

MODELLING ICT SOLUTIONS FOR THE DIGITAL TRANSFORMATION OF EDUCATION

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Abstract: *In the current economy it is difficult to identify an organization that does not use any ICT system in its daily work. Our study focuses on the implementation of a project of solution applicable in education. Regardless of the scope, education or business, the development and implementation of information systems aims at organisational transformation involving the introduction of new processes and the elimination/modification of existing processes in the organization. In the process of shaping an ICT solution, it is essential to identify the requirements of this solution that meets the needs of users, i.e. prior to modelling, it is necessary to know as thoroughly as possible the users and the processes in which they are invoked because the modelling of ICT solutions involves the identification, simulation and testing of processes regarding human-application-human. In the process of digital transformation of education as well as in other digital transformation processes, at some point the problem of reskilling users/stakeholders is attained. In this phase, discrepancies often arise between categories of users who understand and accept the transformation process and those who do not understand or do not want to make extra effort to understand and accept the processes in which they are involved.*

Keywords: *E-Learning Management System, ICT modelling, Digital Transformation.*

JEL classification: *I21, M15, O33.*

1. Introduction

The content of this study comes from the authors' recent experience of implementing an E-learning system that includes three main parts: User Experience Design – UX, User Interface Design – UI and a part more related to human behavior Users Training process.

All these parts are necessary in every ICT solution implementation and the modelling of this stages are the main task of project team. The aim of this article is to show few practical steps that project team followed during implementation of an ICT solution for E-learning to serve as model for those who meets this kind of challenges.

The leading objectives of our practical oriented study are to implement a feasible solution in a short period of time based on a agile project management approach and to emphasize the importance of modeling scenarios using the most recent modeling technologies in order to achieve the best user experiences.

In order to successful implementation, project team involved tools and practices used in developing of software applications and used an agile management approach and knowledge sharing methods.

2. Background and Context

Nowadays, the importance of technology applied in education are more and more visible. The potential of technology-enhanced learning nurtures the potential for more substantial transformation (Flavin, 2017), this usually make a big difference in the adaptability of education organizations to changes surrounds it.

Regarding our study, to understand the advantages and contribution of modelling process regarding implementing ICT solution, first we must clarify what steps and elements include it. The ICT system modelling process can be link with business process modelling because in both cases implies actors, processes and flows, variables etc. A

business process modeling application requires the ability to design, run, manage and monitor processes that incorporate interactions between the system and humans (Havey, 2005). Also, these elements are available for ICT system modelling process. However, this modeling effort begins with identifying the concepts to be represented (Weske, 2007).

The model of an ICT solution usually reflects a deep understanding of the whole project and this is possible by involving different categories of developers. Phases needed to be achieved by them are:

1. Identifying and understanding of user's needs, what are their possibilities and level of digital skills related to solution developed.
2. Identifying the main functionalities of the ICT solution which respond to users' needs detected in first phase and are realistic from developers' point of view.
3. Developing a user-friendly design and methodology (alternative use cases can help);
4. Provide training for users if needed, to ensure fluent using of all facilities which offer the ICT solution.

So, beside of each of this step regularly is a high skilled expert which can apply agile work style and specific methods and tools.

Developers of advanced ICT and graphics systems, 3-D printing tools, or consumer products recognize that their success depends on the construction of effective user interfaces-UI and the creation of appealing user experiences – UX (Shneidennan and et al., 2017). Regarding UX modelling, it can include two phases mentioned above: 1st could be represented by UX Research-UXR and 2nd phase by UX Design – UXD (Stull, 2018).

What a good UX means? (Stull, 2018)

- Effective UX design and research saves time and money
- The conflict between what we sense and what we perceive lies at the core of user experience.
- Effective UX anticipates events a user may encounter and is more than a summation of features.
- UX translates business, marketing, and technology solutions into meaningful experiences for users.
- Effective UX fulfills users' needs and serves them.
- Storytelling and UX share similar inductive and deductive arrangements.
- Early UX activities, such as research, are often intangible to novices
- UX is in a constant state of change.
- The potential for both good and bad UX is built into every product, service, function, interaction, and piece of content.

While a UX model reflects back-end flow of the system and responds to the main problem of the users through functionalities of ICT system developed, UI model represent the specific wishes of the users-developers, how responsive is the content and aims to deliver a user friendly solutions to them. Usually, User Interface model is defined by three ingredients (MacDonald, 2019):

- A named solution describing what the pattern does – how easy users understand and use the ICT Solution/Idea developed?
- The problem the user is facing or why this pattern is needed – how well/efficient solution solves the user's problem?
- The context for when to use the pattern – if users reached maturity to use the solution?

