Using i* to Understand the Domain of Video Tutorial for Online Training*

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Abstract. Educational videos are massively used in e-learning, while their adoption in professional training as a complement to class sessions needs more careful evaluation.
We are investigating opportunities and challenges to use video tutorial for continuous training of professionals in emergency management in the context of an industrial project, called ELEVATE. The final goal of ELEVATE is to develop a novel tool suite for authoring and managing video-based training exercises.
In this paper, we present a goal-oriented analysis of this domain, which helped us to define the authoring methodology that complements the ELEVATE tool suite.

Keywords: Goal-oriented analysis · Video Based Learning · Distance Learning

1 Introduction

Asynchronous e-learning or distance learning (DL), where students can attend a lecture at their pace accessing online software platforms called Learning Management Systems (LMS) is used pervasively worldwide. Indeed, e-learning is used as a complement to traditional class teaching, as a powerful means to help overcome illiteracy in underdeveloped countries, and as an indispensable approach in crisis situations as the one we are currently living with the COVID-19 pandemic.

Nowadays Video-based learning (VBL) [5] represents a relevant knowledge area in the field of DL. VBL seems to be particularly effective for procedural knowledge learning and training. Different types of video-based material are used in VBL, offering different degrees of interactivity ranging from simple mechanisms, such as video pausing, replaying and rewinding, to more engaging interactions, which are enabled by building videos with a graph-structure where the

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nodes are linked to video-clips and arcs represent the possible choices the viewer can take, and that will determine the next video-clip to be played.

Research in this area includes studies about tool-supported methodologies for authoring video-based material, and especially about assessing the effectiveness of VBL, through the analysis of the huge amount of data that are available from session logs. Focusing on professional training, attention is paid on how to leverage benefits provided by VBL, while mitigating costs of production of good quality material, which is a prerequisite for certified professional training.

We are investigating these issues in the context of an industrial innovation project called ELEVATE (E-LEarning with Virtual interAcTive Experience)[3]. The main objective of the ELEVATE project is to develop a tool suite for creating and managing interactive video exercises for online professional training on Standard Operating Procedure (SOP) [2].

We performed a goal-oriented (GO) analysis of the project's application domain to understand the role of the different stakeholders. In particular, we focused on the main stakeholders involved in the production of video-based exercises and on the management of online training sessions, as well as on the underlying collaborative processes. This has been a preliminary step to elicit key requirements for the *ELEVATE Tool Suite* and its companion methodology.

In this paper we present this GO analysis that we performed using i^* modelling. The rest of the paper is structured as follows. We provide some background information on the ELEVATE project in Section 2, the i^* model of the ELEVATE's application domain is presented in Section 3. Finally, section 4 concludes recalling follow-ups of our goal-oriented domain analysis and pointing out ongoing work.

2 The ELEVATE project

The ELEVATE project aims at delivering tools for authoring and managing interactive videos with a graph-structure for online training. In short, an ELEVATE video contains a number of decision points, shown to the trainee. The trainee's choices (or lack thereof) determine which scenes are to be played. Target users of the *ELEVATE Tool Suite* are the education departments of organizations that have to fulfill obligations on continuous education on emergency management, such as hospitals (more generally healthcare organizations) and civil protection organizations. ELEVATE follows a previous project that explored the use of virtual reality (VR) and "intelligent" behaviours of artificial characters for training purposes [3]. While VR exercises are technically appealing and engaging for trainees, costs and skills required to produce and run them are too high for most purposes and most healthcare organizations.

ELEVATE investigates novel ways to produce and manage training videos that keep budget and technical skills within reach of an average organization, while supporting effective learning of SOPs. Data collected from the logs of online

[3] The ELEVATE project is coordinated by Delta Informatica - https://elevate.deltainformatica.eu/

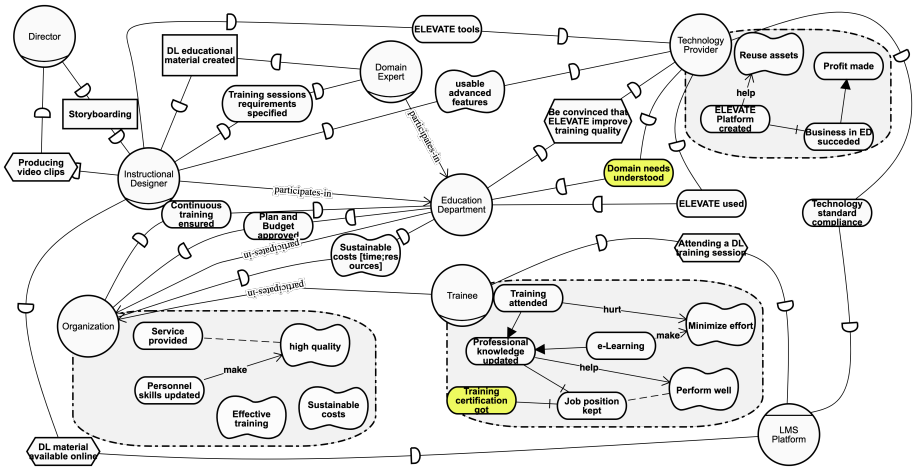

Fig. 1. i^* model of the ELEVATE domain.

training sessions with ELEVATE interactive videos can be analysed to evaluate trainee's behaviours and to elicit requirements for improving the video exercises.

