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APPLICATION OF A SERVICE ORIENTED PARADIGM AS A SOLUTION FOR THE DEVELOPMENT AND DELIVERY OF A CONTINUING EDUCATION COURSE

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Game-approach, service-oriented paradigm, continuing education

1. Introduction

The role of continuing education and lifelong learning are becoming increasingly more significant because of rapid technological advances, which require frequent skills upgrades. These make life-long learning mandatory. In order to successfully design continuing education courses that will meet not only the rapidly changing vocational requirements, but also take into account individual learning styles and the effect of environmental factors on learning, we have developed a model for successful course design based on service orientated architecture (SOA) and a game approach which can provide players with data concerning the theory and practice of successful performance more in accordance with "real-life" situations.

In this paper we describe a prototype of a continuing education course designed in accordance with SOA specification and a game approach model. SOA has now become popular as new approach for building IT systems. It gives businesses the leverage to evaluate existing assets and easily make needed changes for business support. This paradigm is often applied to IT systems for enterprise development, but rarely used for continuing course development and delivery. In our paper we provide a model of successful SOA application to creating a continuing education course for project management. In our model the SOA

approach in it is combined with the e-game-oriented approach. The game simulates real-life situations and gives trainees the chance to acquire and demonstrate skills that they will actually need in their professional lives.

The paper is organized according to the following main headings. Section 2 describes the basic aspects we have identified as needed to develop our proficiency managements game. Section 3 reflects the developed approach in the continuing education course prototype. The analysis of the course prototype application is discussed in Section 4. In Section 5 we offer our conclusions and suggest points of departure for future work.

2. Identified Aspects

2.1. A Motivation

According to the lifelong learning Memorandum it is necessary to provide universal and continuing access to learning for gaining and renewing the skills needed for sustained participation in a knowledge society (Trapenciere I., 2004). Continuing education is defined as an educational program that brings participants up to date in a particular area of knowledge or skills (Stale, 2006). The necessity of continuing education is determined by fast development of technologies, working methods, and enterprise cooperation forms requiring employees to acquire novel skills and improve knowledge in fields closely related to or sometimes further a field from their initial education (Stale, 2007). There is good reason for looking to continuing education as a means for providing new approaches, methods, and tools for professional and personal development. Some of the solutions that are often identified are distance learning, interactive learning, collaborative learning, problem-based learning, educational games, and other similar solutions. The remaining part of the paper describes the use and application of computer-based project management game that is an essential part of e-learning course which trains for project management skills.

2.2. SOA benefits

The software of the management game is designed to apply a service oriented paradigm. Service orientation has increasingly become important in software development since more and more software designers are attempting to develop and utilize this approach. Thai is “a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains.” (OASIS, 2006)

“[A service] is an application function packaged as a reusable component for use in a business process. It either provides information or facilitates a change to business data from one valid and consistent state to another.” (Bennett, 2002)

According to the service-orientated paradigm, it is primarily comprised of the following eight design principles (Erl, 2005):

- Standardized Service Contract
  Services within the same service inventory are in compliance with the same contract design standards
- Service Loose Coupling

Service contracts impose low consumer coupling requirements and are themselves decoupled from their surrounding environment

- Service Abstraction
  Service contracts only contain essential information and information about services is limited to what is published in service contracts
- Service Reusability
  Services contain and express agnostic logic and can be positioned as reusable enterprise resources
- Service Autonomy
  Services exercise a high level of control over their underlying runtime execution environment
- Service Statelessness
  Services minimize resource consumption by deferring to the management of state information when necessary
- Service Discoverability
  Services are supplemented with communicative Meta data by which they can be effectively discovered and interpreted
- Service Composability
  Services are effective composition ingredients regardless of the size and complexity of the composition

2.3. Using SOA for game design

"A game is an artificially constructed, competitive activity with a specific goal, a set of rules and constraints that is located in specific context" and resembles portions of reality. It provides a competitive environment for a player by challenging him or her to reach a goal. The purpose of the game (e.g., enjoyment, information, instruction, etc.) helps define the goals, rules, and context of the game (Hays R.T., 2006).

