Improving Animation for Novel Surgical Device Education and Adoption

PROJECT CONCEPT

The development of novel surgical devices is driven by the need to address new findings in emerging research and to improve patient care. However, the process of implementing such devices into current medical practice faces many challenges.[1] Surgeons cite ease of learning as a key determining factor in the adoption of a new device.[2-4]

This 3D animation project is about a new device used for liver trauma management: a transparent, non-adherent inflatable bag designed to surround the liver and control bleeding known as the *liver airbag*. This particular device would benefit from 3D animation as it is a complex product that requires an explanation of how it interacts with the surrounding anatomy. However, there is a lack of research on how to produce an effective animation that educates, engages, and convinces surgeons to adopt a device.

This project will combine research from the fields of education and advertising in order to create an effective animation that will not only inform but compel surgeons to action and to adopt the device. Recommended guidelines will be created based on the research and the *liver airbag* animation will be created as an example. A qualitative feedback survey will be given to surgeons following its presentation at the Trauma Association of Canada 2021 conference. This will serve to improve the previously developed guidelines by determining which characteristics of novel medical device animations are effective, according to the preferences of surgeons. While the animation created in this project will focus on a specific tool, the larger goal is to demonstrate effective practice in 3D animations for surgeons learning about novel surgical devices.

POTENTIAL CONTRIBUTION TO BIOCOMMUNICATION

In addition to contributing to an important emerging innovation that can significantly improve trauma patient outcomes, this project will guide future developments in 3D animations for medical device education. Previously, animation has been used for the purpose of education or advertising. This project proposes using elements from these two fields to effectively help innovations become implemented into current practice.

SUPPORTING IMAGES

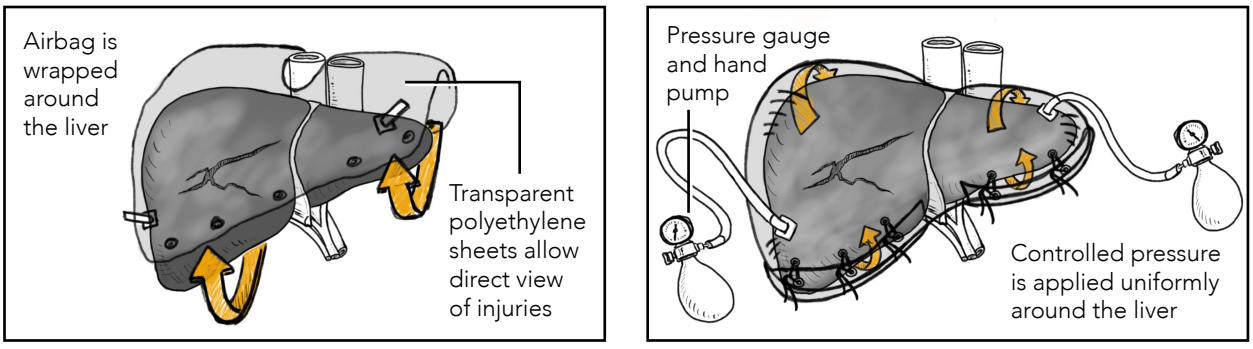


Fig 1: Storyboard selections depicting how the *liver airbag* is applied and its function.

OBJECTIVES

1) **Research techniques and practices** proven to be effective in the field of multimedia education and communication. Research in the field of advertising/marketing that will guide design for compelling viewers to adopt the device and technique.
2) **Develop recommended guidelines** based on the aforementioned research for the production of the 3D animation.
3) **Create a 3D animation** that teaches surgeons how to use a novel device for liver trauma management and convinces them to adopt the device into their own practice.
4) **Investigate the efficacy** of the animation through an expertise-based evaluation that will be given to surgeons to assess their preferences and perceptions.

AUDIENCE

The animation's primary audience is surgeons and medical professionals involved in the surgical repair of liver trauma and disease. A secondary audience includes investors who may be interested in funding the device creation and other healthcare providers who may be interested in adopting the *liver airbag* device into their practice or institutions.

