SE 315 SOFTWARE PROJECT MANAGEMENT

A Bronchoscopy Simulation for Department of Pulmonary Diseases in Hospitals

Software Development Plan

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1. INTRODUCTION

A bronchoscopy is an examination of the air passages leading to the lungs. It involves passing a narrow, flexible instrument through the mouth or nose and into the airways. The procedure itself, which is useful in the diagnosis and treatment of pulmonary disorders, involves little risk and is not painful.

Bronchoscopy can help to find the cause of a lung problem. For example, during the procedure, the doctor may see; a tumor, signs of infection, excess mucus in the airways, the site of bleeding, a blockage in airway. The doctor also may take samples of mucus or tissue from lungs to test in a laboratory.

In this document, everything needed to know about this project is explained in detail. High-level functionality, stakeholders, project staff distribution, project needs, tradeoffs, software process, requirements, detailed project schedule, measurements, risks, software tools, payoffs, all kinds of supports (including hardware, software and personnel support) are explained clearly. This will be very helpful to the project manager if it is followed during development.

2. OBJECTIVE

Objective of this project is to prepare a simulation of a bronchoscopy operation. So that the patients' anxiety, concerns are going to decrease. It is more effective to see what things will come up rather than reading it. This animation is going to include;

- What to do before and after bronchoscopy operation
- Whole bronchoscopy process from start until the end
- The things that the patient should do and should not do during the operation (clothing, lying position on the operating table etc.)
- What kind of devices will be used

3. HIGH-LEVEL FUNCTIONALITY

The bronchoscope has a light and small camera that allows the doctor to see windpipe and airways and take pictures. If the patient have a lot of bleeding in the lungs or a large object stuck in the throat, the doctor may use a bronchoscope with a rigid tube. The rigid tube, which is passed through the mouth, is wider. This allows the doctor to see inside it more easily, treat bleeding, and remove stuck objects.

The patients who are going to be operated by bronchoscopy are informed with a document which involves only three papers of instructions about the operation, the risks, the things that they need to do on the operation day. Since the age of the patients changing between 30 and 70, some of them are not able to read that document, some of them do not read or understand

what is written. Therefore they are having anxieties, and some concerns about the operation. This makes them to fear on the operation day and making the process difficult to complete.

To get rid of these concerns, a good researched animation is going to be developed. This animation is going to help doctors to deal with fear issue of their patients.

3. 1. Requirements

3. 1. 1. Functional Requirements

- Bronchoscopy room should be introduced on the screen at first.
- Animation should be composed of three parts: before, during and after bronchoscopy.
- Sound acting should be clear about the instructions in the video.
- The scenario should follow the instructions document.
- Lung tunnel should be clearly visible and smooth.
- All medical tools about bronchoscopy should be included in the video.
- Lung information should be given at somewhere before bronchoscopy operation.

3. 1. 2. Non-Functional Requirements

- Patients should not be frightened about what they see on animation (i.e. bleeding). That is the main purpose of the project.
- Video length should be around 5 minutes.
- Real human figure cannot be used as patient only doctor figures can.
- Voice acting should be as friendly as it can to believe patients that this is not a surgical operation.

3. 1. 3. Quality Assurance

Quality assurance (QA) is a process-centered approach to ensuring that a company or organization is providing the best possible products or services. It is related to quality control, which focuses on the end result, such as testing a sample of items from a batch after production. Although these terms are sometimes used interchangeably, quality assurance focuses on enhancing and improving the process that is used to create the end result, rather than focusing on the result itself. Among the parts of the process that are considered in QA are planning, design, development, production and service.

In this project, testing will be the main quality assurance tool. Every part will be tested during the development as it has been explained before. Other than that the development will follow ISO 9001 standards.

4. STAKEHOLDERS

There are three types of stakeholders in this project;

- Development team
- Customers
- Prospective customers

4. 1. Development Team

The developers and the project manager are the natural stakeholders of the project. The categorization of all developers is explained in detail at “Project Staffing” section.

4. 2. Customers

The customers are the doctors, assistant doctors, hospital managers and patients of Adnan Menderes University Medical Faculty Hospital, Department of Pulmonary Diseases.