As we see, UX and UI model are very close to each other and combine similar elements in both cases and an ICT solution can't be developed by one of this. Here comes

another big task, communication between project team: UX designer, UI designer, project manager and for sure involving of users (in research phase and feedback collection phase).

One of the software tools used in implementation process design was Scene2Model application. The application provides users with a digital design environment that addresses relevant aspects of design thinking that companies can download for free and use to experiment with their innovative ideas, for example by linking them to business processes or other company-specific elements. (DIGITRANS PROJECT, 2019b) Scene2Model provides a process for transforming tangible figures into digital models / diagrams, with the possibility of simultaneous semantic enrichment with new objects for modeling (Miron *et al.*, 2018).

Regarding training and support of the users, project team took in account many forms of knowledge transfer to and between users. As in the case of many other ICT solutions, knowledge transfer methods must be as close as possible to user's familiarity and understanding. This is the main argument, why the project team decided to create video tutorials with verbal explanations and digital documents with instructions and print-screens. Nowadays, disseminating knowledge in general are shaped by the interaction of three factors: resources including technology, the nature of knowledge, and the method for managing it (Moodie, 2016).

3. Research Results

Our case study reflects UX design and UI design regarding implementation of E-learning system in University and additional phases regarding these two main steps. As we mentioned before, each of this element include a research component. First, any organization that intend to implement an ICT solution must ensure that have capacity from human, financial and technical perspective. In our case, all these conditions were ensured, and implementation process begins. ICT infrastructure was supported by existed database of users.

As was mentioned above, project team member used Scene2Model application which offers large possibilities in modelling of business and ICT processes. This tool includes characters (actors), ICT equipment, different backgrounds, furniture, processes and types of relations between elements. Annex 1 represent the application interface with modelling elements.

In figure 1. below is represented the process of updating organizational ICT infrastructure and how it was adapted for E-learning system. First, we have to argue that existing database of users was very helpful and moved a step further project team in preparing infrastructure.