The project is led by Delta Informatica, who plays the role of developer and vendor of the *ELEVATE Tool Suite*. Project partners are: Fondazione Bruno Kessler who acts as a research partner and contributes to the definition of the authoring methodology, as well as to session data analysis; and PHO[4] who plays the role of potential adopter of the *ELEVATE Tool Suite* and contributes with illustrative application cases. For example, the Newborn Life Support (NLS) procedure [2], which is the procedure that professionals, e.g. obstetricians, have to follow for reanimating newborns. The NLS procedure implements the international guidelines proposed by ILCOR and ERC[5] [4]. The NLS algorithm aims at guiding professionals in taking critical decisions under stress. The PHO department in charge of the management of continuous internal education and training of professionals follows an educational approach that recognizes a central role to practical experience that professionals have to develop in dedicated simulation sessions performed in realistic settings. Trainees get a certification upon attending regular training sessions and passing standard assessment tests.

3 Domain analysis with *i**

Goal-oriented (GO) analysis can help understand the application domain by modelling and analysing the stakeholders of the domain, with their goals and

[4] Public Healthcare Organization
[5] https://www.ilcor.org/, https://www.erc.edu/

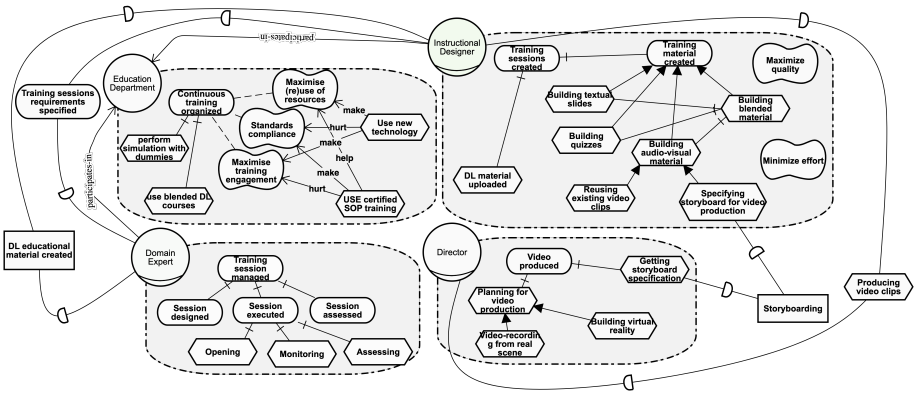

Fig. 2. Key actors: Excerpt of *i** SR models.

their strategic dependencies [6]. We performed a qualitative goal-oriented analysis using *i* 2.0* modelling language [1]. Part of the model is depicted in Fig. 1.[6]

The key stakeholders we identified are modelled as *i* 2.0* actors, with their mutual dependencies, their own goal and quality aspects. In particular:

- the *Organization*, in our case the PHO, that has to do continuous training of its employees, in order to ensure high quality services. In our context *Trainee*s are employees of the *Organization* (see *participate-in* relationship). Relevant quality goals have to be taken into account by the Organization, such as keep costs sustainable in terms of resources needed for continuous training and time that the employees have to dedicate to training sessions. The goal *Continuous training ensured*, and associated quality goals are delegated to the internal *Education Department*, who is responsible to keep them satisfied.
- the *Education Department*'s team includes people playing the roles of *Domain Expert* (DE) and *Instructional Designer* (ID), who collaborate with their respective skills to produce high quality training sessions. In case video-based material is used, the team may need to assign specific tasks to a *Director*, whose role is to produce appropriate video clips.
- the *Trainee*, or Student, who attends training sessions by accessing online training available on an LMS, as well as participating in class training simulation with dummies. Among her key objectives is that of getting a certification upon having passed successfully a mandatory training session.
- the interactive-video *Technology Provider*, in the case of ELEVATE it is Delta Informatica, who depends on the *Education Department* to get the *ELEVATE Tool Suite* adopted. On the other hand, the *Education Department* depends on it to ensure that the *ELEVATE Tool Suite* can help keeping their key goals and quality aspects satisfied.
- the technological agent, namely the *LMS*, which is adopted by the *Education Department*, where the ID can deploy the educational material s/he has cre-

[6] https://www.cin.ufpe.br/ jhcp/pistar/ - we used the *piStar tool*.

ated. The *ELEVATE Tool Suite* has to comply with the e-learning technical standard supported by the *LMS*, such as SCORM 1.2.[7]

Taking the perspective of the interactive-video *Technology Provider*, the critical dependencies that we have to take into account in the ELEVATE project are those where the *Technology Provider* takes the role of dependee. Particularly challenging are: the task dependency from the *Education Department* that needs to be convinced about the advantage of using the *ELEVATE Tool Suite* to keep its key goals and quality aspects satisfied; and the quality-dependency from the ID who needs usable authoring tools for producing suitable educational material. In order to better understand what the *ELEVATE Tool Suite* should offer, and which authoring methodology should support its users, we need to analyse deeper how actors cooperate to produce training material and to manage training sessions.