- **Doctors:** They will verify the animation whether it is suitable for the presentation or not by watching it.
- **Assistant Doctors:** They will present the animation to the patients after it is completely developed. They will hold statistics about the reactions, behaviors of the patients as well to survey the usability of the project.
- **Manager of Department of Pulmonary Diseases:** He will be responsible from the payment of the project.
- **Patients:** They will watch the video; learn the process of the bronchoscopy operation about how it is being done, how to prepare themselves for the operation.

4. 3. Prospective customers

If the project will be successfully implemented, there may be other departments of the hospital which may want similar animations for their specializations such as;

- Colonoscopy
- Endoscopy
- Gastroscopy and etc.

5. SOFTWARE PROCESS

In this project, exploratory development part of evolutionary development process is going to be used. The objective will be to work with customers and to evolve a final system from an initial outline specification. Therefore it should start with well-understood requirements and add new features as proposed by the customer.

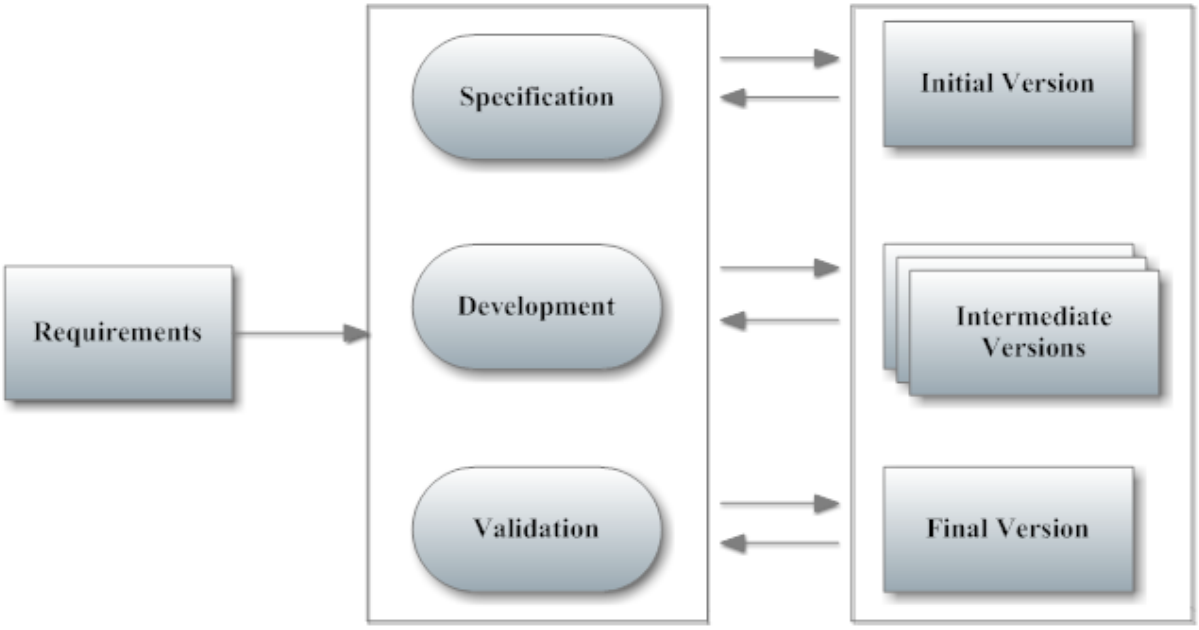


Figure 1: Evolutionary Development

Additionally, the whole animation will be divided into parts. Each part will be tested during the development cycle (using component testing) not at the end. Each team member will be responsible for their parts mainly.

However when it comes to merge all the parts, they can all suggest their opinions. Other than that after some time, the completed part of the project will be delivered to the customer for testing whether it is being done correctly or not. Then missing parts will be filled according to customer needs. This means an iterative development process is going to be used as well.

6. PROJECT STAFFING

There will be seven types of project staff; a software project manager, a requirements engineer, a lead designer, a 3D graphics designer, a photoshop specialist, an animation designer and a sound effect supervisor.

- **Software Project Manager:** He will have the responsibility of planning and scheduling the project, assessing risks, managing the team members, organizing tool selection and etc.

- **Requirements Engineer:** He will be responsible for identifying the stakeholders getting the requirements from the customers, analyzing and documenting the software requirements.