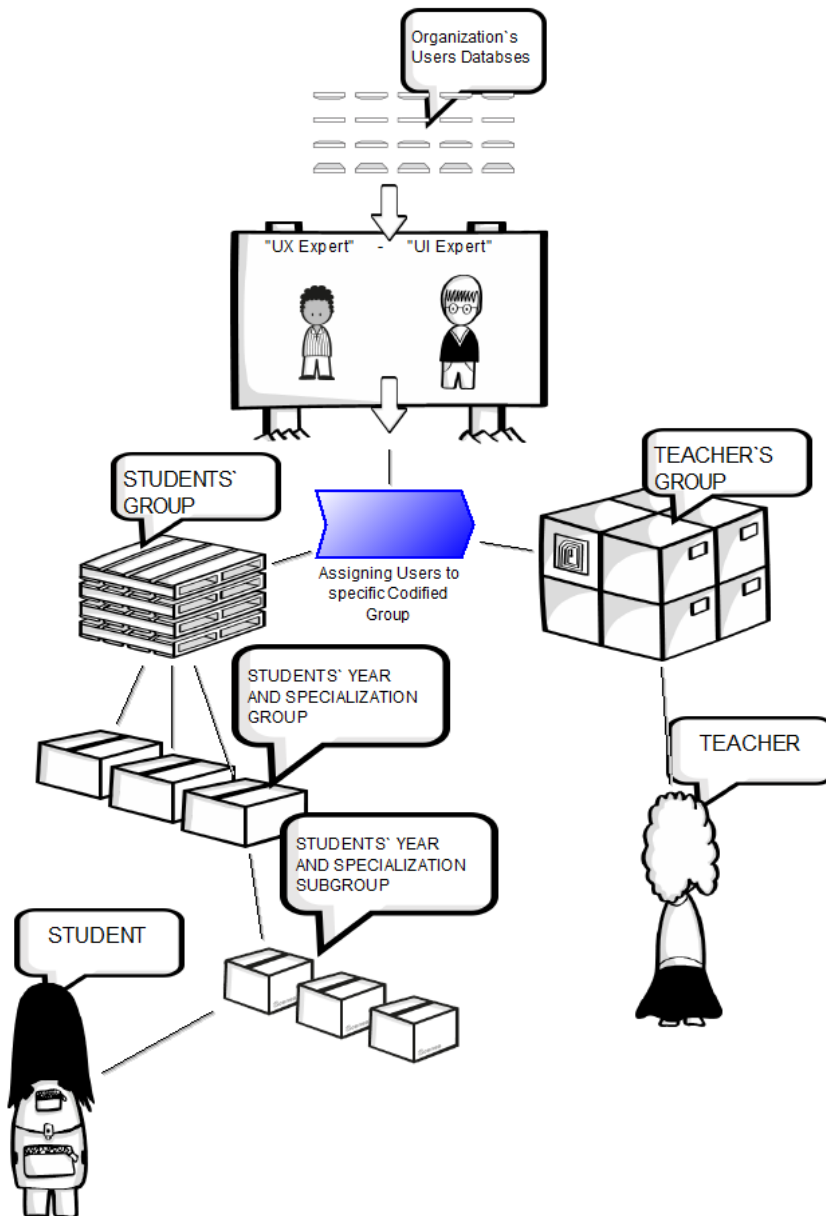


Figure 1. Organization's ICT infrastructure Update

As we see in the figure 1. UX and UI experts which are also the IT admins of organization, divided users in two main groups, teachers with full access and rights and, students with limited rights to E-learning system. Students was assigned to a specific codified groups and subgroups which ensured an easy way to add them to classes by *specialization/admission year/Group or Subgroup*. This way of codification helped teachers and admins to manage databases and processes related to learning activities.

In Figure 2. we represented an overview of the whole process of implementation of ICT solution. This process was divided in two phases, first include research on users needs and their competences and UX design to ensure a deep understanding of what they expect and what are they able to do to support this process. Second phase included UI design and training, support and feedback from users.