There are a number of educational games currently available. Some of these are especially targeted for the workplace. Educational games emphasize learning. There are different types of the game, used in workplace:

- Teaching attention allocation skills – these games are aimed at developing skills that are needed in a real environment; for example, piloting skills for complex fighter aircrafts.
- Teaching Periscope Skills – these games are designed to upgrade the training programs for submarine **periscope** operators, and they develop such traits as curiosity, competition and control, as well as, visual and sound sensitivity.
- Teaching Technical Skills – these type of the games provides the practical skills necessary for working with technical equipment;
- Teaching the Principles of particular fields– these games provide visual representations and basic fundamentals of particular fields.
- Business and management games – these games allowed learners to see the effects of their actions in larger action / counteraction cycles.

In our application we used a particular business and management game to provide learners with project development skills (Stale, 2007 IEEE). There are several educational properties of business and management games to be taken into consideration during game development and delivery (Hays R.T., 2006):

- Games can provide training to sensitize participants to functionality interactions of occupational specialities within companies;

- Games may sensitize learners to the fact that in the real world they must take particular actions for the purpose of information gathering;
- Games can offer the trainees the opportunity to learn and refine a variety of analytic tools;
- Games allow learners to become aware of psychological and organizational interactions and interdependencies in business;
- Players may learn that most decisions are made by teams of several persons and that these decisions are constrained by a variety of variables, such as time, complexity of the decisions, and personality factors of the players;
- Games can teach institutional facts about the learners' companies.

The formal elements (see Fig.1) of game design are players (number of players, roles of players, player interaction patterns), objectives, procedures, rules, resources, conflict (obstacles, opponents, dilemmas), boundaries, and outcome. "The game design determines what choices players will be able to make in the game-world and what ramifications those choices will have on the rest of the game. The game design determines what win or loss criteria the game may include, how the user will be able to control the game, and what information the game will communicate to him, and it establishes how hard the game will be." (Rouse, 2005)

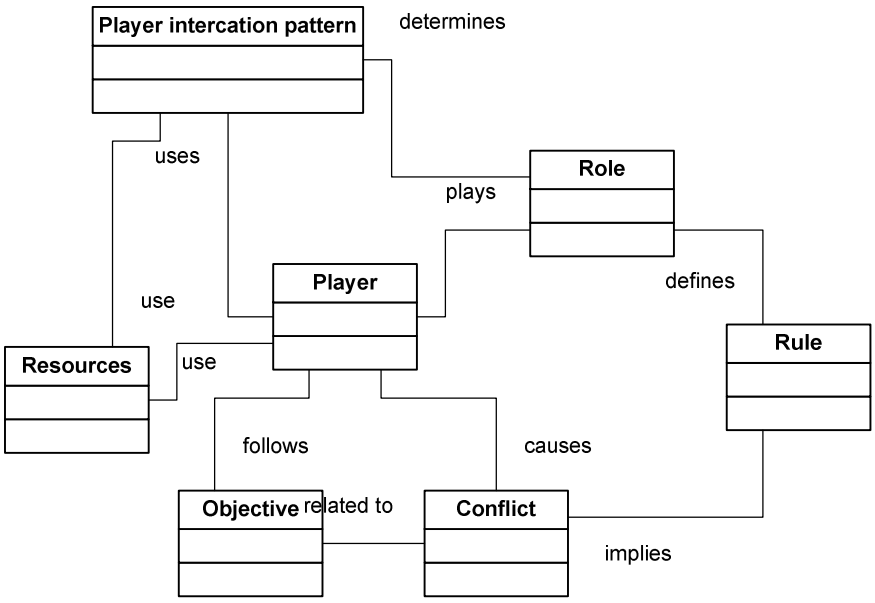

Figure 1. Game architecture

Taking into account the game architecture depicted in Fig.1 the following services can be defined:

- **Message services** implement player interaction patterns and provides access to resources;
- **Resource services** provide access to resources for player, game instruction and other game software components and updated resources;
- **Game manager services** implement game actions according to the rules, generate and manage conflict situations according to the game scenario, provide support both for players and game instructors.

