

John the Employee- Research and Development regarding a Safety and Occupational Health Avatar as an IT Companion for Employees in an Optimal Safety Culture

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This research was started in order to make more attractive and more likeable the lessons of safety performed by our institute for various industrial operators. In this respect we have developed some reusable learning frames that are used together with a dynamic safety avatar (John) in order to make the lessons more interesting and optimal from the safety point of view. Such a lesson could be disseminated on line or off-line and its results are analysed in order to have a continuous improvement. The system was tested on an enterprise with 300 employees during 2 months of testing (June-July 2014) and the results are encouraging.

Keyword: Avatar, safety lessons, improvement, reusable frames.

Introduction

Have you ever slept at one of your safety classes? Was it too long, too boring or not very understandable? If so, this paper would perhaps change some of your ideas- showing that safety teaching could be fun.

The term "avatar" has come to mean several related but different things in the computing world. In its broadest sense, an avatar is a computer user's self-created visual representation of him or her. An avatar can be a two-dimensional picture, a three-dimensional animation, or a small icon.¹ Avatars are not exact a novelty². There are lessons on how to build a static avatar³. However, dynamic avatars that could be involved in teaching a safety class are not exactly a lot. One solution for such an avatar is presented in this paper.

The idea of this research came to us when we analysed the user feedback from our safety classes. While good in principle, this feedback also showed us an incredible boringness and lack of interest sometimes, especially towards the end of the classes. The learners are obliged to participate 4-6 hours at class- time in which they are trained. The national rules for obtaining a certificate are asking explicitly for the presence at class of the students at least 80%. We have tried and partly succeeded in developing a mixed approach- part class and part on-line approach.

The presented solution could be accessed on-line and also could be loaded off-line- where there are no wireless connexion or is not desirable to stay tuned at work- for example it could be downloaded on a smartphone or on a tablet.

Our approach tried to "spice up" a little the training process, using elements from the theory of learning and also new IT instruments.

The main concept is build around the value construct- following the obtaining a certain plus-value after the training by using the avatar and other tools to optimally imprint the important things into the abilities of the learners⁴.

The developed knowledge would be also improved through the Erasmus + project"Mind your safety, Safety matters"

Conceptual Aspects

The classic safety lesson is developed in an optimised mode, so that the necessary knowledge is collected (from bibliographical sources, from incidents and accidents that are giving the lessons learned and also from the feedback of former students and trainers and from expert opinion). All the collection is done as an elicited knowledge collection process using specific software and based on frames like the one presented below.

Table 1- Knowledge elicitation form

Main subject	Expert opinion			Changes in technology	Incidents/Accidents	User/Trainer feedback		
	Add new content	Change existing content	Improve existing content			Lessons learned	Procedures to be improved	User feedback
				List the main changes				

Using more forms like the one presented above it is possible to perform an optimal load-up with content and after that an optimal build-up of the lesson. In building up the lesson a distinct attention is given to the following points:

- The educational level of the target: in our activity one lesson is developed generally for would be a user with a medium technical knowledge- then an upgrade is made for engineers and persons with high level studies. So, we have always two levelled lessons for the same subject.
- The way of delivery. As it is possible to see in the Table 1- a distinct space is given for user feedback. In the beginning the lesson is presented at class. However, a lot of users are asking such lessons to be on-line or to be

installed on their mobile devices (this is one main reason for the apparition of avatars in safety- to improve the learning process).

- Easiness of learning- we are asking feedback from our students- on a 0-10 scale- where 10 is the ideal. Till now, our lessons are grouped around 7.5-8.5 as a measure for the easiness of learning
- Time for training. There are situations in which training could be done just 5-10 minutes /day. So a proper sequence would be needed- in order that the employee should retain the former training and should enrich it with the actual one.
- Definition and satisfaction by the developed lessons of a certain KPI- not necessary for one lesson but for a module of lessons. This KPI could be a very simple one (Understanding and acceptance of lessons) - measured after the class or it could be a more complex one (percent of incident reduction after training).
- The resulting imprint. We are glad if certain safety rules could be associated with one of our avatars- so that the employee would remember that John the avatar presented him a certain safety rule.

