Hierarchical Learning Management System for the Insurance Industry

Stoyan Cheresharov(✉), Hristo Hristov, Veneta Tabakova-Komsalova,
Veselina Naneva
Plovdiv University "Paisii Hilendarski", Plovdiv, Bulgaria
cheresharov@uni-plovdiv.bg

Abstract—This paper describes a model of a Hierarchical Learning Management System (HLMS) for the insurance industry. The problem is that LMSs are widely used, but not suitable for each educational environment and domain. The existing LMSs are with the general purpose and do not reflect the specific needs of different domains. The proposed LMS is a specific hierarchic system specially created for the insurance industry. The model uses a hierarchic approach to share, organize and present the learning content. It allows for building an LMS specific for the insurance industry which is reliable, efficient, fast, and easy to use by the insurance professionals.

Keywords—learning management system, LMS, hierarchic LMS

1   Introduction

1.1   The problem statement and research goal

The problem we try to solve is to build a LMS for the specific needs of the insurance industry. The main idea and goal is to create a model of Hierarchical Learning Management System (HLMS) which meets the specific requirements of the insurance industry. The HLMS allows content sharing similar to the social networks in which the content creators can share content between each other and their content consumers. This way the insurance companies can create learning content for their products and share it to the agencies which sell the products to the customers. The individual agents working for the insurance agencies have access to the shared learning content and can educate themselves about the product offered by the companies. This way the time for learning the new product decreases and the efficiency of the agents increases leading to revenue increase of the insurance agencies and companies by selling more products. The model can be applying to any industry with the similar hierarchical structure where the manufacturer is interested in educating the reseller about the product with the purpose of better sells. The specific needs of the insurance industry are to have a hierarchical structure between the users and content with the ability the content to be shared.

In the insurance industry, like other areas, there are relationships between the entities, which are hierarchical. The specific requirements of the educational process in

the insurance industry requires a specific approach. The insurance agents are usually employees of the insurance agencies and have different background, knowledge and educational levels. They have to learn alone fast different type of insurance products, in order to adequately inform the customers and offer the best options. The insurance agencies are selling the products of the insurance companies. Logically the insurance agencies cannot create the best educational content for different insurance products since they just sell not create them. So the best option would be to allow the creator of the insurance product, which is the insurance company to describe it in a learning content. Often not all insurance companies offer the best learning content. In this case the insurance agency has to step in and create its own content for the product in the way which better matches the requirements of the insurance company and the agents. Which means the insurance agency may create a learning content for a certain product instead of the creator of the product the insurance company. The insurance agencies should be able to pass the learning content for a certain product to their insurance agents, but at the same time they should be able to create their own content for the same product.

Often the learning content created by the insurance company does not match the requirements and needs of an insurance agency. In this case the content needs to be replaced with content created by the insurance agency. In many cases the insurance companies do not even provide learning content for a given insurance product. In this case the insurance agency has to create it. The learning content is very important for the insurance agents because they have to learn about the product as fast as possible and to know it in the best possible way in order to offer the best options to the customers, increase the customer satisfaction and increase the sales. The learning content should be created in the way which allows the insurance agents to learn as fast as possible and pick up the details very fast. The learning content also should allow for quick references. If the agent cannot remember a particular detail he or she should be able to quickly find the topic and learn about it in a matter of seconds. Also the learning content should allow to be used even without watching it but by listening, which means the best media should be short tutorials no longer that 1-2 minutes. The learner should be able to listen the topics in a sequence or just to jump quickly to the interested topic. The preferred type of media is a video tutorial, but written documents also can be used.

The learners in the insurance agencies and companies are usually the employees. So each insurance agency or company is responsible for creating and managing its own users, which are the employees and educational content for them. The advantage of the HLMS is that the content can be inherited from the entities higher in the hierarchy.