- **Lead Designer:** He will work like a director of the animation with senior management team to create define and shape the overall vision of the project as well as the creative and production direction needed to achieve this.

- **3D Graphics Designer:** He will have the responsibility of drawing the objects such as organs and tools to be processed in the animation using some specific software tools.

- **Photoshop Specialist:** He will take the needed photos in the operation room and convert them into PNG format, extract items such as operation table, monitors and etc. to be able to use in the animation properly.

- **Animation Designer:** He will work with lead designer to create the scenario of the animation.

- **Sound Effect Supervisor:** He will be responsible for all the sound management of the project. Also he will vocalize whole script for the animation.

7. PROJECT RISKS

Project risks are going to be analyzed with combined risk list.

7.1. Likelihood Risk List

Likelihood Rank	Risk Description
1	**Requirements Volatility:** Requirements can be changed during the development cycle when requested from customer.
2	**Training:** If developers are not familiar with chosen tools the training time may be required to speed up with platform and process**.**
3	**Design Complexity:** Design might be getting complex day by day with new requirements and such. It should be clear and as simple as possible.
4	**Tools:** New configuration management and design tools should be suitable for the team.
5	**Testing:** Since testing will be done at every step, there may be some errors and faults occur. Error handling is a must for the project.

7. 2. Impact Risk List

Impact Rank	Risk Description
1	**Training:** If developers are not familiar with chosen tools the training time may be required to speed up with platform and process**.**
2	**Design Complexity:** Design might be getting complex day by day with new requirements and such. It should be clear and as simple as possible.
3	**Testing:** Since testing will be done at every step, there may be some errors and faults occur. Error handling is a must for the project.
4	**Requirements Volatility:** Requirements can be changed during the development cycle when requested from customer.
5	**Tools:** New configuration management and design tools should be suitable for the team.

7. 3. Combined Risk List

Likelihood Rank	Impact Rank	Combined Rank	Risk Description
2	1	**3**	**Training:** If developers are not familiar with chosen tools the training time may be required to speed up with platform and process**.**
3	2	**5**	**Design Complexity:** Design might be getting complex day by day with new requirements and such. It should be clear and as simple as possible.
1	4	**5**	**Requirements Volatility:** Requirements can be changed during the development cycle when requested from customer.
5	3	**8**	**Testing:** Since testing will be done at every step, there may be some errors and faults occur. Error handling is a must for the project.
4	5	**9**	**Tools:** New configuration management and design tools should be suitable for the team.

8. SOFTWARE NEEDS

Features, resources, time, cost, productivity and quality are the most important needs to be considered in a software project. Since this is a software project, it has to be analyzed.

When analyzing those project needs, the best way to use features/resources/time triangle.

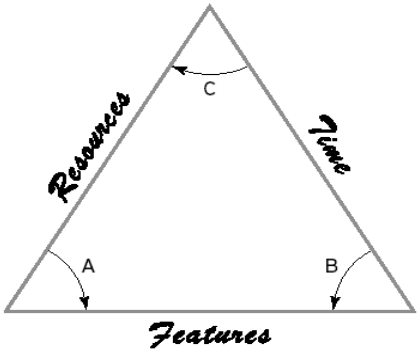


Figure 1: Features/Resources/Time Triangle

There might be some additional features on the project when requested by the customer. This will definitely delay the delivery time of the project. Therefore it has to be included in the schedule like an extension.

When the productivity of engineers is increased, the quality of the work will be increased too. Therefore their salary, morality and working environment should be as balanced as possible.

There will be lots of meetings during the development time. It may consist of a group of developers or sometimes all developers should attend to the meetings. The project manager will trace the meeting time and the content of the meetings as well as individual working times of the people. By doing this, the time will not be spent on useless tasks.

9. MEASUREMENTS

There is a number of different software measurements needed to be included in this project.

- **Schedule and Effort:** This is given in detail at schedule and efforts section already.
- **Number of Changes:** Requirements and some design properties may change during the development process. It is needed to be tracked to measure the quality of the work.
- **Amount of Media:** Since this is an animation project, the amount of media should be tracked to see how much the project improved from beginning to end.
- **Lines of Code:** There will be some Action Script 2.0 codes in the project. By counting these codes it will help to measure how much effort used in development.
- **Defect Count:** Defects are natural consequences of all projects. Defects should be fixed whenever they are found in the system. The number of these defects will show how robust the system.