Knowledge could be changed by:

- The opinion of an existing expert (generally we are using three expert panels in order to judge) regarding the existing knowledge or the necessity of a new lesson. The expert should tell:
 - if there is need for new knowledge- together with the change of technology or work procedures or;
 - if there is a need to change/improve the existing knowledge;
- Incidents/accidents happened recently- that would be transformed into lessons learned or will lead to improved best practice procedures;
- User/Trainer feedback. Users generally tell when there are parts of knowledge that they could not understand, that are insufficiently explicated, etc.

After the lesson is developed- there are added test points- in order to retain and imprint the significant parts of the lesson.

A first check-up is done by the educational team, checking the following aspects:

- Utility- is the educational content needed at this moment?
- Usability- could the intended target use the content in order to add a plus-value to the existing safety?
- Feasibility- would the lesson be feasible in time?

If these criteria are met- a scenario is developed – as shown in figure 3

The scenario is tested on the intended target- generally at a workplace with 3-10 employees. If the results are good- the lesson is implemented into a module- and then into the intended course.

Stability points are core for reusable frames- the basis for such a frame is presented in figure 1

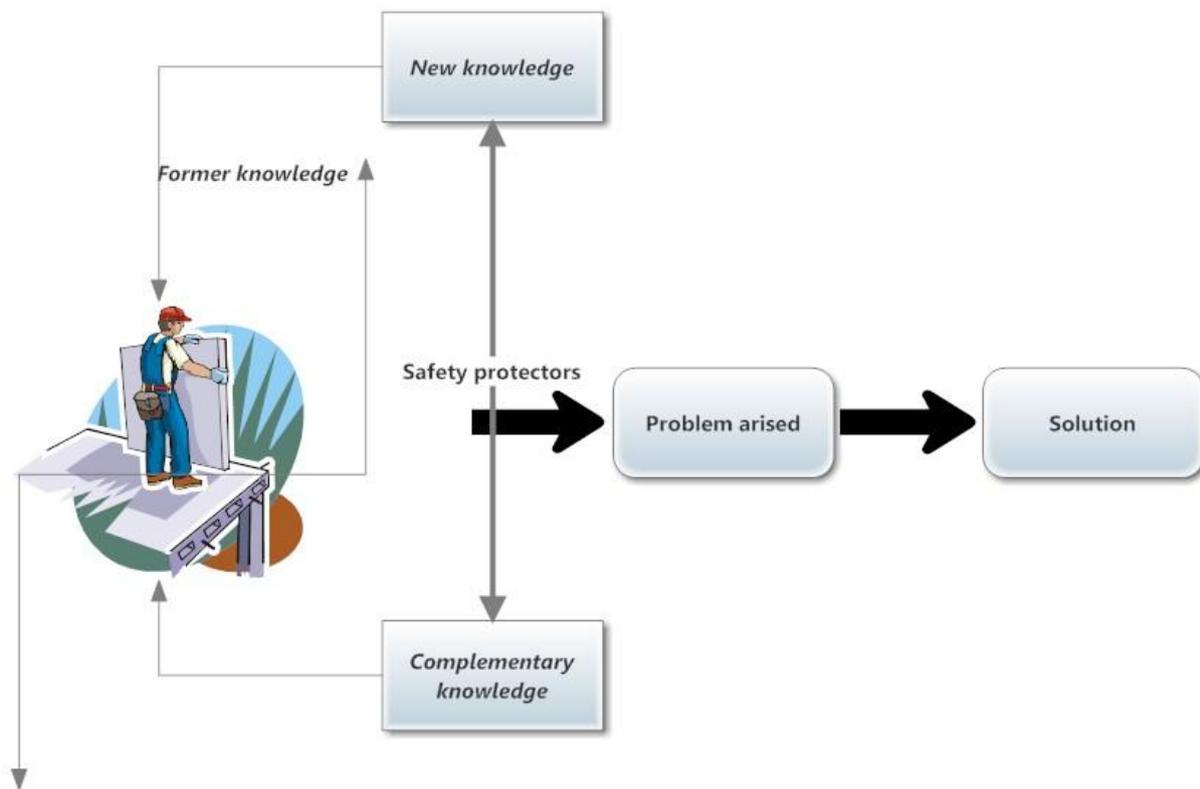


Figure 1 Basis for the safety frame

The schema presented in figure 2 describes how is developed an upgraded safety lesson that involves John the avatar.

