Implementation of Digital Visualization Tools in Education Concerning Business Process Administration

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Abstract

The integration of innovative technologies, such as digital twin one, is directly contributing to the evolution of the educational system, enables students to practice and learn them in an inclusive way of all areas, one of which is in the business sector. This study helps students in the field of education for the administration of business processes, enhance curriculum and increase faculty competency to the proper level with state-of-the-art technological developments with help of Digital Visualization Resources. On the other hand, enterprises should gain the competitive edge in the current dynamic marketplace by enhancing customer satisfaction, reducing costs, and increasing efficiency through the integration of digital technologies. Furthermore, such technologies make the learning process easier, interactive, interesting and more efficient than any form of traditional learning methods by creating customized content for the students as well as meeting of their specific needs and skills in the administration of business processes.

Keywords: *visualization, 3D technology, education, digital, enterprise, business process*

1. Introduction

Nowadays digitalization is a contemporary term that has become part of the field of business and education in Universities, as well as in our thinking and daily life.

In general, digital twin technology has the potential to completely change sectors giving the ability to better comprehend, monitor and improve their digital processes and physical assets.

On the other hand, academic programs related to business processes must progress in conjunction with technological advancements in the business sector.

An in-depth analysis of the applications of 3D digital technologies in the humanities is given by researchers, taking into consideration user communities, scenarios, technologies, infrastructure, design, maintenance, and educational initiatives [1].

The significance of 3D modeling as a novel strategy for developing an interdisciplinary learning model has been

emphasized by the researchers. In addition to generating questions on education, science, art, STEM, and 3D modeling, they have demonstrated how to create a 3D model for educational use. The purpose is to highlight how 3D technology may be integrated into learning environments in order to assist students develop important skills and information [28].

In order to provide innovative and enhanced learning experiences in various circumstances, academics and researchers have employed a variety of adaptable 3D environments in recent years. Nonetheless, little is understood about the components of adaptable 3D environments that support learning.

Recent papers examine 3D virtual learning environments as a topic that is dynamic and in need of more research, with promising findings pointing to the need for more study in this area. [28], [29].

Let's have a look at some occupations from various disciplines [30]. They adapt 3D technologies, which use the software for different issues, such as:

- A 3D designer produces visual representations of three-dimensional objects, such as models, animations, or tangible goods.
- 3D video game characters and environments are made by video game designers.
- A technician specializing in 3D printing creates files and keeps equipment in working order.
- A graphic designer produces three-dimensional ideas, including graphics, product renderings, and logos.
- A 3D animator crafts 3D animations for movies, video games, and other uses.
- An architectural designer creates plans for buildings and landscapes.
- A web developer integrates many aspects, including 3D images, into webpages.

Although the results are important for 3D technologies across all disciplines of humanities, the focus of our work is on modeling structural objects through interpretive approaches to better business process management with the use of modeling. Nevertheless, the 3D technology implemented in this project can be very easily adapted and scaled to different contexts and disciplines, to comply with different levels of education, diverse categories of students with many differences between them (cause of age groups, cognitive development, learning styles, motivation, social development etc.). This is can be achieved by creating fully customizable models in 3D, which can be tailored to match curriculum requirements and individual learning styles, providing personalized learning experiences.

The development of teaching strategies supported by technology and/or ICT tools can use the 3D Enterprise Digital Visualization (3D EDV). The main purpose of using the 3D EDV for students is its impact in the field of education, training on business processes in a company, and as a consulting and monitoring tool as well for the maintenance, analysis and business intelligence of companies or institutions.

This study uses as case study the enhance of the program at the Aleksander Moisiu University of Durres, Albania (UAMD). It is in continuous efforts for implementation of innovative technologies in the academic life, as well as the improving of the curricula with the demands of the market.

UAMD and Crystal System are collaborating institutions. The partnership between the institutions has improved the scientific research infrastructure by helping to set up information technology laboratories. Also, through the cooperation of the institutions, several weekly free trainings were organized for Faculty of Information Technology' students in the ABAP-JAVA courses. Students can grow as digital specialists and learn the fundamentals of IT from real experts with their assistance.