10. SOFTWARE TOOLS

Software tools are chosen by using a comparison graph. As an example for one of the chosen tools are as follows;

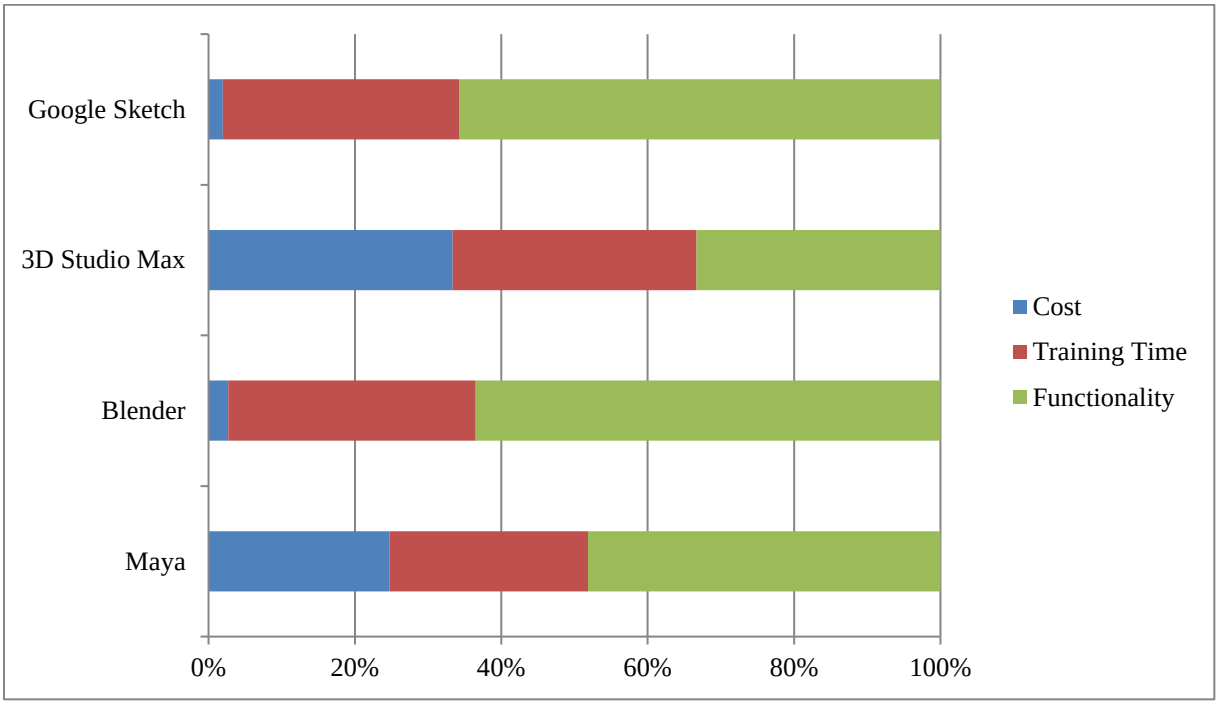
10. 1. Tool Cost/Training/Functionality Data

Tool	Maya	Blender	3D Studio Max	Google Sketch
Cost	$1450	$29	$3450	$49
Training Days	5	1	10	3
Functionality	80	20	90	55

10. 2. Normalized Cost/Training/Functionality Data

Tool	Maya	Blender	3D Studio Max	Google Sketch
Cost	45.6	0.8	**100.0**	1.8
Training Days	50.0	10.0	**100.0**	30.0
Functionality	88.8	18.8	**100.0**	61.1

10. 3. Normalized Tool Graph



As result 3D Studio Max is the most suitable tool for the project. Maya is also needed to support the design.

10. 4. Additional Tools

- **3D Studio Max:** Autodesk 3DS Max software provide powerful, integrated 3D modeling, animation, and rendering tools that enable artists and designers to focus more energy on creative, rather than technical challenges. The products share core technology, but offer specialized toolsets for game developers, visual effects artists, and motion graphics artists along with other creative professionals working in the media design industry on one hand; and architects, designers, engineers, and visualization specialists on the other. All the organs, bronchoscopy tools, cyringes and etc. will be drawn by using this tool.