It starts with the development of the classic safety lesson as a distinct and specific content, lesson that could use various support- paper or slides, voice that could be recorded, etc. Figure 3 shows the build-up of the safety lesson.

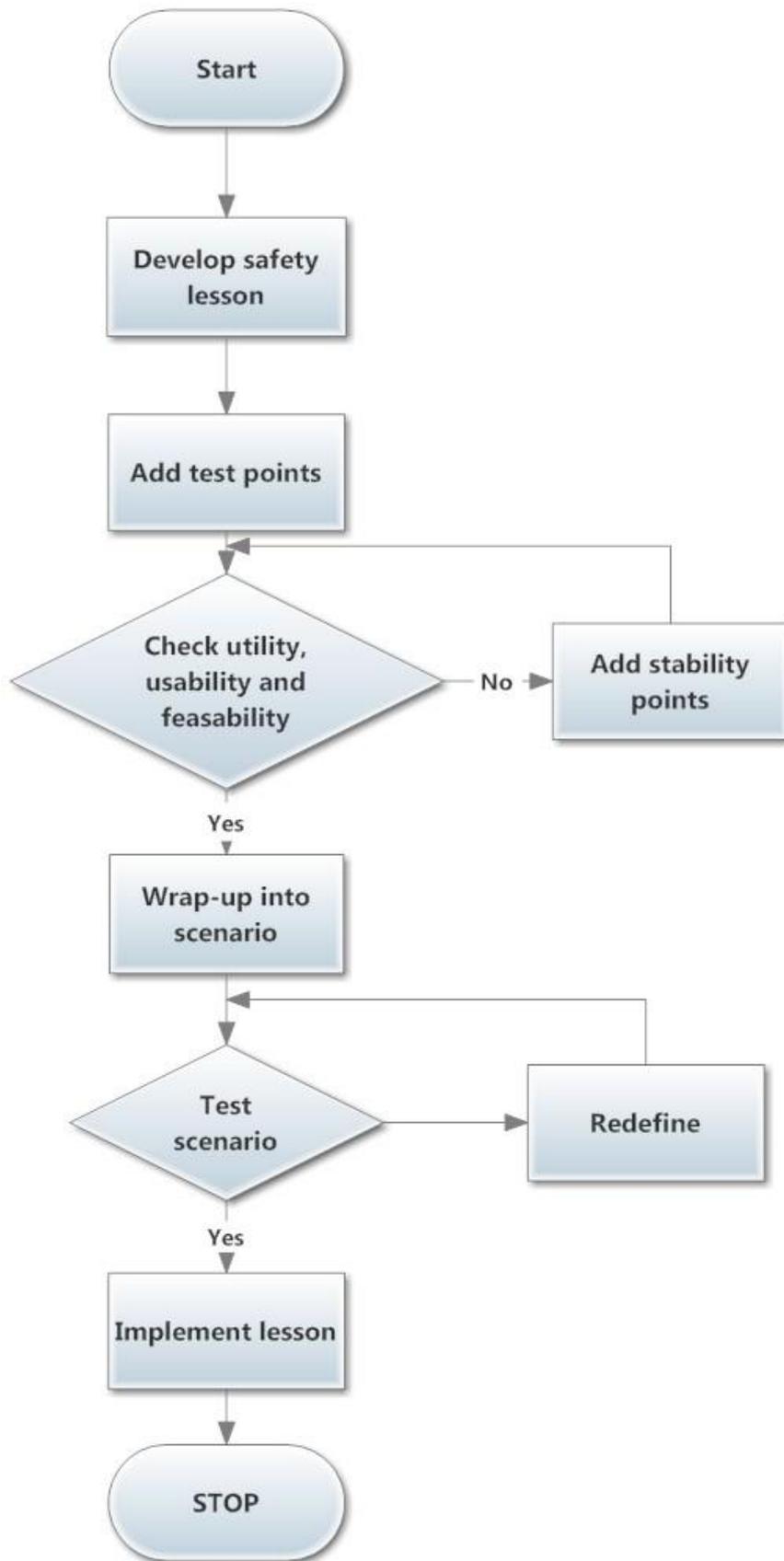


Figure 2 Cycle Lesson-Scenario

Stability points are added for:

- understanding- if there are complicated notions that should be understood- for each such notions one/two stability points are introduced under the form of distinct notes;
- imprinting- the notions that should remain are summarized in a stability point at the end of the lesson;
- Developing the knowledge- if needed- one or more stability points- as examples that could be easily understood- is added.

Scenarios must be tested in order to establish their adequacy with the specific training process. For example, a scenario in which the avatars are extraction workers would not be proper for training in the drug industry. So, we are testing the developed scenarios currently