"Administration of business processes with Enterprise Resource Planning" is one of the courses offered in the Professional Master program. In this course, students learn about enterprise systems, key business processes, how to use SAP ERP effectively, how to gather the data needed for each process, and how to integrate these processes. In the practical aspect, students connect theoretical knowledge with the implementation of 3D technologies for the visualization of business environments.

Manufacturing, retail, and other sectors of the economy could all undergo radical change if 3D technologies can manage company processes. Let's mention the various ways in which these technologies can be utilized [12].

Supply Chain Visualization refers to the ability to see the complete supply chain, from identifying raw materials to delivering finished goods, using 3D modeling and simulation. This enhances overall efficiency by locating bottlenecks and optimizing logistics [6].

Developing deeper insights into a business's operations is possible for enterprises through the application of 3D visualization techniques in *data visualization and analysis.* This involves using geographic data analysis and spatial visualization techniques for illustrating trends in sales and market segmentation.

Distant Cooperation and Communication in other words, 3D technologies enable remote collaboration through the ability for team members to engage in real-time, remote collaboration with virtual models and prototypes, regardless of their physical location. For multinational groups in particular, this improves communication and decision-making.

Digital Twins for Asset Administration, which is meant for creating virtual versions of physical assets, digital twin technology helps companies to forecast maintenance requirements, improve performance, and enhance operations in real time. By being proactive, downtime is reduced and asset lifespan is increased [5].

2. Materials and Methods

The students of the Professional Master's program in planning business processes develop the course "Administration of business processes with ERP". After they get knowledge about all business processes, their management, creating documentation for each process based on structured data, they must implement these processes, which can be later visualized in the 3D environment. Implementation of 3D Enterprise Digital Visualization in the administration of business processes has been developed through software programs, created by Crystal System.

These programs are mainly designed to be utilized by huge businesses that struggle with the organizational structure throughout, particularly when those businesses have offices spread throughout multiple cities. We can use Google as an example, which has offices across multiple nations and struggles to manage areas, software, accounting, human resources, and who is in charge of each department and what tasks they have to complete. As a result, the larger a company is, the more challenging its management becomes.

Let's define 3D Enterprise Digital Visualization (ED EDV) and discuss how it helps students become more proficient in real-world situations.
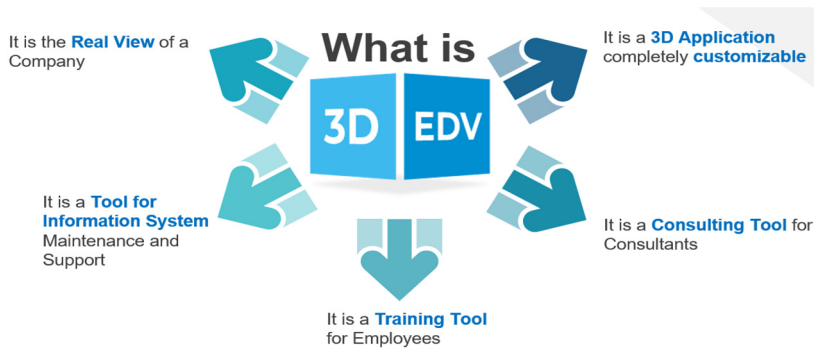

Figure 1. Conception of the program 3D EDV [3]

The goals of the program 3D EDV are:
- Education and training

Businesses frequently circle their workforce, thus every new hire needs to go through orientation that covers the internal organizational structure, job duties, reporting lines, etc. Everything is manageable with this program because it makes it extremely easy for new employees to understand the hierarchy, personnel organization, etc.

The structure of an organization or university can be simulated by the 3D software. It is possible to model business operations in real time, providing students with the necessary training for when they join the workforce [9].

Thus, the expense of staff onboarding and training was decreased through the use of the 3D program [17].
- A consultation tool

As a tool for consultation within each institution, compiling the software is increasingly crucial.