3. Applying the Course Prototype

The applied outcome of the management game Sprīdītis is intended to develop skills and proficiency that are needed for the successful participation in research and technological projects. The game will be used as a model for continuing education course development. The lecture and course material provide a theoretical framework, but the game itself (as the applied part of the course) promotes the development of required skills and proficiencies.

At the outset of the game the participants are divided into teams. Each team has from three to five participants. It is the task of each team to define a project and to plan it so that the goals of the project can be realized. The project plan is entered into a computer by the teams. They may apply programming materials provided by the game or other programming materials to which they may have access. The game may be played with each participant having access to an individual computer or the whole team may use only one computer.

To successfully play the game calls for a lot of interaction among the members of the teams. They need to agree upon and carryout a common plan. Each member also needs to take responsibility for his / her assigned task and report back its results to the other team members of the group, who together decide how these findings may be used to realize the overall plan.

The game consists of following parts:

- Information space
- Communications space
- Evaluation journal / progress report
- Rules / Requirements
- Announcements and support section

The game software is built as a distributed system and as such is subject to a service orientation. In game software design, several messages are specified and some of them are implemented in game software prototype. In Table 1, a general description of services design are represented.

Table 1. The services of the management game Sprīdītis

Message services	Communication between several software components Communication between players Communication between the game instructor and players System messages to the game instructor about players activities System messages to players: • about occurring random events • about resource (information, etc.) update • reminders and advice according to review and analysis of players previous activities
Resource services	Document service: • provides access to different parts of project application (to fulfil blank templates, to modify written parts of the application, to evaluate written parts of application, etc.) • provides access to repository of publications (for the game instructor to update it, for the players to search

	and read the information)
	Task builder service provides information about current tasks that must be done by players in a predefined sequence; Choice builder service provides access to tools for performance of tasks provided by task builder; Action impact analyser service provides access to necessary information about players' progress for the game instructor, experts and some software components; User management service
Game manager services	Dispatcher service Time control service User interface service Game play progress service

4. Analysis of the prototype application

In Fig.2, working environment of the players is represented. The players' interface on the horizontal axis is divided into three sections. On the left side is the description of tasks and templates; these are necessary for planning activity strategies.. The tasks listed represent the project process model that was described in the software systems design. The content and sequence of the tasks are managed chiefly by applying the document and task builder service. But other services are also applied for implementing this part of the system.

On the right side of the interface are located the results of the players' activities and decisions.

The players find all the necessary tools for each assigned task and when a,particular task is finished, it is entered into the repository of deliverable knowledge. At the same time, corresponding messages are sent to appropriate software components, the game instructor and experts in order to (1) evaluate the completed tasks and (2) to request the next one. The tools for this section are mainly derived from the document service. Activities for this section chiefly draw upon analytical and other services. The completed activities for the project may be changed by the players at a later stage of the game.

The central section of interface provides access to the most important supporting resources necessary for the fulfilment of a currently assigned task. These resources are also available for the full course of the game by a pop-up menu which is accessed by clinking on the Information Pool. Additionally, the pop-up menu provides access to other resources, such as a repository of publications, tools of communications among players, and an evaluation journals to allow players to chart their own progress during the course of the game.

On the bottom bar on the interface are tools for time control and an other marked "Assistant." The Assistant acts as a reminder and also serves as a message board.