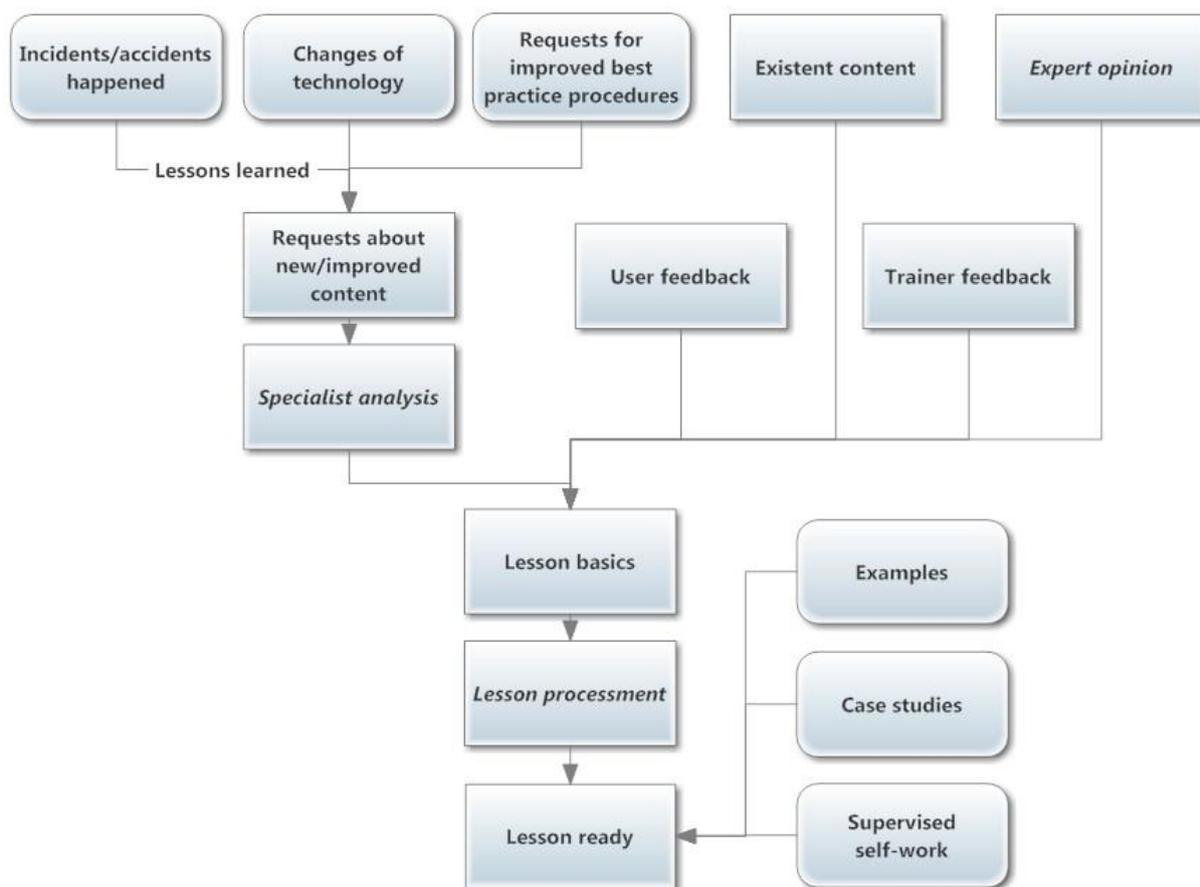


Figure 3 Build-up of the classic lesson

The development of a scenario is shown in figure 4. The scenario ⁵ should be:

- as comprehensive as possible;
- as simple as possible;
- as understandable as possible;