MATERIALS & METHODS

An extensive literature review and media audit was conducted to identify effective attributes of educational media and in advertisement. These attributes combined have served as a guide for this project's animation design. Scripting and storyboarding will be validated for scientific accuracy by a trauma surgeon at St. Michael's Hospital. The animation will not only educate on how to use the *liver airbag*, but it will provide reasons as to why it is superior to current practice. An animatic will be produced using Adobe After Effects. The liver asset will be created using CT data generated in Horos, a 3D segmentation software, while the *liver airbag* will be modelled in Autodesk Maya. The 3D animation will be created in Autodesk Maya, narration will be recorded and edited in Adobe Audition, and video editing and compositing done using Adobe After Effects and Premiere Pro. A qualitative feedback survey will be given along with the animation to assess which characteristics of the animation are effective according to the perceptions and preferences of surgeons. This will serve to further improve the recommended guidelines for the production of future effective animations that educate, engage, and convince surgeons to adopt a device.

MEASUREMENTS OF SUCCESS

Continued feedback from content advisors throughout the project duration will ensure the anatomical and procedural accuracy of the *liver airbag* animation. Results of the qualitative feedback survey will determine the success of the animation and inform the continued development and refinement of the proposed criteria.

Ultimately, the long term success of this project will be determined by the adoption of the *liver airbag* by other surgeons and the use of the proposed criteria in the development of future medical device educational animations.