A straightforward overview of all procedures is required, including the location and necessary steps for employers and students [23]. This provides an easy-to-read summary of the duties assigned to each job and how each was completed. These need to cope with important issues including how to improve production, quality, employee and customer pleasure, etc.

In addition to improving space optimization, the 3D EDV program reduces building management expenses.
- Maintenance

Each business needs to produce reports by documenting its distinct framework [27]. In order to make appropriate decisions for maintenance or enhancements in real time, managers must be aware of the current state of operations when they want to implement adjustments or enhance the Hardware / Software side. Therefore, it is important to highlight

that using the application decreases user support and maintenance costs.
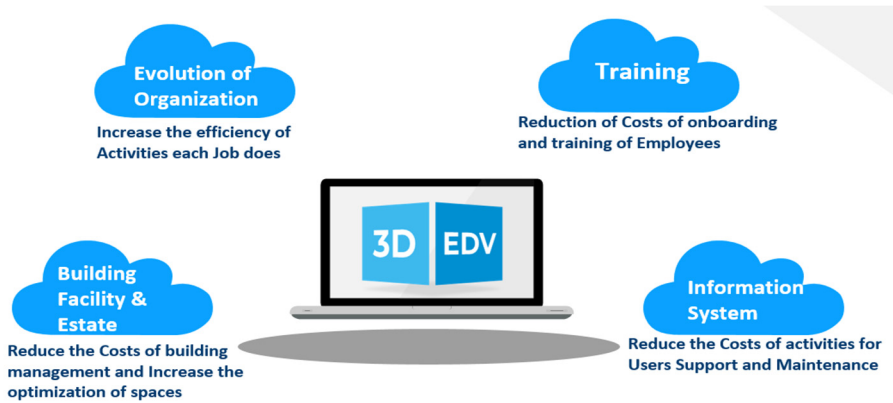The using scope of the 3D EDV program can be summarized as in the following figure (figure 2).

Figure 2. The SCOPE of the APP [3]

The program has two parts:
- 3D - the client
- CMS where the data are normally sent to an online server.

A structure can be created depending on the specific needs and then visualized in 3D, the client can be online and accessed through a link or can be static and the program can be installed and used without the need for the Internet. In terms of structure, the program presents both the physical side and the logical side.

The physical side can be presented with the necessary details of the company and the structure, floors, offices, rooms, people for each office. The physical side can be created in the program, but can also be done by AutoCAD.

From a logical point of view, it is possible that we put several tables in each room, for each table several posts, each post we associate with a task. For example, on the third floor (figure 3) there is a person, who deals with security and this place can be associated with the person's task, such as the installation of Software, Hardware or security devices. It can be the part of network installation, repair, connecting of the printers or other equipment, and it depends on the complexity of the IT processes. This is how we connect the physical structure with the logical one, that is the description of the organizational side of the institution or company. Each of the dates, positions, processes have a series of details that can be placed in the description system at several levels. The detailed description of the company can be placed as external materials such as audio, video, etc. They are a very good form of maintenance, in case if something needs to be changed, you need to know the current situation to change it, so by putting all these into the program you can make the process of evaluating and maintaining the company simpler.

Figure 3. A part of the space taken for study

As we navigate each level, the job titles and their physical aspects are displayed, along with a thorough description, the education and training requirements based on data, IT systems, and the names of the accountable individuals for each role that are kept on file on the server.

Let's see some characteristics of the 3D visualization method versus other data storage methods.

- Text data is boring, monotonous, and not very practical for finding information; a company or university would need several programs to view the data, but 3D visualization is just simply
- The Unity game program supports visualization 3D, which allows for the creation of 3D graphic interface structures.
- Metaverse is a technology that converges the actual and virtual worlds, using AI based on the complexity of the organization or enterprise.

We have interactive navigation; we may utilize the mouse or voice commands to navigate across the floors. We can examine an overview of all of the company's processes even if we are uninformed of the specific details. We can utilize brief overviews from the documentation in each one, but it may also come in the form of text, audio, video, or manuals.

