AND DISCUSSIONS

In this paper we will present a class diagram, shown in Figure 3. The general structure of the class is formed of the documents generated by the class and the actions made by each of the department team or representative. The class diagram helps at creating a general image of the structure of the enterprise, enriched later with the relations between the departments and the flows created for a specific action. The class diagram can easily be completed with the other types of behavioral diagrams.

The essential departments described previously gather in the form of a basic enterprise [1], where the accent is put on the flow on the basic documents: HR documents, financial documents (payroll, invoices, bank statements, forecasts, sales reports, receipts) and marketing documents (promotional materials, orders etc.). The model will further follow the dynamic aspects related to the document flow and the product/service flow and the actions needed within the process [2].

The class diagram is useful especially for the case of studying the structural aspects of the enterprise. This diagram gives a clear picture of the building blocks of an economic entity and helps further in the process of completing the projection phase of the model of an enterprise.

In its usual form, the class diagram contains instances of the model classes. In our case, the classes are equivalent to the departments, the parameters are the main documents that link the activities between the departments and the methods are represented by the actions made within the departments by the employees. The links between the classes are made by the documents that circulate between the human resources that form the human capital of the enterprise.

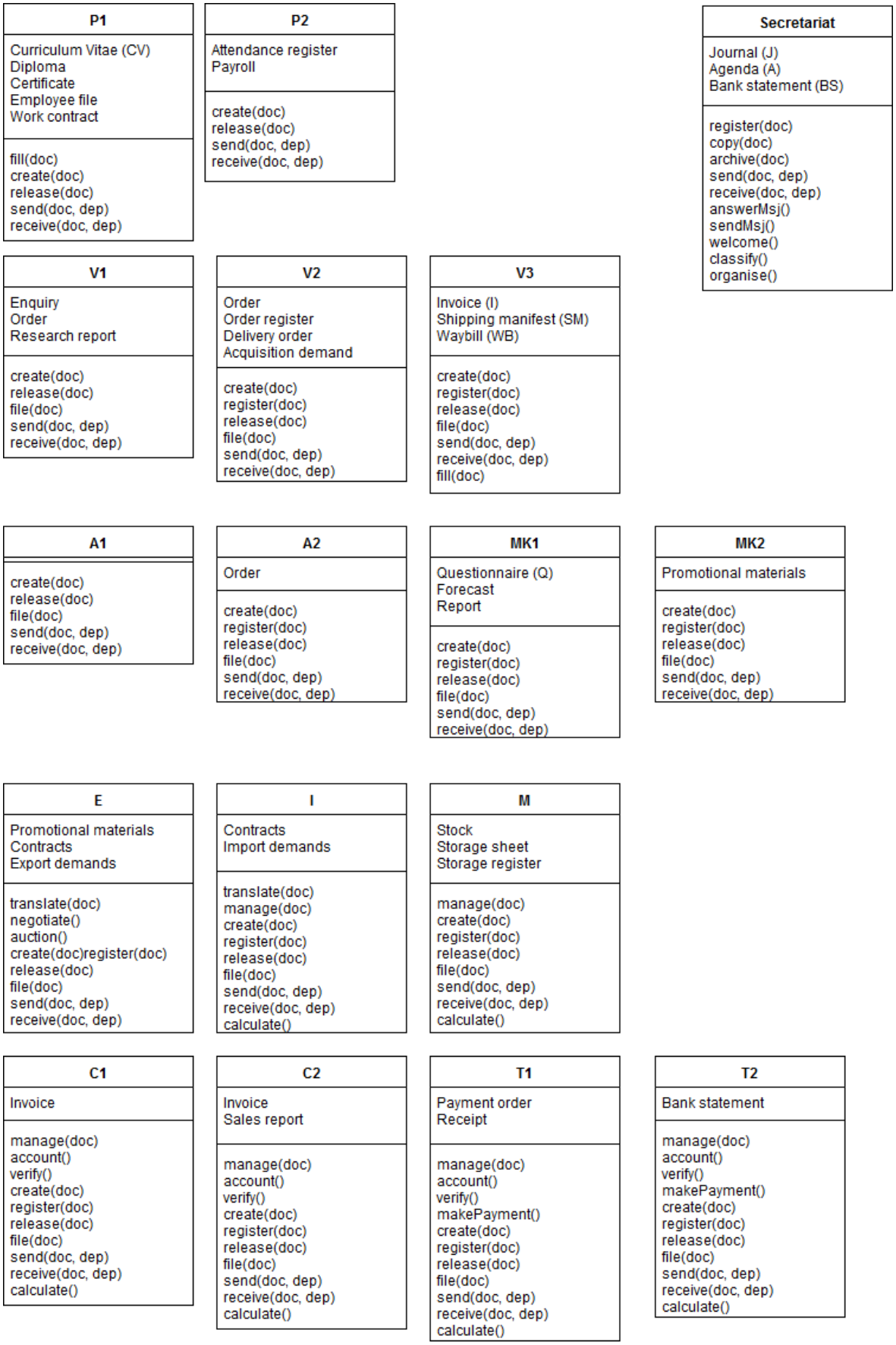

Fig. 3. Class diagram for the given structure
Source: Original

CONCLUSIONS

This paper is a starting point for a research, given the direction for a set of actions with the purpose of creating an environment which will be useful for forming a new enterprise culture within the students. The framework will also emulate a real-based structure based on the principles of gamification that will make the environment usable within the classes.

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