The existing learning management systems do not meet the specific requirements mentioned above. They are too general and have to be customized in order to be used in the insurance industry. In this paper we describe a model of a HLMS which meets the specific needs of the insurance agencies. The hierarchical LMS improves the learning process by adding the ability to transparently inherit learning content from another entity in a multitenant environment. The hierarchical organization of the users allows the entities positioned higher in the hierarchy to share their content. The successor organization can use the shared content or create their own for the same topic. Sharing the content increases the efficiency of the entire LMS. It perfectly fits the requirement of the insurance agencies. The hierarchical approach used when the content is created

allows creating of a very well structured learning content, which is easy to understand follow and decreases the time for searching a particular topic.

1.2 Related work

Different solutions exist. Many authors research the field of learning management systems. This fact supports the claim that learning management systems of different types are very popular and interesting topic.

As investigated in [1] learning behavior is an important research topic. Authors claim the Learning Management Systems do not have features for analyzing data and identifying behavior such as learning styles and cognitive traits and instead the systems simply produce reports from access records. According to the authors most studies are based only on a single behavior such as learning styles or cognitive traits but not both. Complex learning models have been proposed in the literature. The study answers the question if it is possible to establish a methodology for the estimation of learning styles and cognitive traits from a learning management system. The research is using Felder-Silverman Learning Style Model and Cognitive Trait Model as theoretical frameworks to identify behavior in a Learning Management System. A model has been designed for extracting records from Learning Management Systems access records to estimate learning style and cognitive traits. The authors developed a prototype to estimate the learning style and cognitive traits for each student. The model was evaluated by administering manual tools to students in a classroom environment then comparing the results gathered against those estimated by the model. Lwande et al. in [1] claim that it is possible to estimate the learning styles and cognitive traits of a learner in a Learning Management System. The created model allows to extract information for learners with similar behavior who can ask each other for help. The authors believe this can reduce the teaching load because the learners communicate the knowledge between themselves. Such research is important for our model because it proves that the online systems can be used without a teacher to increase the knowledge and competence of the learners.

Duin in their case study [2] describe the UMN Canvas LMS experience. The authors provide a historical account of the development and infusion of LMS in writing pedagogy. The research finishes with a conclusion of implications for writing pedagogy along with a matrix for addressing ethical concerns. This study is interesting because it touches the ethical concerns for using the learning management systems.

Aldiab in [3] makes a review of different features of commercially available and mostly utilized modern LMS systems. The authors also include a comparative analysis. Interesting case study focused on the universities of Saudi Arabia was also carried out. This research is important for us since it gives a broad picture of the features and different types of Learning Management Systems.

In [4] Llantos applies Social Network Analysis in the interaction logs from a Social Learning Management System (sLMS). The authors admit that online learning environments are designed with specific users and respective roles in mind. But special social relationships are formed through the time. Typical learning management systems are designed with the teacher and the student as primary users of the system. Llantos is

studying social learning management system that has been designed for use in public schools in the Philippines. The social element is very important for our study since we are using the same social element between the users in the system. To solve the problem, the authors of the research add additional user, the school administrator. The authors claim that pieces of literature are few that provide evidence of presence of social administrators in the learning environment. The paper aims to answer the question: Can instructional leadership be manifested in social system interactions? Using measures of centrality in social network analysis, results show that administrators play a key role in the network as main drivers of the network information flow. The authors use measures of centrality in social network analysis. Their results show that administrators play a key role in the network as main drivers of the network information flow. This study is important for us since our system is similar to a social network.

Hutchison in [5] admits that many online writing instructors are forced to use their institution's Learning Management System (LMS) as a result of interstate agreements for online course accreditation and a correlated requirement to create course shells. The author claims this situation presents a wicked problem for Online Writing Instruction (OWI). The problem is the necessity to teach with/through an LMS, despite a well-developed scholarship tradition of technological critique in the computers and composition field. The author is using a framework comprised of problem, need, and solution. The study is showing that using a LMS does not solve all problems and cannot be a Panacea or silver bullet. It confirms once more again that specific LMS can be used and the approach with one size fits all is not correct. We propose a special HLMS which also has its pros and cons, but its aim is to fit a particular situation in the insurance industry.

