

Soft Skill Simulation Authoring Tools: A State of the Art Survey

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ABSTRACT

Online simulations an efficient and effective means of delivering engaging educational experiences. Soft skill simulations, which utilize rich media, are particularly immersive. There are many advantages in using online rich media simulations such as educational effectiveness and reduction in cost. The key barrier to their mainstream adoption is the complexity involved in their designing developing and testing them (authoring). This paper focuses on a state of the art survey of existing authoring tools for online soft skill simulations and identifies and describes the key requirements needed in an authoring tool.

Keywords

Simulation, online, rich media, soft skills, education, authoring.

1. INTRODUCTION

With the advances in web technology, rich media has become an important part of online education [16]. The progression from simply reading text in a web browser to the presentation of data through the means of rich media such as audio and video was inevitable. But for certain aspects of education, simply presenting the information to the learner is not sufficient, there also needs to be aspects of interaction with the rich media. Where the learner no longer passively absorbs the online content but does instead engage with the rich media creating an immersive learning experience. As an old Chinese proverb states, "Tell me and I forget. Show me and I remember. Involve me and I understand".

This type of interactivity, using rich media, is particularly employed with online educational simulations. This is an educational strategy where the emphases is put on learning 'by doing' [19] and is used in teaching particular types of skills where the use of rich media is important in delivering simulations with a high fidelity.

In the past, the use of rich media in online simulations has been restricted due to the limitations of bandwidth which created a delay of delivery of the media files involved. This delay created gaps between the different online media clips and so broke the fidelity of the simulation making them ineffective. But with rich media now being passed through the web so quickly there is no reduced latency within the online simulations and the fidelity is maintained.

The standard format for online rich media educational simulations

for soft skills is for the learner to be presented with a short video or audio clip. Once this media clip has ended the author chooses from a list of multiple options that are presented to them. They make their choice based on the clip they have just seen and what they believe is the best option is to proceed. A realistic simulation of the real world is created as a result of a sequence of these interactions that the learner performs.

Rich media simulations are predominantly used to teach communication skills such as sales or interviewing skills. These types of simulations are referred to as soft skill simulations [2] where a social situation which involves the interaction of people is being simulated. In the past this type of interactivity was only available in the real world with the use of actors to play the relevant roles. This approach proved to be expensive and not particularly educationally affective as the number of times a learner could engage with the simulation was limited. With the use of online simulations instead of the real world equivalent the simulations are much more cost affective and can be accessed by the learner many times, the accumulation of which creating a much more educationally affective strategy.

The main barrier to mainstream adoption with incorporating these online simulations is their composition [12] and allowing non-technical domain experts to compose simulations. There have been many attempts in creating authoring tools for online simulations, using different approaches to varying success. The focus of this paper is to examine a selection of these authoring tools in a state of the art survey, analyses their main features and illustrate a set of core requirements for supporting authoring tools. Although there have been several state of the art surveys on the educational simulations created [10] and even one or two on the authoring tools used for composing these educational simulations [21] there has yet been a survey dedicated to the authoring tools for rich media based online simulation, specifically designed to teach communication skills.

In the first section of this paper there is a detailed description of the online media rich educational simulations that are created. This is followed by a state of the art survey of four authoring tool used to create these simulations including a detailed description of each authoring tool, the process in creating the simulations and finally an evaluation. Then a section outlining the key requirements for authoring media rich online educational simulations is presented. The final section is a conclusion which describes the present state of the art of authoring tools.

2. ONLINE RICH MEDIA EDUCATIONAL SIMULATIONS

There are many different types of educational simulations but most of them fall into two general categories, hard skill simulations and soft skill simulations. Hard skill simulations cover a broad range of skill areas. They are usually thought of as being simulations of physical systems, such as machinery or electronic systems [2]. For example Future Lab: Circuits for Physical Science [8] where the user learns about the functionality of circuits by building and manipulating them. This category also includes procedural or task simulators which are designed to teach a learner to follow steps in a procedure. A typical and well known example being Microsoft's Flight Simulator [11] where the user is learning the skills involved in flying. Soft skills are far more specific and refer only to simulations that occur in a social context. As previously mentioned, the focus of this paper is on soft skill simulations.

Soft skill simulations (also known as instructional social simulations or dialectic based educational simulations) are generally used for teaching skills based on interpersonal relationships, in particular communication skills where the learner is taught through the process of interacting with simulated people and scenarios through dialogue presented in a rich media format. The learner takes on a particular role and interacts with the simulation, from which they learn by constructing their own understanding by means of interaction and control the dialogue with the choices they make. Soft skill simulations are typically used to teach communication skills within the domain of business, such as customer care, interviewing skills and sale process simulations. Examples of these soft skill simulations are Skillsim Simulations [15] and ForceTen 4.0 [5]. The knowledge models that soft skill simulations depend on are dialogue based, the visualization of which within authoring becomes very important as it needs to capture and display the features and attributes of communication between two or more people.

There are many advantages of using soft skill simulations. From an educational point of view soft skill simulations are very effective. It has been argued that serious learning only occurs if it takes place in the social and physical context in which it is to be applied [3]. Soft skill simulations also have advantages over the real world alternatives of either employing actors to take on the roles or allowing the learner to participate in real scenarios. These include:

Cost: Soft skill simulations can be reused so are a much cheaper option compared to that of constantly employing actors.

Convenience: Compared to the use of actors, soft skill simulations are far more convenient, especially if they are available online. They can also be easily saved for replay, removing the necessity of recording equipment.

Time: Time within a soft skill simulation can be decelerated which is not possible if training with the use of actors. This could for example allow the learner to actively reflect during their simulation.