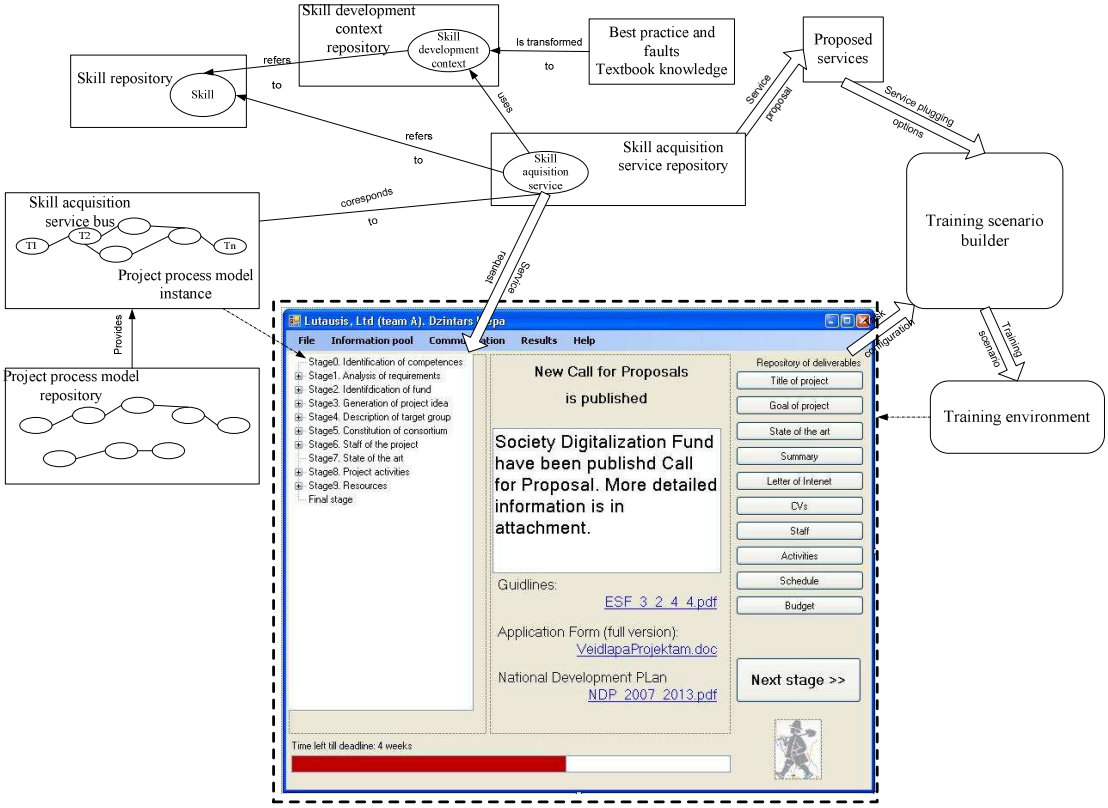

Figure 2. Project management skill acquisition environment in the game prototype

5. Conclusions and Future work

The development of SOA based educational games for continuing education is a complex task. Two challenges standout as uppermost in such an effort: (1) the need to follow SOA principles not only at the conceptual level but also in service development and delivery of the game prototype; and (2) the need to keep the contents of the game up-to-date with respect to the growth of knowledge in the subject area of the game. (Bussler Ch., 2007) Nevertheless, we can conclude from the our first experiments with the development of a game for a course prototype that applied SOA principles that it opened up a wide-range of possibilities that promised a more dynamic course and curriculum design potential.

More generally, our first results from the development of the management game Sprīdītis demonstrated the usability of service orientation for the design of game software.

To meet the second challenge that was mentioned above, we have to devise approaches for the development and maintenance of a skills repository, a skills development context repository and a best practice and faults Textbook. Additionally, we need to test our approach in a real-life environment and evaluate the results.

Our future work is concerned with prototype evaluation for the target group and analysing the evaluations from our results.