In their interesting research Eriksson [6] observes the crisis management. The authors admit that the crisis management is related to planning systems. The actors involved in crisis management need to learn continuously in order to adapt and transform their capabilities. We live in a world of ever-changing threats and vulnerabilities. The business can be seen as a crisis management. The crisis management system is a dual system, being a planning system in-between crises and a response system during crises. The authors combine the theories of organizational learning with general systems theory to develop a model for how systems learn in order to adapt and transform. If we look the insurance business as a crisis management we see the important role of learning management system as a tool for learning in order to adapt and transform.

Mehrolia in [7] admits that despite the fact that several educational institutions in India adopted Web-Based Learning Management Systems (WLMS) they fail in their objectives, leading to little or no return on investments. The authors study the factors that affect students' acceptance of a web-based learning management system and test the moderating effect of their academic involvement. Questionnaires were collected to test the research model using the structural equation modelling approach. The authors conclude that indirect and direct effects account for 49% of the variation in the intention to use. The discussed topic is interesting because it reveals the intention of using a LMS.

In the digital era the learning Management System (LMS) plays an important role in knowledge acquisition and learning management [8]. Nguyen believes the users could be seen as the key stakeholders who impact the system's survival. The attitude of the users toward the system is very important. The research explores the factors influencing learner's satisfaction. A quantitative survey is applied to test the influence of 4 factors:

Announcement system, Instruction information, Interaction, Technology quality. The findings can be used to improve our model of HLMS.

Yoshida in [9] investigates the motivation and structures of scholarly connections on Twitter. The student's motivation was studied using standard questionnaire developed under the attention, relevance, confidence, and satisfaction (ARCS) model. The authors conclude that although students selected social users as targets for tweeting, most students who had reciprocal ties with these users did not contribute to the expansion of the community. Our model relies on hierarchical relationships similar to the researched social network.

The era of industrial revolution 4.0 transformed the educational system [10]. The authors claim that the boost of mobile devices and internet technologies has led to the development of new content. The demands of the students and teachers are changing. Ramli in [10] admits that even with advanced technologies the science, technology, engineering and mathematics (STEM) subjects are yet to fully grasp the attention of students. The authors think the education intuitions need to be redesigned to improve students' learning experience. The research is very valuable for us because it discusses the design and development of a learning experience model. In our research we also develop a model to improve the learning experience of the professionals in the insurance industry. The model created by Ramli is emphasized on three factors; content, pedagogy and interaction. It uses multimedia elements such as 2D graphic, video, AR with 3D object and gamification concepts. A prototype called m-BioP was developed based on the designed model and heuristic evaluation was performed to ensure the application's usability. In our research we also use a prototype application based on the model to ensure the usability.

Li in [11] explores the importance of teaching dynamic visual communication design (DVCD). The authors claim that the DVCD teaching quality can be improved by providing feedbacks to applications. The feedback should contain data on students' needs for practical perception (PPN). Li et al. have discovered that the current practical perception and service applications rarely tackle the feature extraction and application of high-level needs for practical perception in the context of digital media. The authors explore the practical perception and quality evaluation for DVCD teaching in the context of digital media. Our model can greatly benefit from this research in the future by implementing the findings.

The described in this paper model is using hierarchical structures similar to social networks to meet specific requirements for creating and sharing content. In [12] Hoda admits how important the social networking is in technology-assisted learning (TAL). The role of online social capital built upon social networking sites (SNS) adds significant value to the TAL. The study compares the users' profile, behavior and online social capital in LinkedIn and Facebook. The results based on statistical analysis show that on demographic factor, age is significantly different in the two SNS platforms. However, for online-bridging social capital, no significant difference was observed. Social network element is an important part of the design of our model. The research of Hoda proves the importance of the social network connections.