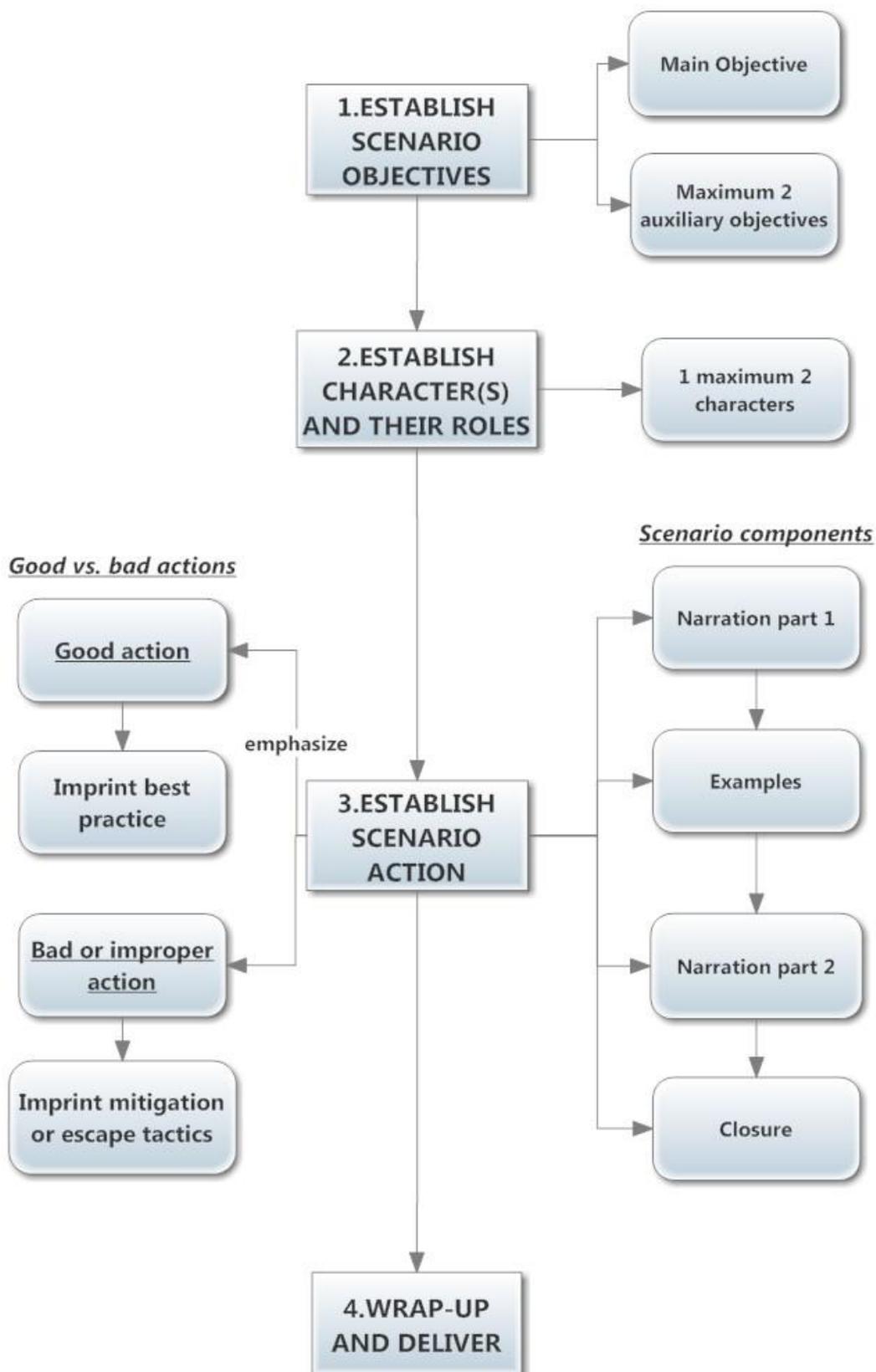


Figure 4 Scenario Development

All the conceptual aspects presented above are implemented into the practical developments that lead us to John the Avatar.

Practical Developments

We have started by building the lessons on paper and then migrated them on Power Point. Here we have developed several specific courses that were loaded on Slide Share ⁶ in order to test their content. Figures 5 and 6 are showing some screens in this respect.



Figure 5 Safety course about hammers- 1



Figure 6-Safety course about hammers-2

Such a lesson like the one illustrated in the figures 5 and 6 was viewed by more than 3000 users of Slide Share and liked by 956 users. Once confirmed the content and the interest regarding it- we are porting these classes into tools to improve it- introducing avatar based scenarios. We have developed some general frames (a general structure of such a reusable frame is presented in figure 7) including avatars- in order to automatize our work as much as possible- so that we could quickly adapt such a frame (shown in figure 8 and 9) to our specific content.