Safety: Soft skill simulations are often used to replicate situations where if mistakes are made by the learner in the real world there would have an adverse affect for example, a trainee sales representative making a mistake with a customer which results in the loss of a valuable client.

The soft skill simulations are based on the dialogue that takes place within the simulation. This is the model that details all the possibilities that can occur in the simulation Although being examined in particular are semi-structured dialogues such as conversations and interviews, the modeling of these types of simulations are considerably complex [1]. While there have been many different approaches to modeling human-to-human dialogue; such as Chat Circles [17] and Comic Chat [9], a complex task in itself; ensuring pedagogic appropriateness adds further to the development complexities. Soft skill simulations not only have to be authentic simulations but they must support serious learning. The idea that learning in a highly interactive environment is not something appended to the side of the experience but something that flows implicitly within the experience.

To fully understand the experience of the learner within the simulation and hence the transfer of learning, an illustration of the interactions in such a simulation is now described. This is accomplished using the example of an online simulation provided by Experience Builder [6]. It follows a format that is utilised by most simulations that are used to teach soft skills. This particular simulation is a coaching simulation, the goal of which is to teach managers how to communicate and relate better with their staff. The scenario is as follows with a screen shot of the simulation in Figure 1.

The learner is to take on the role of a manager of a technical support centre. The managers company has recently introduced a new training initiative which the manager has implemented in their department. One of the employees that work under the manager has had difficulty in adopting to the new initiative. This simulation reproduces a meeting with the employee to discover what the issues are.

The simulation starts by showing a video of the employee entering an office, sitting opposite the manager's desk and asking:

"Hi, what did you want to see me about?"

The learner has three options to choose from:

"Ask him if he has concerns about the new training initiative"

"Ask him why his enthusiasm for work has dropped"

"Explain you've noticed his dropping enthusiasm lately and ask him how it's going"

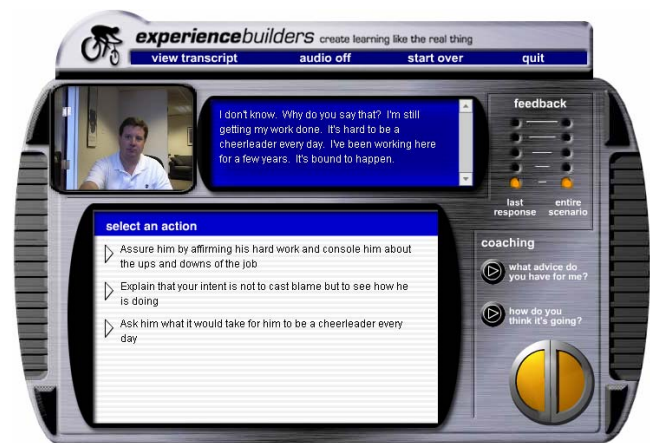


Figure 1: Experience Builder soft skill simulation

By choosing the second option the simulation progresses another stage with another video clip being played. The employee's response to the learners question is:

"I don't know. Why do you say that? I'm still getting my work done It's hard to be a cheerleader every day. I've been working here for a few years. It's bound to happen"

The learner is then presented with another set of options to chose from:

"Assure him by affirming his hard work and console him about the ups and downs of the job"

"Explain that your intent is not to cast blame but to see how he is doing "

"Ask him what it would take for him to be a cheerleader every day"

The simulation continues in this format, with each step preceded by another video and set of options that the learner can choose from, the accumulation of which, creates a realistic and engaging simulation. The true value in using these types of simulation is that the learner wouldn't just use this simulation once but would work with it several times being able to try out different routes gaining more experience each time.

As mentioned soft skill online simulations typically take on this format of a combination of video followed by multiple choice options that the learner can choose from.

There are however online rich media educational simulations that adopt a different approach. The simulation provided by SIVOX [14], for example, allows the learner to interact with the simulation using voice recognition as an alternative to multiple choices. While the soft skill simulations of Extempo Systems [7] offer a free text input.

As previously mentioned, the key problem with incorporating any type of simulations is their composition [12] and allowing non-technical domain experts to compose simulations. Generally, simulations are expensive and very time consuming to produce [20]. This is particularly true where the simulation is designed to be an educational tool and is based on interpersonal relationships and role-play. To examine these challenges further there now a survey of existing authoring tools that are used to create online rich media educational simulations.

3. STATE OF THE ART SURVEY

In this section there is a detailed description of four authoring tools that are used to produce online educational simulations that utilize rich media. Each authoring tool is examined under the following criteria.

Overall Description: This describes the general details of the authoring tool, such as it origins, overall goal and information regarding the rich media simulations that are produced.

Dialogue Visualization and User Interface: An integral part of creating a soft skill educational simulation is the authoring of the dialogue upon which the simulation is to be based. To this end there is a detailed description of how the dialogue is represented within the authoring tool and a description of its user interface

Authoring Process: This describes the steps which the author takes to create an online rich media educational simulation.

Evaluation: This is the evaluation of the authoring tool. It gives a critical account of the advantages and disadvantages of using the tool to author online rich media soft skill simulations.

Each authoring tool must be capable of creating simulations that fit the following criteria. **Online:** The simulations produced must be accessible through the World Wide Web. **Rich Media:** The simulations must use rich media, video or audio, as their main form of delivery. **Educational:** The ultimate goal of the simulations should be to teach soft skills.