3.1 Understanding key stakeholders' goals

Fig. 2 reports fragment of the *i** Strategic Rational models for the four actors involved in the achievement of the goal of ensuring continuous training of employees of the organization, namely, the *Education Department* (top-left), and its team that includes the DE (Fig. 2, bottom-left) and the ID (top-right), and the *Director*, who can be an actor external to the Education Department.

The main responsibility of the *Education Department* is that of organising continuous training of the employees on SOPs that complies with national or international standards (modeled as quality *Standards compliance*), so to be able to provide recognized certificates to the trainees who attend their training. Two approaches are mostly used: the first one rests on class sessions in which simulations of an emergency situation is conducted, by employing instrumented dummies or people, for example playing the role of injured subjects; the second one is based on online blended courses, which can combine slides, video-tutorials, and forms for the trainee's assessment (task: *use blended DL courses*).

A trade-off between two different quality criteria guides decisions on training material to be used, namely maximise reuse of existing resources and maximise the engagement of trainees. In this regard, while using standard SOP training material can *hurt* trainee's engagement, using new technology, as the interactive video tutorial that can be produced with ELEVATE, can contribute to maximise engagement. The DE and the ID that are part of the *Education Department*'s team, collaborate both during the production of the training material and during the execution of a training session. In particular, as shown in the SR diagram depicted in Fig. 2, the DE depends on the ID to get newly created educational material, while the ID depends on the DE to get the requirements for a training session specified, including a description of the profiles of the target trainees and the learning objectives.

The main goal of the DE is that of managing a training session, which requires a session to be designed, executed and assessed. To design a training

[7] Shareable Content Object Reference Model (SCORM).

session, existing material can be reused, which might have been created by a different team, while in the case new educational material has to be created, a new authoring process has to be performed in collaboration with an ID, and a *Director*, if new video material is needed. Typical skills of IDs include the use of methodologies and tools for designing educational material (especially for online DL). The *Director* collaborates with the team agreeing on a storyboard that will guide her planning for producing new video clips (dependencies in Fig. 2). In particular, in some situations, as for example when the emergency scenario to be generated is particularly dangerous for people or things (e.g. a fire in a building), virtual reality can be used to generate the needed video clips.

4 Conclusions

The GO analysis of the application domain described in this paper helped defining a first version of the methodology for producing and managing interactive video tutorial for training on SOP procedure with the *ELEVATE Tool Suite*. In [2], we illustrate this methodology for the NLS procedure case study.

In particular, the presented GO analysis supported us identifying the three different roles that are involved in this methodology (i.e. the domain expert, the instructional designer and the director), with their specific goals. The resulting tool-supported process is a collaborative process, which embraces a set of authoring steps (i.e. definition of training requirements, the design and validation of appropriate video-based exercises, and their deployment on an LMS), and management activities related to the training execution, such as the analysis of data extracted from session logs with the aim of understanding if the exercises need to be improved.

Work is ongoing to extend the platform and its methodology with the objective to enable producing dynamically customisable training sessions.

References

1. Dalpiaz, F., Franch, X., Horkoff, J.: istar 2.0 language guide. arXiv preprint arXiv:1605.07767 (2016)
2. Dellagiacoma, D., Busetta, P., Gabbasov, A., Perini, A., Susi, A., Gabardi, E., Palmisano, F., Mase', C., Moletta, C.: Authoring Interactive-video Exercises with ELEVATE: the NLS Procedure Case Study. In: Int. Workshop Nursing at MIS4TEL 2020 (2020)
3. Dragoni, M., Ghidini, C., Busetta, P., Fruet, M., Pedrotti, M.: Using ontologies for modeling virtual reality scenarios. In: Proceedings of the 2th European Semantic Web Conference, ESWC 2015, LNCS, volume 9088. pp. 575–590. Springer (2015)
4. Wyllie, J., Bruinenberg, J., Roehr, C.C., Rüdiger, M., Trevisanuto, D., Urlesberger, B.: European resuscitation council guidelines for resuscitation 2015: Section 7. resuscitation and support of transition of babies at birth (2015)
5. Yousef, A.M.F., Chatti, M.A., Schroeder, U.: The state of video-based learning: A review and future perspectives. Int. J. Adv. Life Sci **6**(3/4), 122–135 (2014)
6. Yu, E., Giorgini, P., Maiden, N., Mylopoulos, J.: Social Modeling for Requirements Engineering. The MIT Press (2011)