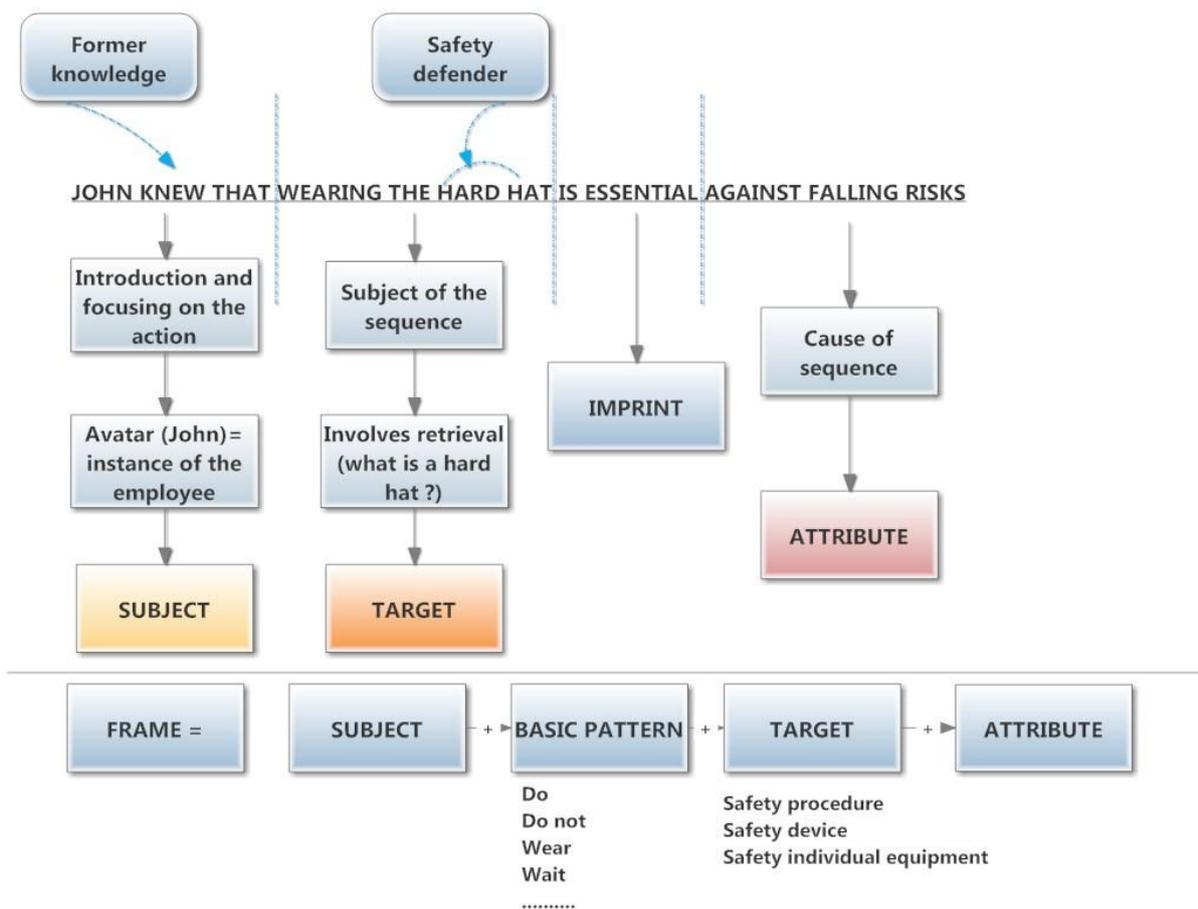


Figure 7 General reusable frame presentation and structure



Figure 8- Avatar 1

The avatar presented in figure 8 was a trial done using CourseLab- the free version. It could use directly PowerPoint presentations and allows the definition of reusable learning frames. This software is using objects⁷ as a way to construct reusable frames in which could be involved 1-3 avatars. The avatars dialogue could be of more interest and could lead towards a repartition of roles- one avatar could be the leader of the training course, one could present examples and one could discuss real cases.



Figure 9- Avatar 2

In figure 9 we have an avatar built with a more sophisticated approach- an instrument named Character Builder. The advantage is that this instrument allows also the development for mobile platforms⁸.

In the screen illustrated in Figure 9 we have actually two avatars- a static one- developed inside Power Point using the possibilities of that tool- and a dynamic one- that comments the slides.