The authoring tools to be examined are VISION, Experience Builder, RapidBuilder and Captivate 3. While each of the authoring tools examined can be used to compose soft skill online educational simulations, RapidBuilder and Captivate 3 are also capable of creating other types simulations such as hard skill simulations. For the purposes of this paper these only the authoring tools proficiency in authoring soft skill simulations is examined and evaluated.

3.1 VISION

The VISION project [18], Virtual Interviews for Students Interacting Online, was started in 2002 in Trinity College Dublin for the sole purpose of creating online simulations used to teach psychiatric interviewing techniques. It is a joint project between the Knowledge and Data Engineering Group of the Computer Science Department along with the Department of Psychiatry. The goal of this collaboration was to deliver simulated patients using rich media files allowing medical students to take on the role of doctors and nurses within the simulations. Through this interaction with simulated patients the student's communication skills with real patients was greatly improved.

The simulations are delivered to the learner online as media files and multiple choice options where each choice will bring the learner down a different path of the dialogue to another media file and set of options creating a realistic psychiatric interview for the students. Due to the complex nature of the dialogue within psychiatric interviews the simulations that are created are very large and intricate. To this end an authoring tool was developed to allow the domain experts to create these complex simulations.

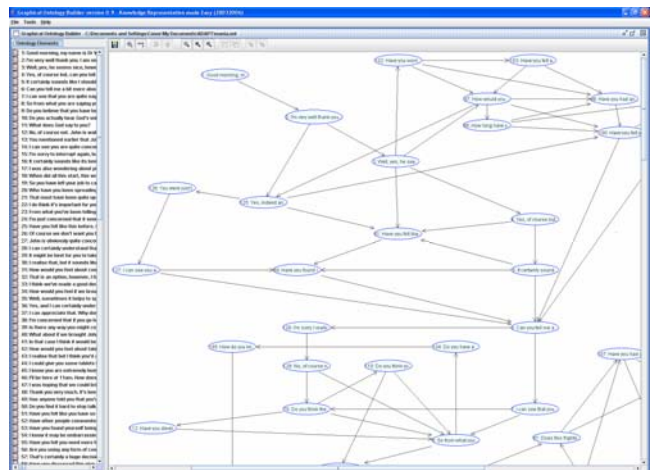


Figure 2: VISION Authoring Tool

3.1.1 Dialogue Visualization and User Interface

To aid in the visualization of the dialogue on which the simulations are based, known as the dialogue model, it is broken down into smaller sections. Each section representing an initial statement and corresponding response within the dialogue. These sections are later associated with a video file which is recorded once the dialogue model is complete.

The sections of the dialogue are presented visually as ellipses in the authoring tool and the different paths, or options that the learner can take within the simulation, are shown as directed connections between the ellipses. To facilitate this representation, the dialogue model is visually expressed as a graph of nodes and connecting edges. Within this representation the author graphically adds, moves and connects the different sections of the dialogue with no restrictions in location or movement.

The user interface, as seen in Figure 2, is composed of three main sections. The largest area is the main canvas where the dialogue model is composed using connected dialogue sections to represent all possibilities that can occur within the online simulation. Above this is a tool bar allowing the author to add nodes and edges to the main canvas, zoom in and out, undo/redo and save. To the left of the main canvas there is also a list of all nodes that have been created with respect to their initial statement.

3.1.2 Authoring Process

The authoring process to create these simulations is very straight forward as the only concern for the author is to create the dialogue model upon which the simulation is to be based. This is achieved using the menu bar to add dialogue sections and connect them within the main canvas. To edit the details of each dialogue section the author double clicks the ellipse for a popup menu to appear which allows the author to fill in the initial statement and response for each section. After the dialogue model is completed and the all the video files are created the location of the corresponding video file locations can be added to the properties of each dialogue section. Once the author has completed the dialogue model they can publish the online simulation. This done by uploading it onto the VISION web server where it can be accessed by the author for examination and then released to the learners.

3.1.3 Evaluation

In terms of the visualization of the dialogue model upon which the simulation is based the VISION authoring tool performs very well. The representation is intuitive and easy for the author to follow allowing them to compose the dialogue model as quickly and simply as possible. The freedom provided to the author in expressing the dialogue model in the interface, with no restrictions further improves this user friendly experience and allows the author to create very large and complex simulations. The author is also not distracted from the dialogue composition by having to input the details of the front end of the simulation. For example background color, shape or size of buttons, etc.

There are, however, two main drawbacks with composing soft skill educational simulations with the VISION authoring tool. The first of these is the lack of formal process used in creating the online simulations. The author is only required to create the dialogue model and upload it to the server for distribution. While this is of course the most important component in creating the simulations, there are other additional steps that should be in

place to aid the author while composing the simulation and to insure the simulations achieve their educational goals. For example, the author never details the situation in which the simulation is to take place or outlines the educational objectives they wish the simulation to achieve. While the process in creating the actual dialogue model works very well, it is really only one step in creating the final simulation.

The second issue with using this authoring tool is that, with the exception of zoom in and out, there are no navigational aids provided in the main canvas area. With the approach taken of representing the dialogue model with nodes and edges the main canvas can become very cluttered, especially if the author is creating a very large and complex online simulation. Without some kind of assistance to the author they can easily become disorientated within the main canvas.

Although there are some issues with the VISION authoring tool it does perform very well in authoring online rich media educational simulations. It is intuitive, user friendly and ideally matched to the needs of a non-technical domain expert.

3.2 Experience Builder

Experience Builder LLC [6] began as a spin off company in 2000 from Institute for the Learning Sciences at Northwestern University. Its primary goal was to simplify the way in which soft skill simulations were created and to provide a tool to allow others to create their own simulations. Experience Builder now provides authoring tools for the composition of both hard and soft skills. It is the later authoring tool which is the focus of this survey, in particular those that use rich media to create realistic soft skill simulations.