- **Maya:** Autodesk Maya 3D animation software delivers a comprehensive creative feature set with tools for animation, modeling, simulation, rendering, matchmoving, and compositing on a highly extensible production platform. The animation of when bronchoscop is inside the body at throat and lungs will be created by using this tool.

- **Macromedia Flash 8:** Macromedia Flash is a multimedia platform used to add animation, video, and interactivity to web pages. Flash is frequently used for advertisements, games and flash animations for broadcast. More recently, it has been positioned as a tool for "Rich Internet Applications" ("RIAs"). This is the main software of the project. All the scenario will be created by using this tool. Before bronchoscopy, after bronchoscopy, operation room and tools will be animating with this.

- **Adobe Photoshop:** Adobe Photoshop software delivers even more imaging magic, new creative options, and the Adobe Mercury Graphics Engine for blazingly fast performance. Retouch with greater precision, and intuitively create 3D graphics, 2D designs, and movies using new and reimagined tools and workflows. Taken pictures on real operation room will be turned into PNG format using this tool.

- **SWF to AVI Converter:** When the project is completed, Flash will create a SWF file. In order to deliver it to the customer and open it on every Windows computer, it will be converted to AVI format using this tool.

11. PROJECT SCHEDULE

In software project management, a schedule consists of a list of a project's terminal elements with intended start and finish dates. It is the most crucial part of a software development process. Each date must be reasonable and included with delay times. A good schedule will probably lead to a quickly completed and qualified product.

Detailed project schedule of the project is given below;

Task Name	Duration	Start	Finish	Predecessors
Requirements Phase	**20 days**	**Mon 09.04.12**	**Fri 04.05.12**	
Reqirements Gathering	5 days	Mon 09.04.12	Fri 13.04.12	
Requirements Analyzing	8 days	Mon 16.04.12	Wed 25.04.12	2
Requirements Documenting	7 days	Thu 26.04.12	Fri 04.05.12	3
Design Phase	**27 days**	**Mon 07.05.12**	**Tue 12.06.12**	**1**
Tool Choosing	2 days	Mon 07.05.12	Tue 08.05.12	
Tasks Distributing	2 days	Wed 09.05.12	Thu 10.05.12	6
Scenario Writing	5 days	Fri 11.05.12	Thu 17.05.12	7
Data Capturing	10 days	Wed 16.05.12	Tue 29.05.12	
Design Documenting	10 days	Wed 30.05.12	Tue 12.06.12	9
Software Delevopment Phase	**67 days**	**Wed 13.06.12**	**Wed 12.09.12**	**5**
Voice Recording	2 days	Wed 13.06.12	Thu 14.06.12	
Pictures Crop & Editing	10 days	Wed 13.06.12	Tue 26.06.12	
Medical Tools Drawing	10 days	Wed 13.06.12	Tue 26.06.12	
Before Brochoscopy Animation Development	15 days	Wed 27.06.12	Tue 17.07.12	13;14
Iteration I	1 day	Wed 18.07.12	Wed 18.07.12	15
During Bronchoscopy Animation Development	15 days	Thu 19.07.12	Wed 08.08.12	16
Iteration II	1 day	Thu 09.08.12	Thu 09.08.12	17
After Bronchoscopy Animation Development	15 days	Fri 10.08.12	Thu 30.08.12	18
Iteration III	1 day	Fri 31.08.12	Fri 31.08.12	19
Throat Animation Development	20 days	Tue 03.07.12	Mon 30.07.12	
Voice Adding	5 days	Fri 31.08.12	Wed 05.09.12	21
Merging All Animation Phases	5 days	Thu 06.09.12	Wed 12.09.12	22
Software Testing Phase	**10 days**	**Thu 13.09.12**	**Wed 26.09.12**	**23**
Animation Testing	10 days	Thu 13.09.12	Wed 26.09.12	
System Finalizing	**11 days**	**Thu 27.09.12**	**Thu 11.10.12**	**25**
Credits Preparing	3 days	Thu 27.09.12	Mon 01.10.12	
System Finalizing	7 days	Tue 02.10.12	Wed 10.10.12	27