Xiao in [13] proposes research-based case teaching based on Moodle LMS. An integrated research-based case teaching based on Moodle teaching system was proposed. In the research a learning system in the dynamic environment for object learning was established in a modular manner, integrated with interactive analysis, research-based

case teaching mode. A specific teaching mode was designed. The author was using questionnaire survey, to find that proposed teaching mode is significantly superior to traditional teaching mode. For us this is an encouragement that if a specific model is used the results are better.

2 Formal model, methods

2.1 Specific structure and requirements of the model

The specific relationships between the insurance agencies and companies are presented on Figure 1. The companies and agencies have their own staff. The insurance companies create products which are sold by the staff of the insurance agencies – the agents. The agencies don't create products. Instead their agents communicate with the clients and sell the products of the companies.

To answer the question why the LMS for the insurance industry is special we have to look the relationships between the entities. The insurance agencies have their staff – the agents. They communicate with the customers and sell the insurance products. The insurance products are not created by the direct employer of the agents – the insurance agencies, but they are created by the insurance companies. The relationships are presented on Figure 1. The insurance companies have their own staff which also needs educational content for learning the procedures, rules etc.
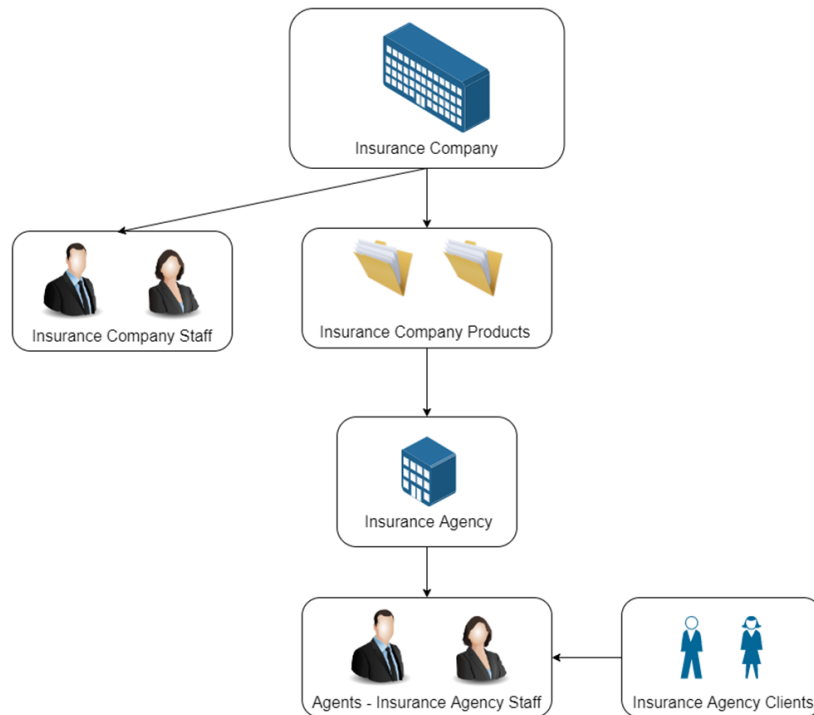