The educational simulations created are deliverable in HTML and Flash format, where the user is presented with a short video in each step and then allowed to choose from multiple choice options to interact with and decide the path of the simulation. These simulations are primarily used within the business domain, teaching a wide variety of skills from sales to customer service.

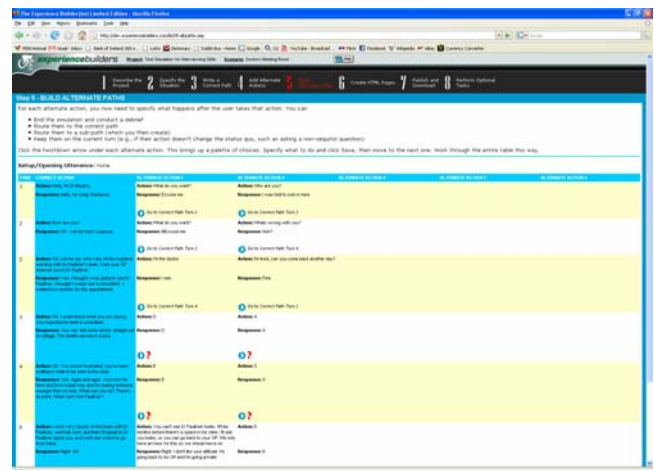


Figure 3: Experience Builder Authoring Tool

3.2.1 Dialogue Visualization and User Interface

Unlike most authoring tools, Experience Builder is an online application where the author composes the educational simulations through a web browser, as seen in Figure 3. The

details of the simulation are captured using a precise authoring process composed of eight steps that the user must follow. An integral part of this process is to compose a dialogue upon which the simulation is based. The dialogue is developed over three steps of the process and is represented differently in each step on a different web page within authoring tool. The author initially describes the optimal route the learner would take within the simulation. This is visually represented with a column of text boxes coupled together as a 'User Action' and 'Character Response'. These correspond to a choice the learner can take within the simulation and a coinciding response dialogue from the person being simulated.

The next step in creating the dialogue is to add alternative actions to the optimal route. These are the other choices that are presented to the learner in the simulation and are also composed of a 'User Action' and 'Character Response' and represented using text boxes.

The final step of the in composing the dialogue for the model is to build the alternative paths which allows the author to branch out from the optimal path they have created to other sets of choices for the learner.

As mentioned before the user interface of the authoring tool is delivered online within a web browser. It is composed of menu across the top which displays the eight steps of the process that is used to create the simulations, each step having its own ASP (Active Server Pages) web page. By clicking on any of the steps the authoring tool will open this page, where the author can update the details of the step and save to the Experience Builder web server. All details of the process steps properties are stored and edited using text boxes. The only notable exception being the specification of alternative paths between different sections of the dialogue, these are input using a drop down menu which lists all other paths.

3.2.2 Authoring Process

As mentioned before the authoring process is central to the development of the online rich media educational simulations in this authoring tool. The author follows each step from one to eight to compose their simulation. Each authoring step is now examined in detail.

Describe the Project: The simulation is named and an overall description is given in the text boxes provided. This section also allows the author to create learning objectives within the project which detail the different educational goals the author wants to achieve within the simulation. This provides a sound pedagogical framework for the simulations to be based. There is now a detailed examination of each step.

Specify the Situation: The author describes the situation in which the simulation is to take place which could include a physical description of where simulation. This step also includes the 'Learner's Goal in the Situation', a short description of what the learner thinks they should be accomplishing within the simulation. They type of interaction that takes place is also chosen from a drop down menu, 'Video Role-Play' in this case.

Write the Correct Path: The author describes the optimal path that the learner would take to go through the simulation in a series of 'User Action' and 'Character Response' within text boxes which are in series one under another.

Add Alternative Actions: These are the alternative actions (multiple choices options) that the learner can take within the simulation. An 'Alternative Action' can be added to any of the 'Correct Path' steps previously created.

Build Alternative Paths: The author must decide on the outcome of each action created previously, whether the feed back into the 'Correct Path', end the simulation or branch away from the 'Correct Path' to another sequence that the author would then create.

Create HTML Pages: This section of the authoring process allows the user to add additional HTML pages to the simulation. For example, the author could include a web page that introduces the simulation in the beginning and describes the simulation to the user.

Publish and Download: In this step the author chooses which skin they would like their simulation displayed in from a possible three available. They then publish the simulation online and receive the simulations web address for distribution.

Perform Optimal Tasks: The main purpose of this step is to allow the author to associate media files to appropriate parts of the simulation. Other administrative operations such as spelling check and making a backup are also included in this step of the authoring process.

Although the steps are numbered and the author is expected to complete the previous steps before continuing they often need to backtrack to make adjustments or add additional information. The author is therefore provided with the freedom to jump back and forth between the steps allowing for an iterative development process.

3.2.3 Evaluation

One of the most unique characteristics of this authoring tool is that it is an online application. This allows not only for simulations to be composed anywhere there is internet access but also allows several authors to collaborate easily.

Although having the authoring tool online is a novel approach, it is in fact the detailed authoring process which is the most compelling feature. This includes all steps that are necessary in creating a complete online, educationally sound, rich media simulation. The author is encouraged to input all the details of the simulation which includes an outline of the learning outcomes to be achieved, insuring a pedagogically sound simulation.