Figure 2: Schedule of the Project

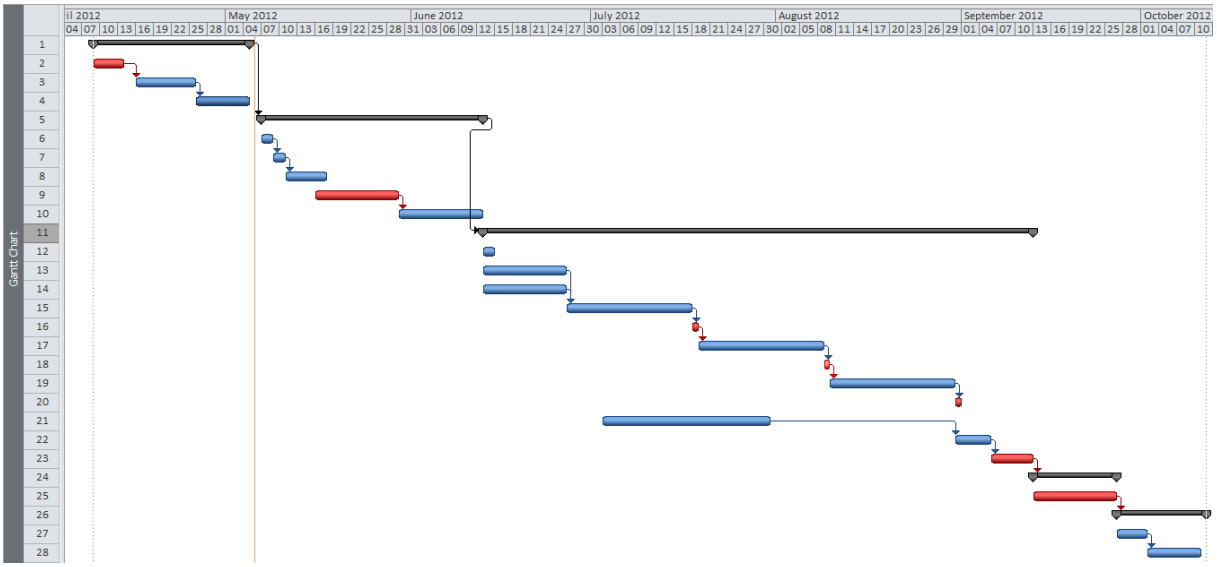


Figure 3: Gantt Chart of the Schedule

12. EFFORT AND COCOMO CALCULATIONS

The overall cost of the project is estimated by the following criteria;

- **Software Pricing**

TOOL NAME	PRICE
3Ds Max	$3,450
Maya	$1,450
Macromedia Flash 8	$50
Adobe Photoshop	$700
SWF to AVI Converter	$39
Total:	*$5,689*

- **Effort Pricing**

PERSON	PRICE
Software Project Manager	6 x $3,000 = $18,000
Requirements Engineer	1 x $2,000 = $2,000
Lead Designer	1 x $2,000 = $2,000
3D Graphics Designer	5 x $2,500 = $12,500
Photoshop Specialist	4 x $2,000 = $8,000
Animation Designer	4 x $2,000 = $8,000
Sound Effect Supervisor	1 x $1,000 = $1,000
Total	*$51,500*