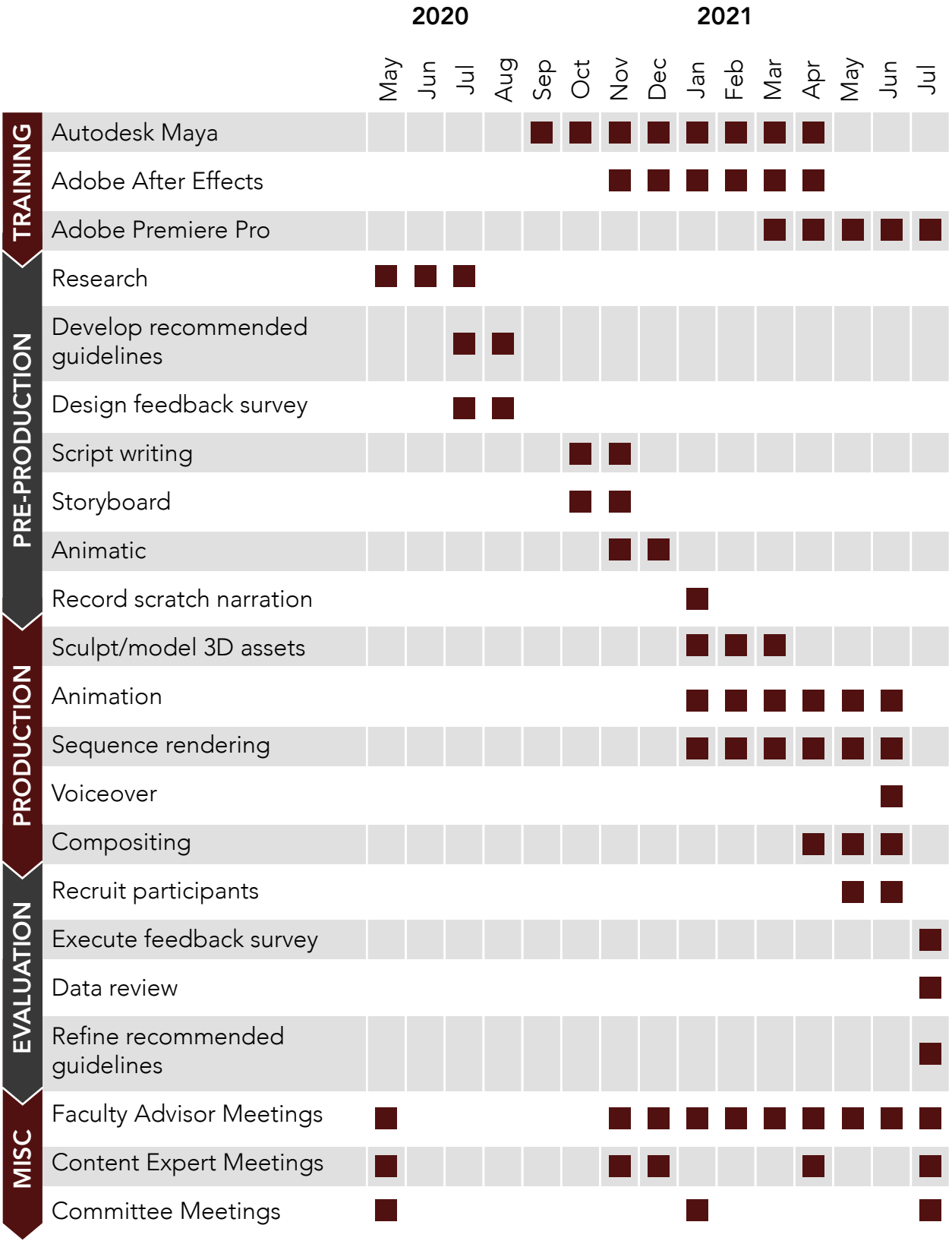
BUDGET

Item	Provided by UofT	Requested from VT
Hardware		
Apple Mac Pro desktop	$6,000.00	---
ASUS PB298Q 29" LED monitor	$200.00	---
Wacom Cintiq tablet	$1,000.00	---
Seagate 2TB external hard-drive	---	$65.00
Blue Yeti USB microphone	---	$135.00
Software		
Adobe CC subscription	$200.00	---
Horos 3D medical imaging viewer	*No associated cost*	---
Autodesk Maya educational license	*No associated cost*	---
Arnold Renderer educational license	*No associated cost*	---
Pixologic ZBrush license	$480.00	---
Procreate	---	$10.00
Reference Material		
Textbooks	*No associated cost*	---
LinkedIn Learning tutorials	---	$300.00
Dissemination		
Trauma Association of Canada registration fee	---	$20.00
Travel fares *	---	$700.00
TOTAL	**$7,680.00**	**$1,230.00**

JUSTIFICATION FOR BUDGET

Hardware: The external hard-drive will be used to store project files and assets. The Blue Yeti microphone will be used to produce studio-quality recordings for the animation's voiceover.
Software: The Procreate app for iPad will be used for ideation sketches and storyboarding.
Reference Material: LinkedIn tutorials will assist in learning specific techniques in the various softwares.
Dissemination: I am invited to share the *liver airbag* animation at the Trauma Association of Canada 2021 conference which will be held in Vancouver, British Columbia. * Travel will depend on the COVID-19 situation.

PRODUCTION SCHEDULE



REFERENCES

1. Rogers, W. A., Lotz, M., Hutchison, K., Pourmoslemi, A., & Eyers, A. (2014). Identifying surgical innovation: a qualitative study of surgeons' views. *Annals of surgery*, 259(2), 273-278.
2. Stafinski, T., Topfer, L. A., Zakariasen, K., & Menon, D. (2010). The role of surgeons in identifying emerging technologies for health technology assessment. *Canadian Journal of Surgery*, 53(2), 86.
3. Lewis, T. L., Furness, H. N., Miller, G. W., Parsons, N., Seers, K., Underwood, M., & Metcalfe, A. J. (2018). Adoption of a novel surgical innovation into clinical practice: protocol for a qualitative systematic review examining surgeon views. *BMJ*, 8(4).
4. Wilson, C. B. (2006). Adoption of new surgical technology. Bmj, 332(7533), 112-114.Wilson, C. B. (2006). Adoption of new surgical technology. *BMJ*, 332(7533), 112-114.