Other important steps include the scenario and situation descriptions which give the author a clear overview of the simulation assisting them in their composition. The concept of first developing an optimal path is also very useful as it gives the author a good starting point. The author is also not distracted with the details of the front-end look and feel of the simulation and development is centered content. Although the authoring tool does still allow the author input some influence into the front-end of the simulation by permitting them to choose from pre-prepared screen designs

The major disadvantage in using Experience Builder authoring tool is its approach to visualization and representation of the dialogues for the simulations. The dialogue being authored is very difficult to follow even for a very short simulation. This is mainly due to the use of text boxes to represent the dialogue. This approach would be acceptable if dealing with a simple sequential

conversation but is inadequate if attempting to express all possibilities that can occur within a dialogue. Another aspect of poor representation is the way different parts of the dialogue that are linked together is expressed. This is done with a simple text reference without any graphical description.

Although specifically designed to be used to author online rich media educational simulations the Experience Builder has its limitations. While the process used in creating the simulations is excellent the dialogue representation is confusing and very difficult to use. This would be particularly true if creating a large and complex simulation. The interface is most probably restricted due to it being an application accessed through a web browser. Although with the advances of Web 2.0 these limitations could be overcome.

3.3 RapidBuilder

XStream is a Canadian based company that was formed in 1998 and has been involved in producing educational simulations since 1999. Some of their customers include Oracle, University of Michigan and NYU Medical Centre. XStream create custom simulations for clients and also offer them authoring tools to allow them to create their own simulations. The authoring tool XStream provides, RapidBuilder [13], is flexible enough to allow the authors to create soft skill simulations and software simulations. The soft skill simulations can be constructed so as to consist of a sequence of small snippets of video or audio being played. After each media file is played the learner then chooses what they believe to be appropriate response from multiple choice options offered. Each decision the learner makes has a direct effect on which media file is presented next hence the overall simulation.

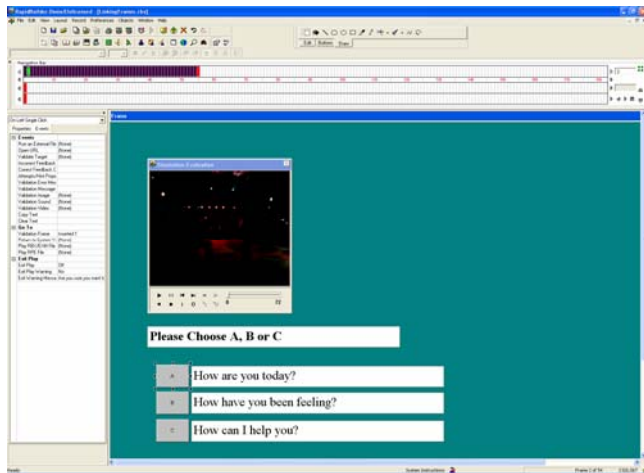


Figure 4: RapidBuilder Authoring Tool

3.3.1 Dialogue Visualization and User Interface

To represent the dialogue upon which the simulation is to be based, the RapidBuilder authoring tool decomposes it into smaller more manageable steps called frames. Each frame corresponds to a video and set of multiple choice options that the learner will see in the simulation.

The authoring tools user interface is composed of four areas used to create the simulations. Across the top is the main 'Menu Bar' which allows the author to perform operations on other areas of the tool. Below this is the 'Navigation Bar' which shows all the

frames that have been created in the simulation. These are displayed as small black boxes in a row from left to right, when one is clicked the box turns green and the corresponding frame will appear in the large main 'Frame Area' which is below the 'Navigation Bar'.

The frames in the 'Frame Area' are WYSWYG, so appear in the simulation exactly as they do in the 'Frame Area'. In the 'Frame Area' the frames can have frame objects added to them using the 'Menu Bar' along the top which include video windows or buttons to link a frame to other frames. To the left of the 'Frame Area' is a properties view of the frame or frame object, this includes an 'Events' tab which allows the author to define actions based upon events within the simulation.

To the right of the 'Navigation Bar' is a 'Thumbnails View' allowing the user to view all frames that have been created as they would appear in the simulation. By double clicking on a thumbnail it will then appear in the 'Frame Area'. The author can perform simple functions on the frames within the 'Navigation Bar' and 'Thumbnails View' such as drag and drop to move them or copy and paste to duplicate.

As mentioned, the RapidBuilder is not just used for the creation of soft skill simulations, so there is large variety of other frame objects

3.3.2 Authoring Process

To create a simulation the author first creates and names a new 'Simulation File'. Once this has been done a blank 'Navigation Bar' appears and the author can begin to add new frames to form the simulation. For each frame the author then adds the appropriate frame objects that are to appear in the frame. To create rich media simulations this is a combination of video windows, text boxes, radio buttons and hyperlinks (buttons that link to other frames). How these are combined and located within the frame is at the discretion of the author based on how they would like each frame to look within the simulation. RapidBuilder provides templates to aid the author in creating many duplicate frames which would be preferable when creating rich media education simulations. To link the different frames the author must use the property event view of the different frame objects where there is a drop down list of all frames created for the author to choose from. There is no visual representation of the links made between frames and if no action is defined within the event property view the frames will run sequentially.

Once saved, the author can run the simulation to verify it. The author can then publish the simulation through their server or deploy it in Flash or XML over the web.

3.3.3 Evaluation

The most striking feature of the RapidBuilder authoring tool is its flexibility and ease of use in creating the look of the rich media educational simulation. The author can easily manipulate all aspects of the frames final presentation by dragging and dropping frame objects in the 'Frame Area', resizing them, changing their color or specifying detailed actions based on events within the simulation. This Object Orientated approach gives the author complete control over every aspect of the simulation.