Fig. 1. The relationships between the insurance companies and agencies

The educational content created by the insurance companies can be used by their own staff or can be shared with the agencies. The agencies on its turn can offer the shared educational content to their staff – the agents. The agencies also are content creators and can create their own content and make it available to their users – staff. The educational content flow is presented on Figure 2.
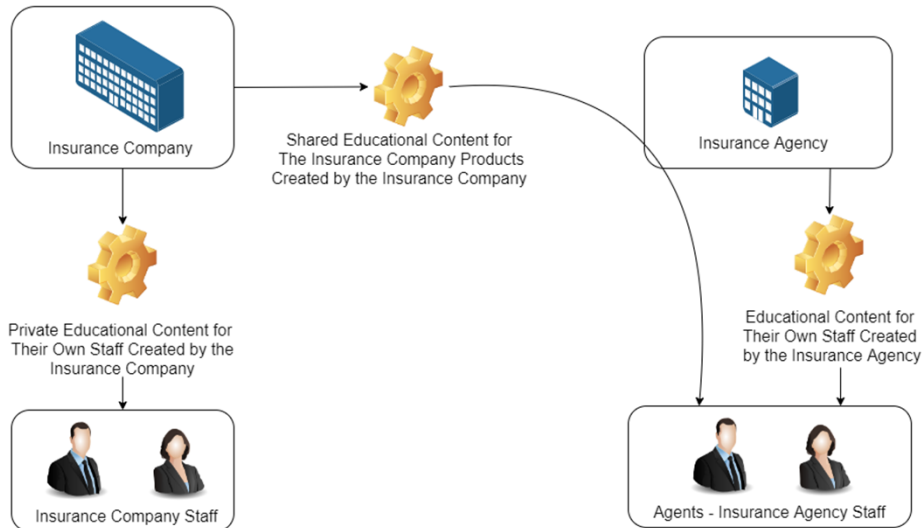

Fig. 2. The educational content flow

2.2 The abstract model of the HLMS

We propose a model for building HLMS. The model meets the specific needs of the insurance industry. The specific needs are hierarchical structure of the users and content with a social element which allows content sharing between users. The implementation can be a multi-tenant web application to be used by insurance companies and agencies. The users of the system are basically following into two categories: content creators and content consumers. The content can be created by one content creator, but shared to other content creators. The system is using the follow-following model similar to the social networks. In which content creators can follow each other allowing them to share the created content as shown in Figure 3. Two major types of roles exist: content creators and content consumers. The content creators can create content and the content consumers can only consume the content. The levels of nesting and inheriting are unlimited. Usually the content creators are the insurance companies and agencies, but the model is not limited to only them. Other entities like Managing General Agents (MGA), clusters, administrator content creators, agents, staff etc. can be added to the system if necessary. The connections between the entities are not obligatory. Each content creator can create its own content consumers – usually staff. The created content consumers by default are immediately following the content creator who created them. The content creators can assign different content to its own content consumers.
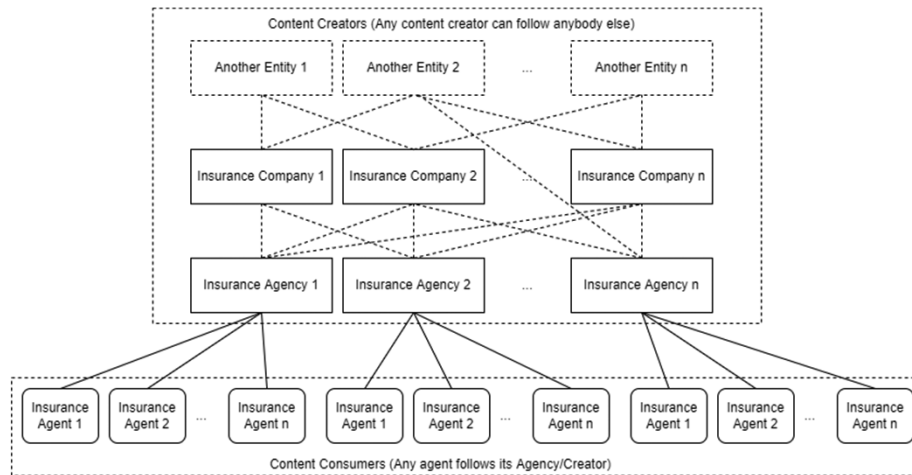
Fig. 3. The hierarchical model of the users

The content creators can create their own content consumers. In the case of agencies, the created content consumers are in fact the insurance agents. By default, when a content consumer is created it gets attached and follows the content of its creator. But on the technical level it is easy to be attached and follow any other entity. Technically this is possible, but the restriction comes only from the business logic. The shared content is visible for the content consumers created by a given content creator.