6. Acknowledgments

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Tomsons Dz., Štāle G., Kirikova M. Servisu orientētas paradigmas lietojums kā tālākizglītības kursa izstrādes un īstenošanas risinājums

Līdz ar straujo tehnoloģiju attīstību un tām atbilstošo specifisko nozares zināšanu nepārtrauktas pilnveides nepieciešamību, pieaug tālākizglītība un mūžizglītības loma sabiedrībā. Tas, savukārt, rada nepieciešamību noteikt tālākizglītības kursa izstrādes un īstenošanas prasības atbilstoši ārējās vide izmaiņām un apmācāmā individuālajam mācīšanās stilam. Ir būtiski izstrādāt tālākizglītības kursu atbilstoši reālās dzīves situācijai, kā arī piedāvāt elastīgu un neatkarīgu mācību vidi. Lai sasniegtu šo mērķi, ir izstrādāts tālākizglītības kursa prototips, atbilstoši servisu orientētas arhitektūras principiem un spēļu pieejai. Šajā rakstā ir atspoguļoti un sīkāk raksturoti tā darbības principi. Servisu orientētā arhitektūra (SOA) kļūst populāra, kā jauna pieeja IT sistēmu veidošanā. Tā dod iespēju elastīgi izmantot un uzlabot biznesa procesu nodrošināšanu saskaņā ar tā vajadzībām. Šī paradigma galvenokārt tiek izmantota IT sistēmās uzņēmumos, bet reti tālākizglītības kursu izstrādē un īstenošanā. Šajā rakstā tiek atspoguļots SOA pielietojums tālākizglītības kursu izstrādē un īstenošanā. Spēļu pieeja , kas tiek veidota atbilstoši spēlē atspoguļotai reālai dzīves situācijai, ir lietderīgi izmantojama profesionālo prasmju iegūšanā un demonstrēšanā.

Tomsons Dz., Stale G., Kirikova M. Application of A Service oriented paradigm As a solution for The development and delivery of a continuing education course

The role of continuing education and lifelong learning are becoming more and more important because the fast development of technologies and vocational demands require specialized and complex skills that need to be renewed frequently. For the design and development of continuing education it is necessary to identify the requirements of the course as well as taking to the account the learner individual learning path and the variability of the external environment. There is important to develop the continuing education course in accordance with real life situation and learner needs as well as to offer the flexible and independent education environment. To meet these goals we developed continuing course prototype, based on service oriented architecture (SOA) and game approach. We illustrate in this paper real life example using SOA and game approach which is implemented in continuing course prototype. SOA has now become highly popular as a new approach for building IT systems. As an approach it is flexible and gives business the leverage to easily access their assets and make required changes to support their business needs. This paradigm is often used in IT systems for enterprises, but rarely for continuing education course development and delivery. In our paper we illustrate application of the SOA for continuing education course development and delivery. The game-oriented

approach is useful for trainee to acquire and demonstrate professional skills according to the real life situation reflected by the game.

Томсонс Д. , Штале Г., Кирикова М. Применение парадигмы сервисно-ориентированной архитектуры в решении задач разработки и применения курсов дальнейшего образования

В связи со стремительным развитием технологий и необходимостью постоянного усовершенствования знаний в соответсвующих специальных отраслях, возрастает роль дальнейшего и самостоятельного образования. Это, в свою очередь, создаёт необходимость определить требования разработки и реализации курса дальнейшего образования в соответствии с изменениями внешней среды и индивидуальным стилем обучаемого. Важно разработать курс дальнейшего образования, который соответствует реальной ситуации, а также предложить гибкую и независимую среду обучения. Для достижения этой цели разработан прототип курса дальнейшего образования, который основывается на принципах сервисно-ориентированной архитектуры и игрового подхода. В этой статье изложены и подробно охарактеризованы принципы его работы. Сервисно-ориентированная архитектура (СОА) становится популярной, как новый подход в разработке систем ИТ. Она даёт возможость гибко использовать и улучшать обеспечение бизнес-процессов в соответствии с необходимостью. Эта парадгма в основном используется в системах ИТ предприятий, но редко – в разработке и реализации курсов дальнейшего образования. В этой статье изложено применение СОА в разработке и реализации курсов дальнейшего образования. Игровой подход, который применяется в соответствии с отражённой в игре реальной жизненной ситуацией, полезен для приобретения и демонстрации профессиональных навыков.