- **Additional Costs**

  Office, network and etc. costs: for 6 months approximately $10,000

- **TOTAL : $5,689 + $51,500 + $10,000 = $67,198**

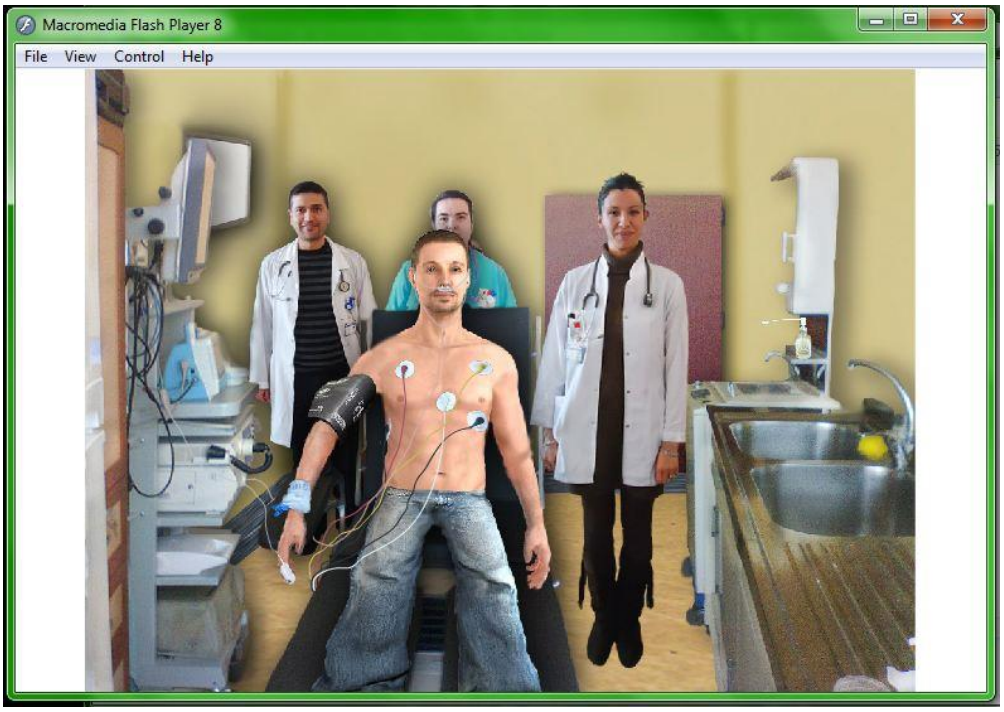
13. PROJECT PAYOFFS

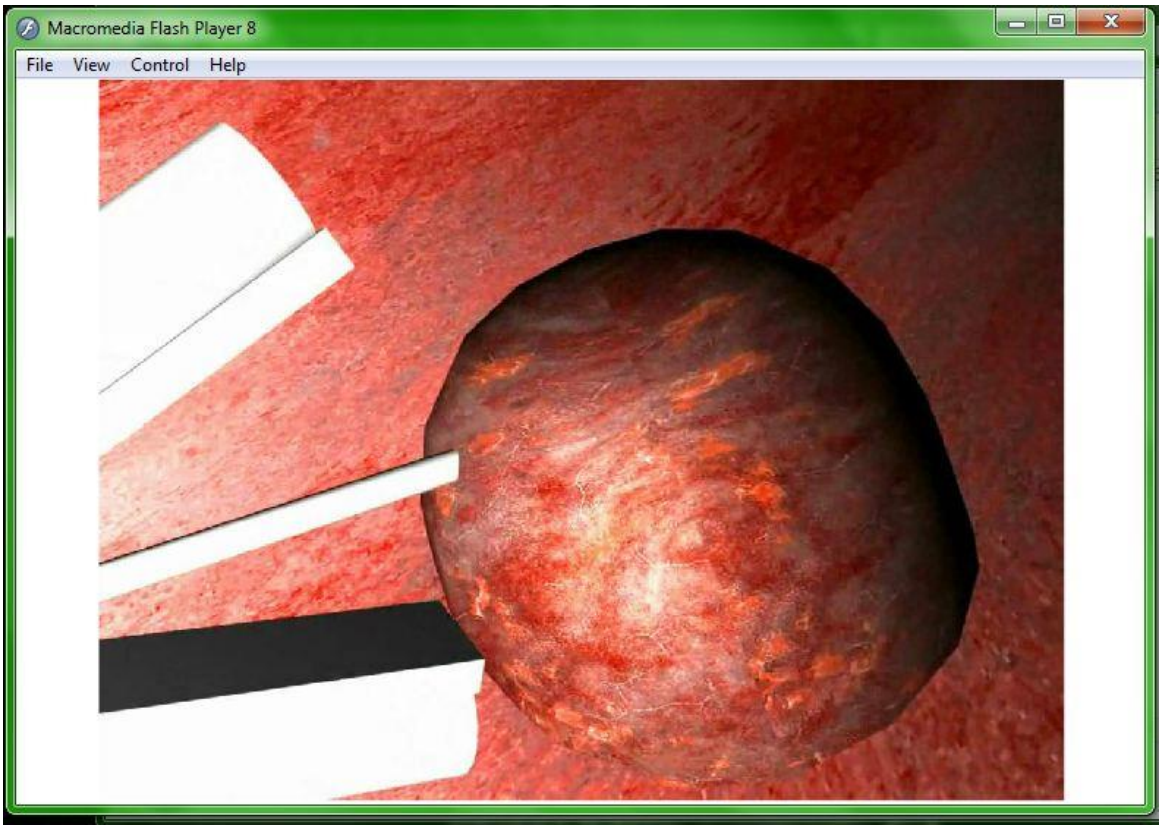
If the project is successfully implemented;