This major drawback however with this characteristic is that the author spends far more time on the end presentation of the simulation rather than on its content. With rich media educational

simulations it is the media that is the focus of the simulation. The video should be shown over as much of the screen as possible and if using audio alone there should be no distractions to allow the learner to be totally immersed in the simulations and improve the educational effectiveness. Another disadvantage of this approach to authoring is there is no separation of concerns with content and end presentation. The actual content of the dialogue model is created at the same time as the frame and is embedded within the frames. Having the dialogue model separate to presentation skin has two advantages. Firstly, editing is made easier for the author as it allows them to focus either the content or presentation and not be confused by trying to do both at the same time. Secondly, it encourages reuse of resources which is a great deal more difficult if the content and presentation have been combined.

Another issue with this authoring tool is that does not give a concise view of the overall simulation that is being created. While there is an option to display the frames in thumbnail form there is no graphical representation of the connections that exist between the different frames. This makes authoring large and complex simulations very difficult.

Overall the ability of the RapidBuilder authoring tool to create online rich media educational simulations is limited. This is due to the fact it has been designed facilitate the authoring of soft skill simulations and hard skill simulations meaning certain compromises must be made to facilitate both.

3.4 Captivate 3

Adobes Captivate 3 eLearning authoring tool [4] was released in 2007 aimed at learning professionals, educators and business users. It allows the author to compose software simulations, presentations, quizzes and rich media online simulations. The simulations that are created to teach soft skills can be composed so as to play a short media clip to the learner and then let them choose from multiple choice options. Branching into different parts of the simulation so the learner is taught through interacting with the simulation.

The authoring tool also offers recording facilities which can be used to either capture screen movements or record sound files. This feature is particularly useful if the rich media being used in the simulation is audio based.

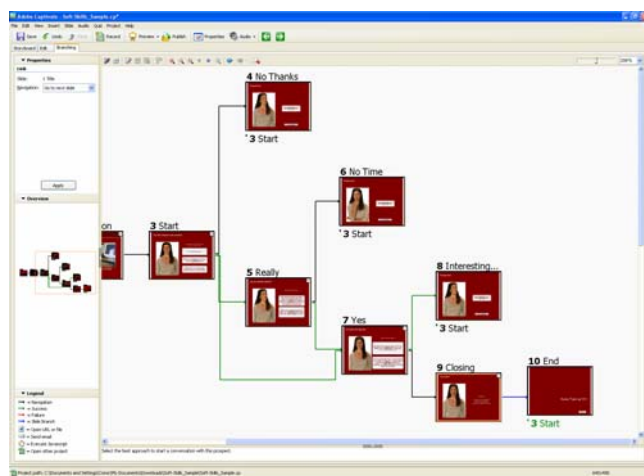


Figure 5: Captivate 3 Authoring Tool

3.4.1 Dialogue Visualization and User Interface

To aid the author in visualizing the simulation that they are composing it is broken down into smaller parts called slides. Each slide represents a section of the simulation corresponding to a rich media clip and multiple choice options which are links to other slides. The authoring tool also allows the author to edit the presentation of the slides with a WYSWYG interface. For example background color, location of multiple choice options, size of video window, etc. The result of which is the dialogue of the simulation is contained within the slides along with the visual description of each slide.

The user interface, as seen in Figure 5, consists of a menu bar across the top with various functionality including save, undo, preview and publish. The rest of the screen is taken up by three tabbed displays which are the 'Storyboard', 'Edit' and 'Branching' displays.

The 'Storyboard' tab displays all the slides that have been created in the simulation as thumbnails so the author can see roughly what each of the slides looks like. Within this display the author can perform basic tasks with the slides that are part of the simulation such copy, paste, delete or moving the slides with drag and drop. While in the 'Storyboard' view the author cannot edit the content of slide, this can be achieved by double clicking the slide so it opens in the 'Edit' tab. Here the author can add a media window, buttons, radio buttons, text, etc. Each of these objects can be moved and resized within the slide. This display also contains another thumbnail view of the slides presented in a column to the left allowing the author to change the slide appearing in the 'Edit' display by clicking on it.

The final display of the authoring tool is the 'Branching' tab which presents the simulation in a graph like view consisting of nodes and edges. Each node representing a slide and being displayed as thumbnail with the edges representing the different types multiple choice links between slides. The slides cannot be moved in this display, they are fixed in the same order as they were placed by the author in the 'Storyboard' view. To alter the connection paths of a slide the author clicks on the existing connection and in a property view to the left of the graph display can choose the new route of the connection from a drop down list of all slides. New connections can not be created in the 'Branching' view.

The 'Branching' view also contains a map outline of the graph view to aid the author in navigating the simulations model when it becomes large and complex. The author can also group several slides together into one thumbnail to reduce the complexity of the graph.

3.4.2 Authoring Process

To create a new simulation the author starts by clicking the 'Record or create a new project' icon on the opening screen. From a popup window that appears they then chose 'Scenario Simulation' from the choices offered and can then use the 'Project Wizard' to create a new project. Within the 'Project Wizard' the author names the project, decides on the size of the end simulations, type of background and how many slides to start with in the simulation. Slides can be added or deleted later in the composition.

Once completed the 'Project Wizard' generates the appropriate slides and opens the 'Storyboard' view. The author then edits

each slide in the 'Edit' tab by adding an appropriate media file using right click and insert. They must also include appropriate multiple choice options in the slide that will appear in the simulation and link these options to other slides. The connecting of slides is completed in the 'Edit' display using a drop down menu of all slides that have been created. Once the all slides have been created and connections are completed the author publishes the simulation in HTML for its distribution.