Virtual assistants that implement machine learning can be interacted with, and as a result, over time, their responses will become more knowledgeable and precise. Everything may be modified, removed, or reset, and the application is more user-friendly because everyone can see their own business without interfering with one another. The server is used to carry out this. In order to make learning fun and engaging for both employers and students, the program is designed to resemble a fun game with attractive outcomes.

The system has a virtual assistant and a ChatGPT that can answer from outside (from the internet) or inside. We can also use the system in different versions. If a new version cannot bring what we expect, we can go back. So we can create different versions. The application can be combined with other mining system applications.

3. Results and Discussions

To enhance their skills, students should become more proficient in using 3D technologies. As part of a project organized together with Crystal System, a group of students from the Professional Master ERP program, had to represent an area of the University of Durres' surroundings in three dimensions using the 3D EDV program and the following roles were the primary focus of the actions to be implemented:

- Information Technology
- Plant Maintenance
- Research & Development
- Sales / Customer Service

-   Finance
-   Material Management

They had to define the jobs for each of the above functions; tasks associated with these jobs and add information like description, documents, as well as define the workflow of tasks for each process.

After the project was finished a survey was done to understand the students' feedback on using 3D technologies as a learning tool for the management of business processes [7]. Below are the results based on the students' evaluation (during the academic years 2021-2024) of the use of 3D modeling as an interactive tool to ease and enhance their learning process (Table 1). There were in total 26 students (number is limited because of the number of students attending the Professional Master ERP program) and they have been asked to answer the following questions, in order to understand their approach of using 3D models and their satisfaction to this technology:

1. Did you find 3D modeling difficult?
2. Did you find 3D modeling more interesting and fun than conventional methods for the administration of business processes?
3. Did it help you to better understand the learning concepts?
4. Are you interested in continuing using it?
5. Do you prefer it in comparison to traditional learning methods?

Table 1. 3D modeling survey

Students	Did you find 3D modeling difficult?	Did you find 3D modeling more interesting and fun than traditional methods for the administration of business processes?	Did it help you to better understand the learning concepts?	Are you interested in continuing using it?	Do you prefer it in comparison to traditional learning methods?
26	Yes-6 (23%)	Yes- 25 (96%)	Yes-22 (85%)	Yes-23 (88%)	Yes-22 (85%)
	No-20 (77%)	No-1 (4%)	No-4 (15%)	No-3 (12%)	No-4 (15%)

Based on their answers to these questions, the results are as follows (Figure 4). Around 85% of students find the 3D modeling useful to help them better understand the learning concepts of their specific subject (management of business processes), while only 15% of them did not see any benefits of using this technology to enhance their knowledge. Also, regarding the difficulty of using the 3D models and visualizations 77% of the students had no problems with it, while 23% of them think that this method of learning has some difficulties. Nevertheless, around 88% of the students are interested to continue using this technology, despite some initial difficulties. Also, it is important to mention that nearly all the students (96% of them) find the 3D visualization and modeling more interesting and fun than traditional methods, through interactive learning. Around 85% of the students confirmed the preference of using this technology instead of traditional learning methods through theoretical lectures and textbooks.

Figure 4. Results of the questionnaires

If we also consider the gender of the students, the percentages are generally similar for both genders with minor differences (Table 2). So, for both genders the 3D modeling technology has almost the same interest and both genders (100% for males and 93% for females) find it more fun and interesting than traditional methods of learning (Figure 5).