- The patients' anxieties are going to be decreased so that they will not be stressed on the operation day.
- The quality of Adnan Menderes Hospital will be increased.
- The development team will be seen as a strong team by others and they may get similar projects to be done with this.

- Team members will be expert on the software they used for the project.
- Software process and measurements will be more valuable to the team.
- These payoffs will maximize the production quality and performance of team members.

13. USER INTERFACES




Macromedia Flash Player 8
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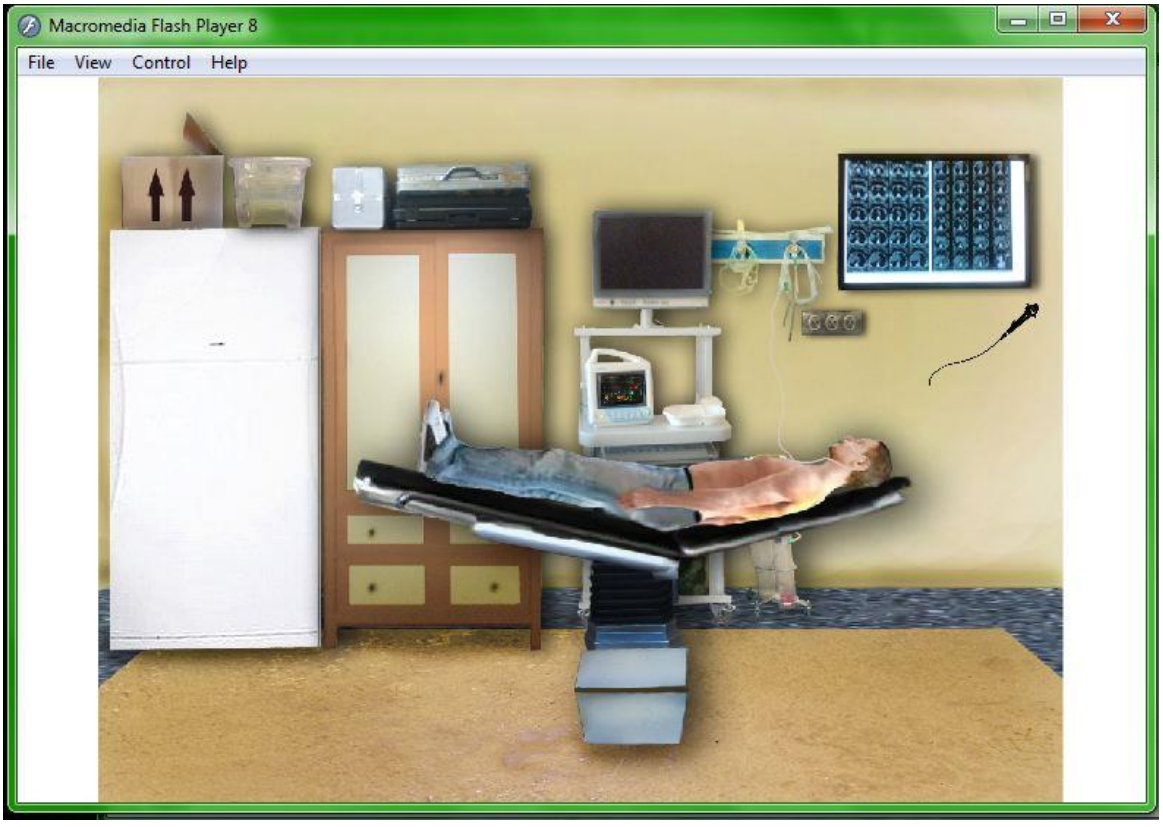
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14. CONCLUSION

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