The model allows the content creators to organize their content consumers into different groups and assign to the group different content and courses. A content consumer can be part of different groups. The ability to organize the content consumers in groups gives the ability to monitor the progress of the entire group and to offer different learning experience to different content consumers.

A special user called administrator is able to establish the relationships following-follow between the content creators. They cannot follow each other without the help of the administrator. Following – Who the user is following. The user sees the content created by the users he/she is following.

The content creators can decide to make their content public and available for the followers or make it private and allow access to it only for its direct content consumers.

The learners can be grouped in different groups. The model offers users with different roles like content creators, learners, administrators, agents etc. The model requires short tutorials and content, usually in a form of short tutorials. The structure of the learning content is created by the content creators and it is also hierarchical.

Only the administrator of the system can establish the relationships follow-following between the content creators. This rule can be changed if necessary. With another words the insurance agencies cannot choose who they follow. The administrator of the system chooses for them. This rule is established to protect the privacy of the companies and agencies. As already mentioned the model does not require this level of secrecy and if necessary the agencies can see and choose from other entities.
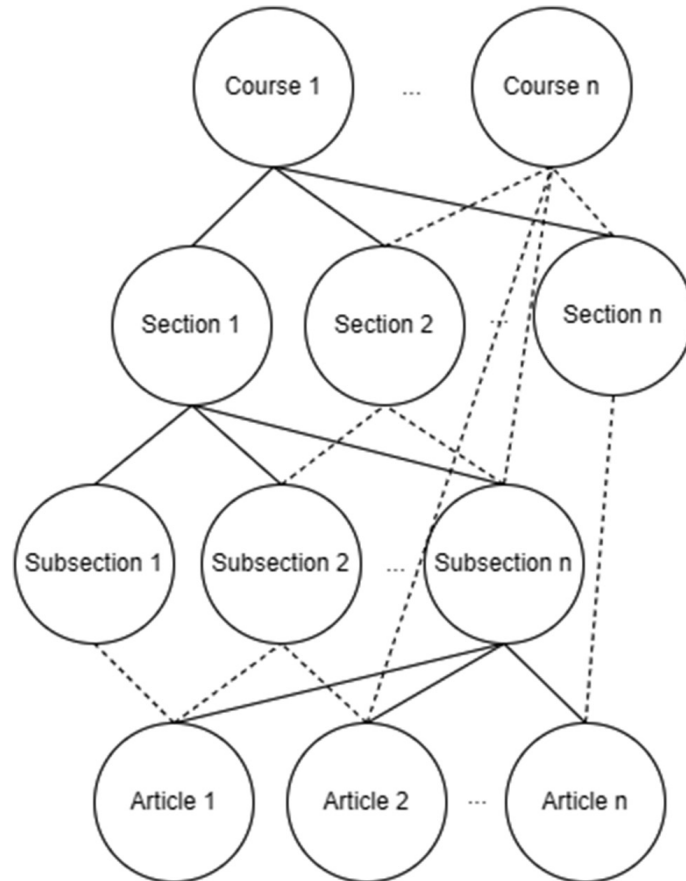
Fig. 4. The hierarchical model of the content

The contents are different types and also follow the hierarchical model as can be seen in Figure 4. The relationships between the contents are also parent-child. The structure is decided by the content creator. One content can be a parent for many contents and in this case can play a role of a course, chapter, subchapter, etc. The model allows any kind of nesting, organization and links on different levels. The content is usually article or tutorial, but it is not limited to only this types. By changing the type of the content it can become a course, chapter, section, subsection, subchapter etc. The model allows building any kind of hierarchical structure. The content can be seen as a node in a hierarchical structure.

Very important aspect of the HLMS for the insurance industry is the fact that the learners can use the system to elevate their knowledge for the insurance products, but also they have to be able to use it as quick reference. This is the reason why the structure of the educational material is of great importance. The articles and tutorials should be very short for example 1–2 minutes long to watch or read. The insurance professionals very often would use them without any previous knowledge and they have to find

the suitable content as quickly as possible. The clear hierarchy structure of the materials is very important.