3.4.3 Evaluation

The most unique characteristic of the Captivate 3 authoring tool is the 'Branching' display which allows the author to view all the slides that are created along with connections between them. This display is particularly unusual as it provides a map and grouping feature to aid the author in navigation. The map shows a miniature version of the main display which uses an orange box to indicate what section of the map is currently being viewed. The grouping function allows the author to encapsulate multiple thumbnails into one thumbnail and thus reduces the complexity of the graph. These are particularly useful when the simulation becomes very large and complex.

The 'Branching' display does however have its drawbacks. Instead of being completely interactive allowing the author to move slides or graphically make connections between them the display is fixed. Existing connection routes can be altered using a drop down menu with a list of all existing slides but to actually create a new connection the author must return to the 'Edit' display.

Certain aspects of the connections within in the 'Branching' display could also be improved. Any connections that are linked to a previous slide are not shown graphically but instead are indicated as text which refers to the name of the slide they are connected to. There are also too many different types of connections within the 'Branching' display, so much so that a legend is provided to explain what type each connection is.

Another usability issue involves the approach of separating the dialogue authoring into three different displays. With a complex simulation the author would find they are constantly going back and forth between displays to add, move and edit the slides.

There is also room for improvement in terms if the visualization of the dialogue. While the 'Edit' display performs very well in allowing the author total control over the presentation of each slide there is no separation of concerns between the dialogue model and visual details of each slide meaning they are blended together. The composition becomes more of a focus on visual details rather than content. It is also noted that the types of video files that can be used in the simulations is rather limited.

Overall Captivate 3 has the potential of being a very useful authoring tool and employs some useful concepts for creating online media rich educational simulations. It is however too centered on the visual display of the simulations rather than the content to allow an author to quickly and easily build large complex simulations. This could improved with a more intuitive and interactive display approach to creating simulations based more on the 'Branching' display that is already in place.

4. KEY REQUIREMENTS FOR AUTHORIZING ONLINE RICH MEDIA EDUCATIONAL SIMULATIONS

The purpose of this section is to examine each of the key requirements needed to allow an author to compose online rich media soft skill simulations in a quick and efficient manner. The requirements have been identified by means of a state of the art survey in the previous section and each are described and discussed with respect to the best practice in authoring the simulations

These include the dialogue visualization, authoring process, a pedagogical framework, visual description of the simulation, scalability and navigation.

4.1 Dialogue Visualization

The ability to visualize the structure and flow of a dialogue is critically important for any authoring tool to support. Soft skill simulations require that all possibilities of the dialogue that can occur are described by the author. This description of the dialogue forms the model upon which the simulation operates. The model contains the dialogue components, connections between these components, links to all of the content and any other information needed by the simulation. For the author to describe this they need an interface that is user friendly and intuitive such as that provided by the VISION authoring tool.

While the authoring tool surveyed do acknowledge the need for the dialogues to be decomposed into smaller more manageable components they do not recognize the need for the graphical display that sufficiently captures the dialogue. The use of text boxes, such as those used in Experience Builder, is inadequate for this purpose. Text boxes do not offer a visual interface that is necessary for displaying different routes that could be taken within the simulation. The author can also only view small portions of the dialogue at any one time. To have a clear understanding of the dialogue the authoring tool should be capable of displaying the whole dialogue and not just small sections.

Although RapidBuilder and Captivate 3 do provide graphical representation to utilize the dialogue the interface is restrictive. For example RapidBuilder allows the author to view the entire simulation in a thumbnail format but does not graphically indicate the links between the different components. In the 'Branching' display Captivate 3 does allow the author to view these connections but all the simulation components (slides) are fixed and connections cannot be moved, deleted or created graphically. Connections can only be created or deleted in the 'Edit' display and the author must use a drop down box to alter what slide the connection links to.

The dialogue visualization in the VISION authoring tool does not suffer from the same restrictions. By using a graph approach to represent the dialogue the VISION tool allows the author to quickly create dialogue components, populate them and connect them. This approach also still allows the author to maintain an overall view of the dialogue including connections between the different components. The only issue raised is the difficulty in navigating the graph produced when authoring large complex simulations. This can be addressed with navigation aids while still preserving the integrity of the dialogue visualization.

4.2 Authoring Process

As mentioned, the dialogue is very important but it is only one aspect of authoring that needs to be addressed in order to support the effective development of simulations. An additional requirement needed to author these simulations is a clear and concise process for authoring. The authoring process is an outline or blueprint that the author follows to insure the simulations created achieve their goals. It is a step-by-step cycle which is also an iterative process as an author is unlikely to create an affective online soft skill simulation in their first attempt. They must review and edit the different aspects of their simulation, constantly making adjustments until the simulation meets their needs. Part of this authoring process does include the composition of the dialogue but also includes all other steps involved in creating the simulations. For example, describing the scenario or outlining the situation in which the simulation takes place. Without these steps the author would have no abstract view of what they are attempting to achieve with the simulations.

The VISIOOn authoring tool provides the author with the functionality to author a dialogue but does not provide any support to this authoring process. RapidBuilder and Captivate 3 do provide help functionality but this is more of a user manual than a formal authoring process. Experience Builder does however provide an authoring process for the author to follow. In fact this authoring tools central approach to creating simulations is based upon the author following this process. This insures the author has a complete understanding of the simulations they are creating and so is more likely to create simulations with the desired affect.