Table 2. 3D modeling according to different gender

Gender	Did you find 3D modeling difficult?	Did you find 3D modeling more interesting and fun than traditional methods for the administration of business processes?	Did it help you to better understand the learning concepts?	Are you interested in continuing using it?	Do you prefer it in comparison to traditional learning methods?
Male-12	Yes-3 (25%)	Yes-12 (100%)	Yes-11 (92%)	Yes-11 (92%)	Yes-11 (92%)
	No-9 (75%)	No-0 (0%)	No-1 (8%)	No-1 (8%)	No-1 (8%)
Female-14	Yes-3 (21%)	Yes-13 (93%)	Yes-11 (79%)	Yes-12 (86%)	Yes-11 (79%)
	No-11 (79%)	No-1 (7%)	No-3 (21%)	No-2 (14%)	No-3 (21%)

Also, apparently both genders faced similar levels of difficulty while using the models (25 % for males and 21% for females). On the other hand, there were some bigger differences regarding the utility of the tool, where around 92% of male students find the 3D modeling useful and helpful to better understand the learning concepts, whereas this percentage was much lower for female students (79%).

The study found that male students were slightly more interested to continue using this technology (92% of them) compared to 86% for the female students. Also, the percentage of male students who would prefer the 3D modeling and visualization instead of the traditional learning methods is higher (92%) compared to 79% for female students.

The results of the questionnaires based on the gender are shown below in figure 5.
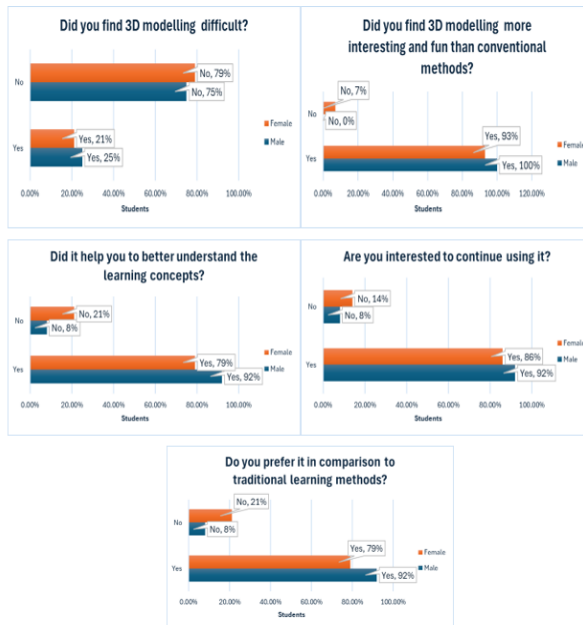

Figure 5: Results based on gender

As part of this study a target group of university students were chosen each academic year, divided into two groups and were trained to build and use simple 3D models, as part of "Administration of business processes with ERP" subject in the Master's ERP program. After that the students were asked to fill a questionnaire and based on their feedback, we can

conclude that most of them find the use of 3D models useful to manage and administer the business processes and to help them enhance their learning outcomes. Even though a small percentage of them faced some difficulties in using this technology, still they are more than motivated to continue using 3D modeling and visualizations. If we take into account also the gender of the students who took part in this study, we can conclude that in general both males and females have responded in a similar way, with a subtle distinction in interest and preference of male students who tend to like this technology a bit more than female students, to use it as a helpful tool to enhance their learning process.

4. Conclusion

The digital twin technology in general and the application of 3D EDV particularly, impact on the evolution of the organization increasing the efficiency, reduction of costs, raising the optimization space, and training of the employees.
On the other hand, the implementation of such technologies in Universities increases academic capacities, improves the infrastructure of scientific research, enables students to use contemporary methods in the administration of business processes and prepares them with the right vision for the international labor market.

To summarize, we can say that 3D modeling offers several advantages like accessibility for everyone, a hands-on learning experience, a very high customization with easy to build models to satisfy various students' needs, more engagement and motivation from the students, an improved comprehension of complex concepts and great interactivity through a dynamic gaming approach. And most of these advantages were confirmed from the feedback of the students who tried the effectiveness of 3D modeling in the learning process using the 3D EDV program created from Crystal System. Of course, in order to get a better and fuller understanding of the effectiveness of the 3D modeling in education and to gain a more comprehensive insight on this technology, a deeper study with improved models which includes more students and other important actors (parents, teachers etc.) from diverse categories, is needed.

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