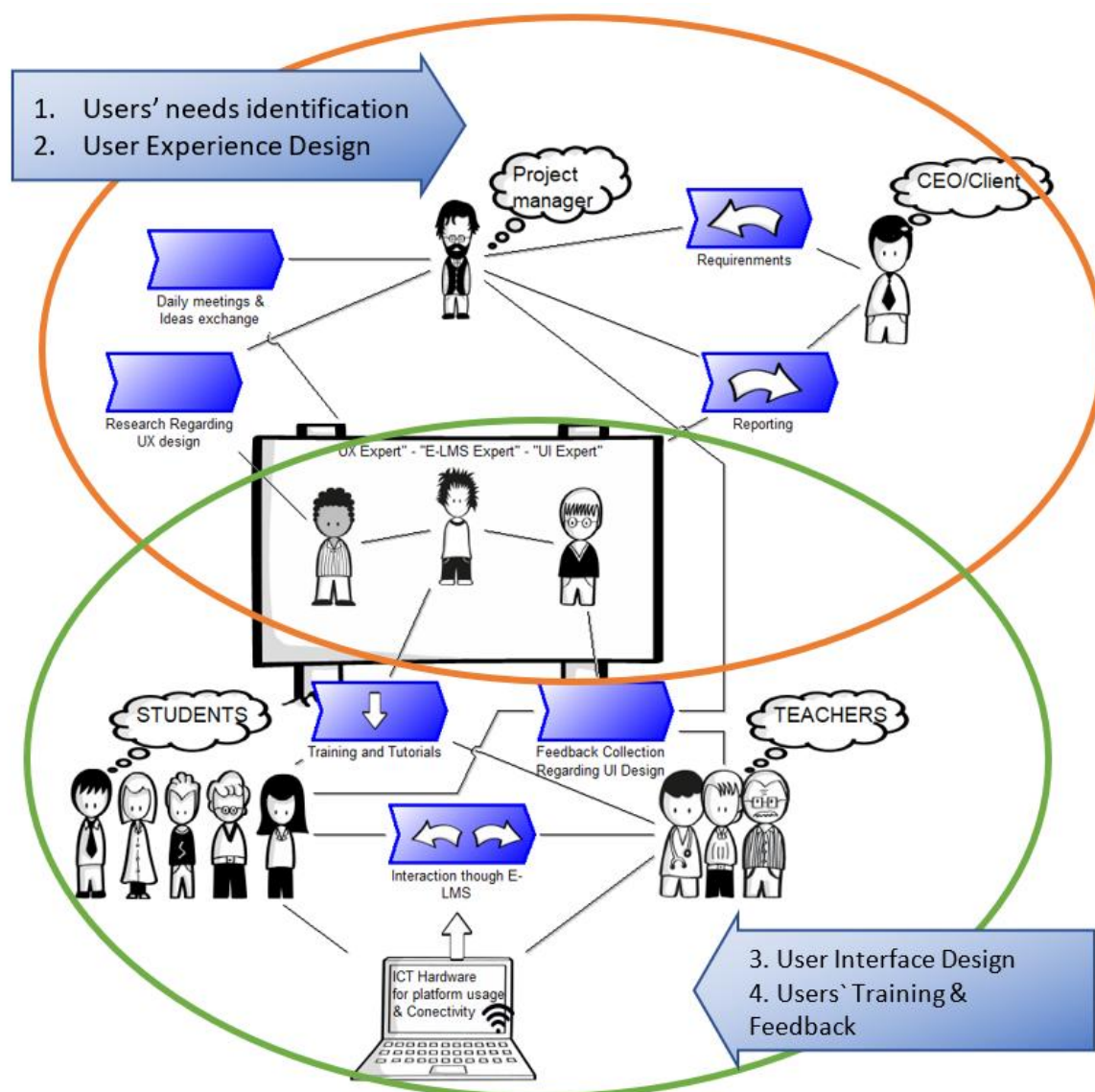


Figure 2. Overview of E-learning platform implementation

In a detailed approach, this figure represents following activities what lead the project team to a successful implementation of ICT solution for digital transformation of education:

1. Users' needs identification – this task was done by project team with methods as *Persona* and *Customer Journey* (DIGITRANS project, 2019a). This helped project team to identify what categories of users are in organization, how well they are prepared for digital transformation. Identifying needs by this method helped project team to anticipate users' behaviour during implementation process.
2. User experience design – using analyses from first step was developed main functionalities and flows which solve needs of users as teachers and students regarding E-learning platform.
3. User Interface design - at this stage the standard E-LMS was personalize for users from organizations, this includes: own terms and polices, adding Logo of institution in header of the platform and backgrounds used in online conferences, personalized tutorials and other training materials with watermark of organization, personalized templates for teachers to create learning materials for students.

4. Users` Training & Feedback – this was the most intense part because the system was implemented in the multidisciplinary organization. Training and tutorials must be adapted to all fields of study and consider at least the most important exceptions. This activity must continue long time after the implementation is done, therefore we would like to add more details regarding this process.

The project team used the ICT solution as a collaborative platform and for users` training. In other words, it was organizational collaborative learning platform which offer the following possibilities (Tatnall, Osorio and Visscher, 2005):

- Technologically mediated dialogue channel
- Shared workplace for a group
- Personal workplace
- Learning materials/ learning tools
- Analyzing tools of data/information
- Repository/memory for data/information
- Reference channel for the collaborative repository
- Modeling tools for monitoring the process

In the figure 3. below we represented the cycle of knowledge creation process regarding implementation of ICT solution. In this stage we include as main actor the E-LMS expert because he played the most important role in this process. Usually this process starting with Socialization represented in the figure, but we would like to start with Internalization phase of knowledge creation process.

- The **internalization** process is the moment when E-LMS expert gets in touch for the first time with this kind of platform and transform explicit knowledge provided by developers into tacit knowledge by experiencing and discovering step by step the platform`s possibilities applied in his own workplace.
- The **socialization** process begins when E-LMS expert involves his colleague to the working methods discovered, in this case, they are applying *learning by doing* principles and tacit knowledge of one person becomes tacit knowledge of his workmate.