The hierarchical approach in the model for the users and content allows great flexibility and stability. It comes with the price of complexity. With this complexity the developers have to deal in the code.

The main research and model contribution is the hierarchical structure of the users and content, which allows content sharing and inheritance. This specific characteristic of the model is a good match for the insurance industry.

While other LMS try to be as generic as possible, in our case the model is created to answer specific needs. The insurance companies are interested to produce content about their products and let the agents from the insurance agencies familiarise themselves with them. The specific requirement is related to the relationships between the companies and agencies. The content also is specific. The content should be short and it is usually create in the form of short 1–2 minutes tutorials.

3   Results

As a result, of our research, the previously described methods and model were used, to build a prototype of a HLMS for the insurance industry. The prototype can be used as a proof of a concept. Important part of the research is the ability to build a prototype as fast as possible with minimum effort. The choice was to use modules for Rapid Application Development of Web-Based Information Systems (RADWIS) [14]. The modules offer all necessary functionality for a web-based information system together with flexibility and speed. For building the HLMS the modular approach with RADWIS modules were used, together with NOSQL approaches in SQL databases [15]. Since the RADWIS modules were implemented with PHP the natural choice was to use the same technology stack. This explains the choice of PHP as a primary language for the HLMS implementation. The usage of RADWIS modules determines the usage of MySQL as a persistent layer. PHP is one of the most used technology for web based information systems. It is suitable for building web-based information system, it is open source with big and vibrant community. PHP is operating systems agnostic and integrates very well with different server technologies.

The RADWIS modules are the perfect match for our HLMS model. They allow a rapid application development and offer flexibility and stability, since the building blocks are already prebuilt and well tested. Modules like Authorization, Authentication, Navigation, CMS are used for building the HLMS. The ORM system Doctrine is used to abstract the communication with the persistent layer and make it easy to work with. It is enough to describe the entity models and their relationships as code and the ORM builds the database tables and relationships between them.

The hierarchical relationships of the users (content creators, consumers etc.) and content (course, chapter, subchapter, article etc.) were implemented using many-to-many self-references relationships in the persistent layer of the SQL database. The relationships between the content creators is implemented using many-to-many self-referencing relationship into SQL database. This approach allows maximum

flexibility, but introduces complexity in the implementation. The levels of parent-child relationships are unlimited.

The implementation of the model with the help of RADWIS modules proved to be sound, stable, fast and reliable. The prototype was built very quickly and easy with the RADWIS modules. It proved that the concepts of the HLMS model can be implemented very easy in a real live application. The prototype can be used for performing different experiments and conducting data for usability and efficiency.

4 Conclusion

The proposed model of HLMS was used for building a real world web-based multitenant business applications. The positive response of the business owners and learners is a good indication for the usability and efficiency of the model. The model helps to bring the insurance industry business to a new level. The implementations are done using PHP and MySQL, but the model is not limited to using only this technology stack. As a feature work other technology stack can be used to implement and test the model and the model can be enriched with other functionalities and modules. The prototypes can be used for conducting different experiments on the effect it has on the insurance business. The implementation of the model has been tested in the real insurance agency with hundreds of agents. It performed very well and the increase of the sells proved the concept.

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6 Authors

Stoyan Cheresharov is an assistant professor at the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski", Plovdiv, Bulgaria (email: cheresharov@uni-plovdiv.bg).

Hristo Hristov is an assistant professor at the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski", Plovdiv, Bulgaria (email: hth@uni-plovdiv.bg).

Veneta Tabakova-Komsalova is an assistant professor at the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski", Plovdiv, Bulgaria (email: v.komsalova@uni-plovdiv.bg).

Veselina Naneva is an assistant professor at the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski", Plovdiv, Bulgaria (email: vnaneva@uni-plovdiv.bg).