Figure 10 shows the action tree that stays behind a scenario frame.

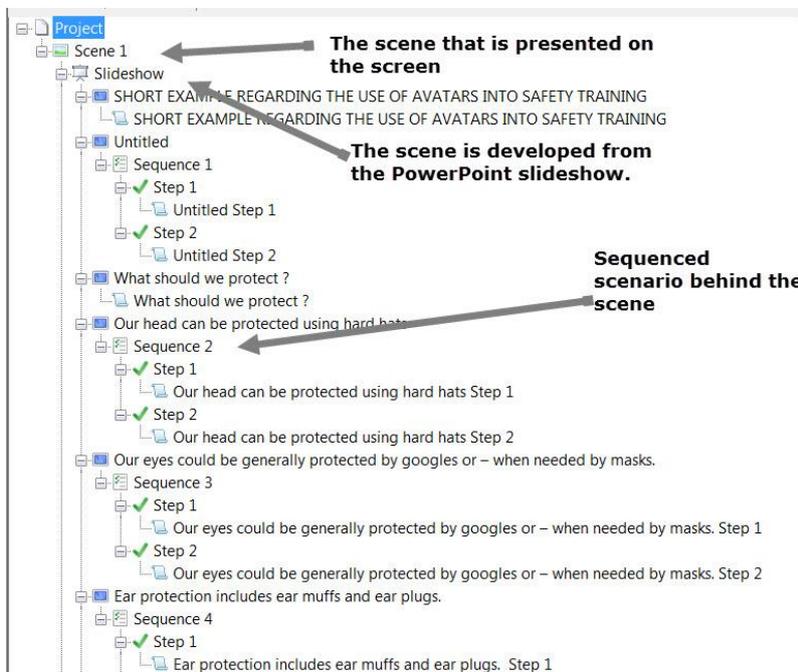


Figure 10 Action tree behind a scenario frame

Testing and Implementation

We have implemented our lessons in a 300 employee enterprise dedicated to the building of metal constructions. Workers were allowed to access central terminals (existing inside workplaces and also in the administration building) and were also presented with the software to be loaded on smartphones and tablets. After OK-ing the whole procedure by the managers and the supervisors of workplace together with the workers representatives we have asked for a general feedback, expressed freely (that was used to improve our product) and for a quantitative feedback, using Likert scales and expressed by the added values (as in two months they have no incidents- so we have no objective measures). The resulting average values of the quantitative assessment are presented in the table 2.