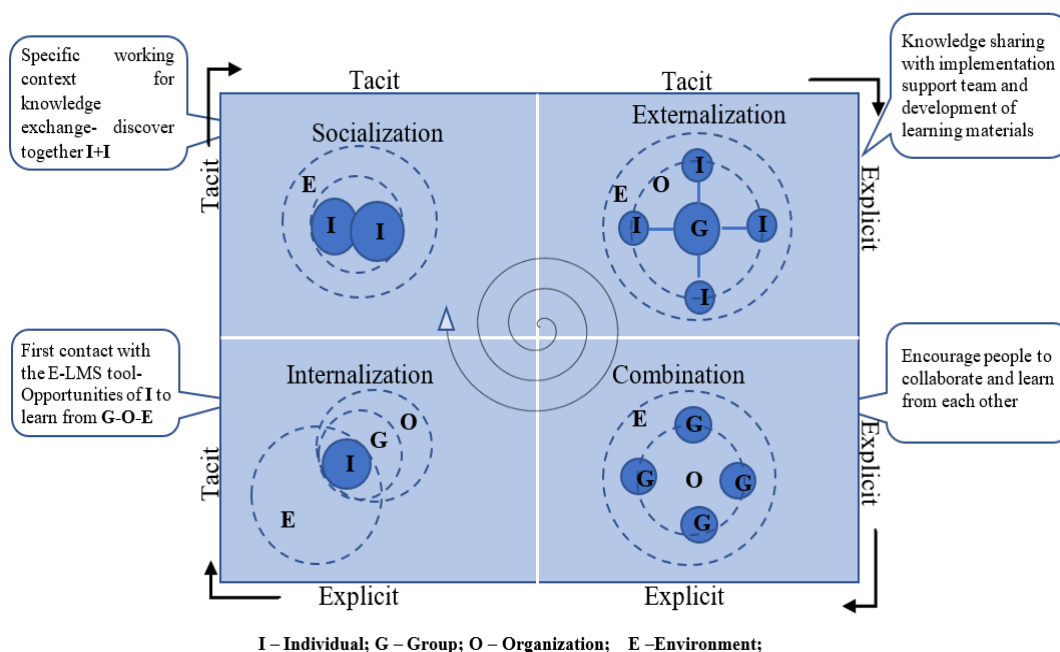


Figure 3. Knowledge creation and users training process explained by SECI Model

Source: Adapted from (Nonaka et al., 2008, p. 19)

- The **Externalization** process started after project team was created which consist of project manager, UX and UI experts and E-LMS expert. In this phase team members putted together their knowledge (tacit and explicit) and experience to deliver training materials for users. As we mentioned above, to cover all users' learning need, project team decided to produce video tutorials explained by experts, digital documents with screenshots and common training sessions.
- **The Combination** process started when was created an online group with users which serves as a knowledge exchange platform. In this way was discovered and solved many issues from users and implementation team perspective. Users started to collaborate with each other and discover together the best functionalities of the platform which solve their problem. From this point could start another cycle of knowledge creating process in organization.

The implementation of an E-learning platform, from an organizational point of view, is resources consuming process: human, financial, or time resources. Like any investment, this could bring profit or loss. Good planning and modeling of processes could help to avoid failure and bring a huge advantage to the organization.

3.1. Risks

As any transformation process, even digital transformation, presume organizational or/and human behavior change, the challenge of this step was high level of tacit knowledge involved in the process. Teachers, as a category of users, are high skilled in their domains of activity which makes them to own high level of tacit knowledge which a very difficult to change and replace. This could category of knowledge usually manifested in the way you teach (learning methods you are an expert), personal relationship with students, the way you organize yourself, etc. Rejection of changes (in our case the E-learning platform implementation), comes from very high skilled users which did not accept the transformation and did not put effort to change/adapt a part of their tacit knowledge.

4. Conclusions

An inadequate usage of E-learning platform implemented could make users' daily work more difficult than it was before implementation. Is more important to do the right things in the right way at the beginning, therefore usually developers phasing the processes, on one hand, implementation process, and on other hand users' training process and support.

UX and UI models could be continuously improved, as users' needs and wishes will change by the whole implementation process. In this context, we prove that UX and UI model is built into every product, service, function, the interaction of user-system-user, and every piece of content that users can view and interact.

To ensure continuous improvement of UX and UI model, project team must apply an agile management approach because they had limited time for implementation, limited users' competences, many exception to which platform have to respond, requirements for project team to measure the progress and ensure sustainable development of E-learning solution. The platform implemented was very helpful in users' training and support. SECI model helped project team to structure the knowledge creation and knowledge sharing process through whole organization. This facilitated learning through collaboration and gave users a chance to discover functions by themselves which ensured better adaptation to each field of study (each exception required from users).

Our study is a part of a broader research approach that we intend to continue and to develop case studies scenarios in a comprehensive manner giving us the possibility to map the processes from the ICT knowledge management perspective.