4.3 Pedagogical Framework

The main goal of the soft skill simulations created is to infer knowledge to the learner. To accomplish this, the simulations must be educationally sound. This can only be insured by putting in place a pedagogical framework to support the author. A pedagogical framework consists of support structures, standard operating procedures and pedagogical best practice that are in place to aid the author while composing their simulations. They are placed across the entire authoring process. Without such a framework, the author risks creating simulations that contain no educational merit.

Experience Builder is the only authoring tool out of the four surveyed to include any kind of a pedagogical framework. In the initial step of its process that describes the project, the author can create and populate learning objectives. When creating a new course or syllabus it is normal practice to identify and describing learning objectives. This should also be the case if creating new simulations that are to be used in education. A useful addition to describing the learning objectives in Experience Builder would be allowing the author to associate each of the learning objectives with the dialogue components. This would insure all learning objectives are addressed and that all the content developed by the author serves an educational purpose.

4.4 Visual Description of the Simulation

This requirement refers to the presentation of the simulations to be delivered, how each of the components that are incorporated in the simulation are layered. This would, for example, include the location of multiple choice options, background color, size of video window, etc. Two of the authoring tools examined,

RapidBuilder and Captivate 3 place a very high priority on the author's role in detailing the visual description. Their approach is to combine the visual description of simulations with the model upon which the simulation will operate. This 'page built' approach, so called as the author composes each of the simulations pages individually, results in the content and visual description being blended together. Without these being separated concerns there is less opportunity for reuse and any editing of the visual description that may occur would result in each page being edited individually. In contrast is the VISIOOn authoring tool which does not allow the author to influence the visual description whatsoever. While the author is not distracted from creating the content of the simulation, they do not control all aspects delivered to the learner. The optimal approach is provided by Experience Builder which separates the dialogue from the visual description but still allows the author to choose a "skin", a canned look and feel, for the delivery to the learner.

4.5 Scalability

The ability to create very large and complex simulations should be provided for by the authoring tool. To accomplish this author needs to be able to perform the following functionality:

Quickly and easily create the components of the dialogue

Quickly and easily create links between different components of the dialogue

Provide a view of the entire dialogue including a visual representation of links that exist

The only authoring tool that accommodates these specifications is the VISIOOn authoring tool. While all other authoring tools surveyed would technically be capable of creating large complex simulations the logistics in doing so would make it far too difficult a task.

Scalability is also closely connected with the dialogue visualization. Without a visually accessible dialogue, creating a large complex simulation is very difficult due to the cognitive overload suffered by the author. For example, creating a large simulation with Experience Builder, which uses text boxes for to visually represent the dialogue, the author would find it a near impossible task to simply remember which dialogue components are connected to which.

4.6 Navigation

Although Captivate 3 is not suited to authoring large complex simulations due to the time it would consume to create all the dialogue components and connect them, it does offer some novel approaches in presentation and navigation. Within its 'Branching' display the entire simulation is viewable by the author, although there is some interaction possible this is very restricted. One of the navigational aids offered to the author is a map of the entire 'Branching' display. Within this map the author can drag the outline of a small orange box which indicating what is being presented in the 'Branching'. As the author moves position of the orange box within the map the 'Branching' display moves accordingly.

Another interesting feature is the grouping function in the 'Branching' display that allows the author to replace several slides with one slide that represents the group. The group of slides can still be accessed by rolling the mouse over the group slide to

reveal the slides that are hidden. By reducing the number of slides visible, Captivate 3 also reduces the complexity of the data that the author needs to manage. While the other authoring tools surveyed do offer some navigational aids such as zoom functionality, Captivate3 is by far the most novel approach.

4.7 Summary

With the exception of RapidBuilder each of the four authoring tools surveyed offers an approach that is functionally adequate for authoring online rich media soft skill simulations. A summary of how well each authoring tool performs with respect to each requirement can be viewed In Table 1.

Table 1: Authoring Tools Surveyed

	VISION	Experience Builder	Rapid Builder	Captivate3
Dialogue Visualization	X			
Authoring Process		X		
Pedagogical Framework		X		
Visual Description		X		
Scalability	X			
Navigation				X

It should be noted that although RapidBuilder and Captivate 3 can be used as authoring tools to produce soft skill simulations they can also be used to author hard skill simulations. By being flexible enough to accommodate the authoring of both hard and soft skill simulations means there must be compromises made. This is particularly true of the dialogue visualization separation of content from the visual description. The manner in which both RapidBuilder and Captivate 3 approach these issues would be more appropriate to authoring hard skill simulations where visual description and content are combined. What works well for authoring soft skill simulations does not necessarily work well for authoring hard skill simulations.

5. CONCLUSION

ELearning has become a widely accepted, adopted and almost expected part of learning and teaching. Learners are now looking more towards the web as a viable and valuable source of information in their learning experience. As part of this there is a requirement in education that the learner is immersed in the experience. Applications in the past could not support this approach to education but now with the advent of web technologies such as Web 2.0 the learners expect engaging and captivating eLearning experiences where they are given an aspect of control. Online simulations are an excellent example of educational tools that deliver these types of engaging experiences to the learner. They have also become essential instruments with regard to teaching in certain domains where the only affective strategy that really works is the education provided by experience.

The one disadvantage with employing online simulations in education is the complexity involved in their composition. In this paper there is survey of authoring tools used to create such simulations. In particular the survey focuses on the authoring

tools that are used to create soft skill simulations which utilize rich media to create realistic and engaging eLearning experiences. The authoring tools surveyed are moving in the right direction and through analysis of the state of the art survey categories of key requirements have been identified. Overall the state of the art is promising and the issues raised are very addressable. The authoring tools of the future promise to be more user friendly, intuitive and accessible to educators in all domains

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