Table 2- Feedback analysis

TERMINAL VALUES						INSTRUMENTAL VALUES					
Value	1	2	3	4	5	Value	1	2	3	4	5
Safety learning					X	Logic					X
Keeping safety at work				X		Reliable					X
Comfort and well-being at work					X	Self-controlled learning					X
Social recognition					X	Self-respect					X
						Optimality					X
						Sense of belonging					X
						Understandable even for those with no specific studies					X
						Simplicity					X
						Helpful				X	

Conclusion

The build-up and implementation of John the avatar is not a big thing by itself. There is another avatar, named NAPO, developed by the EIOSHA that is more mobile and has a lot of movies. However, the development of reusable safety frames and (in the next phase) putting them on a server for free access⁹ – could change a little the way in which safety training is done today. The trainer could sketch its content and then go to the server, take the most significant frames for his subject and develop- without knowledge of a programming language or of a movie making software- a lesson in no more than 15-20 minutes. Once developed, the lesson could be beta-tested on the same server and then used locally or even on a more large scale.

Usage of the avatars¹⁰ together with a tool for sentiment analysis could give something more complex- like learned lessons for large companies. We could assume – for example- that an employee from a certain process industry- which has branches in 10-15 countries- has the same safety experience regarding a certain problem. Using the avatar approach, a safety expert could formalise and distribute this experience in order to act like a learned lesson and also perhaps as a message regarding the need for improvement- for the management of the company.

The main advantages of this approach are:

- more interest- from the learners- regarding the safety training presented;

- a better imprint of the main points that should be learned;
- usage of predefined, reusable dynamic frames that could be easily filled with content;
- possibility of realisation of a link between lessons through the figure of the avatar;
- possibility to realise an inter-cultural safety dialogue and learning context- using the avatar;
- optimal transformation of content into the final lesson;
- easiness in usage;

¹ <https://www.internetsafetyproject.org/wiki/avatars>

² <https://www.behance.net/gallery/23385649/Construction-Safety-Avatars>

³ <http://cooltoolsfor21stcenturylearners.wikispaces.com/Avatars+and+Internet+Safety>

⁴ Jonas Zaddach, Luca Bruno, Aurelien Francillon and Davide Balzarotti, 2013, Avatar: A Framework to Support Dynamic Security Analysis of Embedded Systems' Firmwares

⁵ Cui, A., Stolfo, S. J. .2011, Defending embedded systems with software symbiotes. In Proceedings of the 14th International Conference on Recent Advances in Intrusion Detection (Berlin, Heidelberg, 2011), RAID'11, Springer-Verlag, pp. 358–377

⁶ S.Kovacs- How to solve problems using 8D or at least try- <http://www.slideshare.net/INVDPM/8-d-problem-solving-method>

⁷ Chipounov, V., Kuznetsov, V., 2012, The S2E Platform: Design, Implementation, and Applications. ACM Trans. Comput. Syst. 30, 1 (Feb. 2012), 2:1–2:49.

⁸ Bojinov, H., Bursztein, E., Boneh, D., 2009, Embedded management interfaces: Emerging massive insecurity. In Blackhat 2009 Technical Briefing / whitepaper (2009).

⁹ Avgerinos T. ,Feb. 2011, Automatic exploit generation. In Network and Distributed System Security Symposium pp. 283–300.

¹⁰ Anubis: Analyzing Unknown Binaries. <http://anubis.iseclab.org/>