Annex 1. Scene2Model application interface with modelling elements

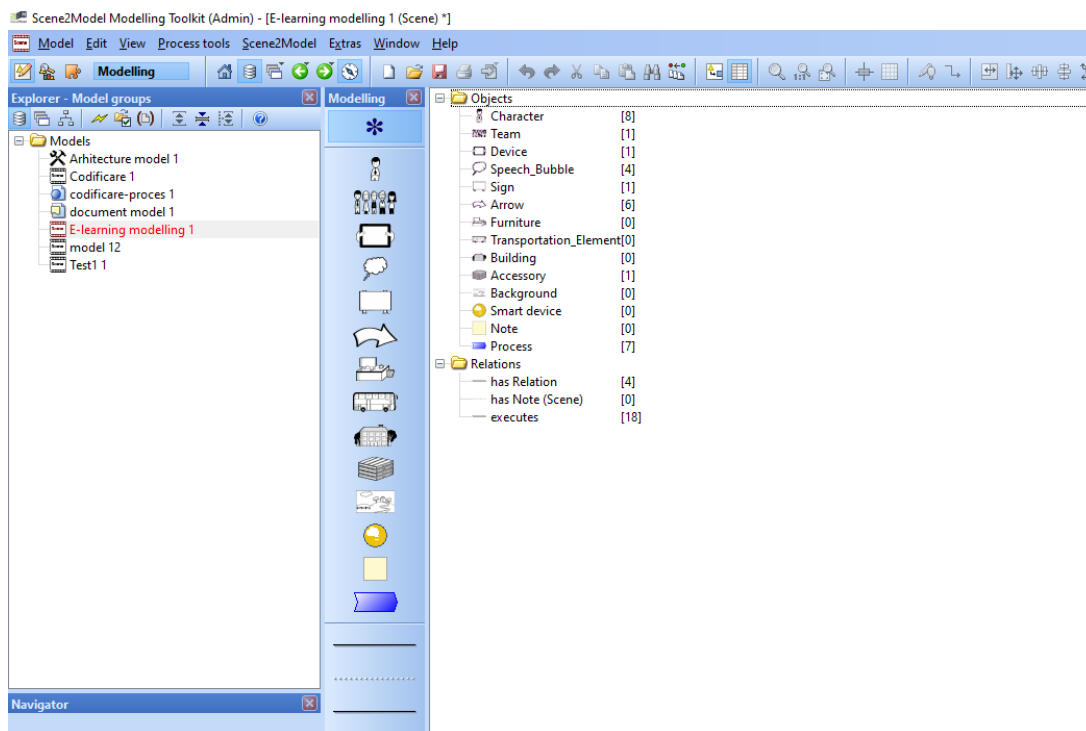


Image 1. Scene2Model application - general overview

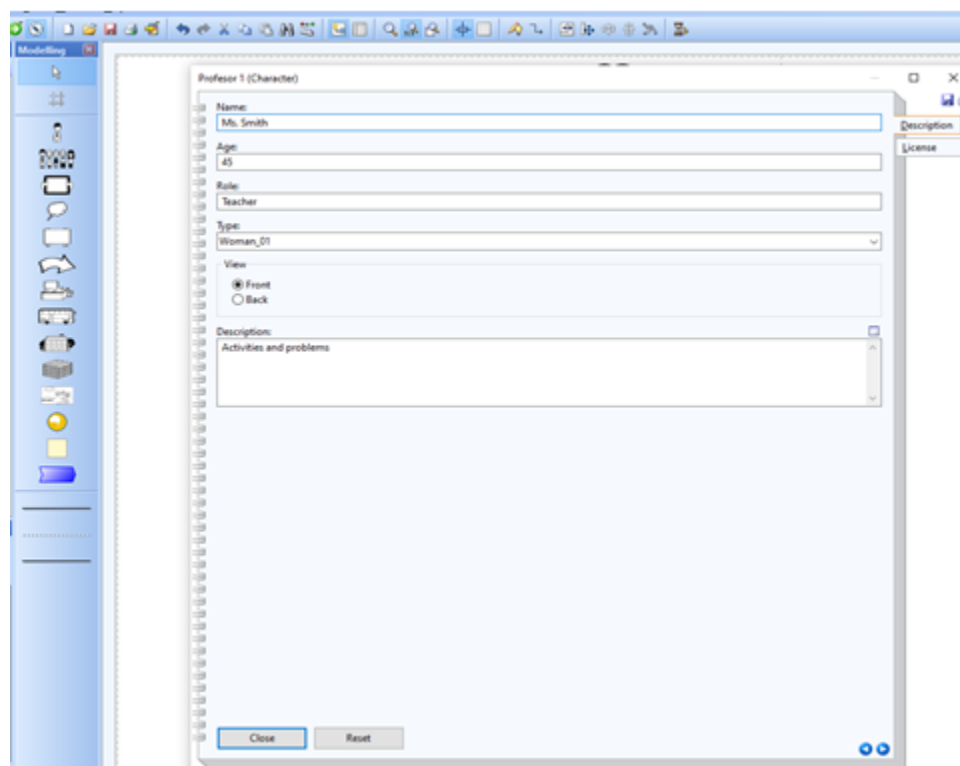


Image 2. Scene2Model application - character overview

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