AN ANALYSIS OF PIPELINE TECHNOLOGY UPDATE PRACTICES

A Thesis

by

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ABSTRACT

The production 'pipeline' is a compilation of conceptual methodologies and software tools which allow a group of people to complete projects of varying scale. Animation, video game, and visual effects studios all use pipelines adapted to their own studio-specific needs. Each studio uses different methods for updating pipeline technology. This thesis utilizes interviews with industry professionals and an analysis of published works to find similarities between those methods and presents general principles for pipeline technology update practices. The findings of this research show some trends across all studios surveyed, which can be used by studios or academic institutions as a baseline for good update practices.

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Contributors

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All other work conducted for the thesis was completed by the student independently.

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NOMENCLATURE

VFX	Visual Effects
GUI	Graphical User Interface
TD	Technical Director
ILM	Industrial Light + Magic
MPC	The Moving Picture Company
IRB	International Review Board

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1. INTRODUCTION

The goal of this thesis is to analyze pipeline technology update practices through the study of professional computer animation, game, and visual effects (VFX) studios. A literature search and survey of various studios were conducted with the goal of determining generalized pipeline technology update practices; furthermore, I will propose how these practices might be used in academic or professional studio environments.

1.1 Introduction to Pipelines

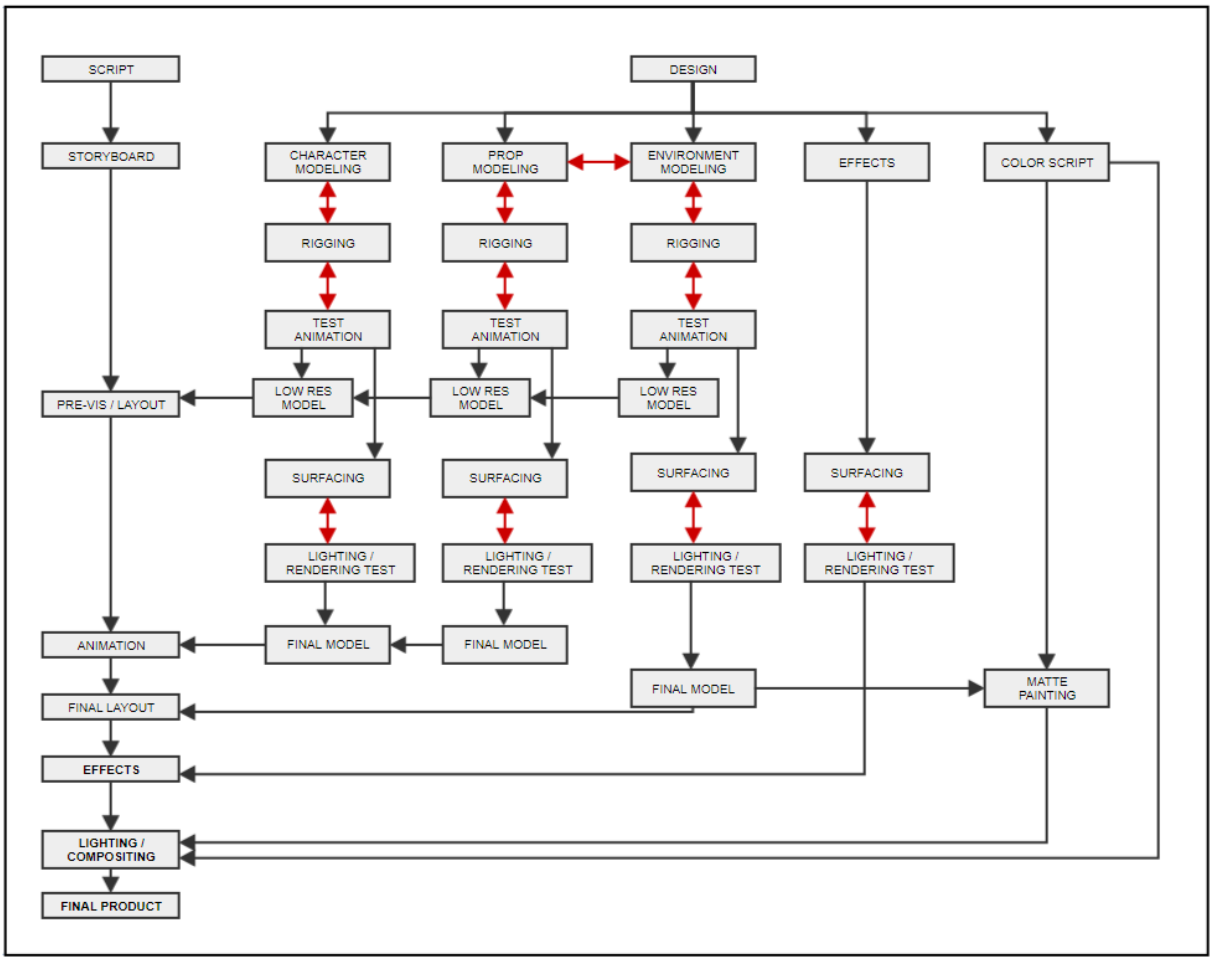
Animation, game, and visual effects studios all utilize a set of tools and procedures to create products. The combination of these tools and procedures is commonly referred to as the production 'pipeline'. A studio's pipeline will be used in all stages of the production process and will often also be used to communicate and transfer assets between stages. An asset is any single unit of production such as a 3D model or texture. Though varying studios' pipelines may vary in depth and scale, all studios use some form of production pipeline to manage data, workflow, communication, and efficiency [8].

1.1.1 Workflow and Production

Pipelines involve every member of production, from directors to artists to technical staff. Pipelines can involve wide ranges of people from the single digits up into the thousands. Every member of production is placed in a department with a specific task, such as a modeling, rigging, or production management department. Every department must be able to communicate and work easily with related departments.

Due to the number of people involved and numerous steps to creating digital works in these fields, the production processes are highly iterative and complex, as seen in Figure 1.1 adapted from Catherine Winder and Zahra Dowlatabadi [15]. A single asset may go through multiple rounds of feedback, known as a feedback loop, before it is approved to be sent to the next department 'downstream'. Department B would be considered 'downstream' from Department A if Department B

Figure 1.1: Example Parallel Pipeline Diagram, adapted from Catherine Winder and Zahra Dowlatabadi [15]



required completed assets from Department A in order to complete their portion of production. For instance, a character model may be critiqued and sent back to the artist several times before it is approved by the department and sent downstream to the rigging department; however, the rigging department could also have critiques for the modeling artist, in which case the model will be sent back to the modeling department to be fixed, and the process would start all over again. These feedback loops are to be expected in any production environment, so the workflow portion of a pipeline must be set up to accommodate them.

Procedures for communicating within and between departments are critical in the production environment and are a major component to a successful pipeline. This includes the hierarchy of artistic control (who gets to decide which version of an asset makes it in the final production),

interdepartmental notes, and communication between departments; furthermore, the naming conventions to be used for digital assets, revision control, and issue tracking for problems within the pipeline itself.

1.1.2 Technology and Tools

Studio tools are necessary to implement the pipeline workflow in production. These tools can be categorized as system, front-end, and software tools. System tools are used to manage data and assets in a directory system. In these systems, artists no longer have to worry about file placement, naming conventions, or version control. This also prevents human error from causing confusion between departments or the accidental deletion of important assets. Artists typically do not access the system directly, but instead use 'front-end' tools to access files.

One of the foremost goals of pipeline technology is to make the studio artists' lives a little easier. If a tool can be condensed down to a single command or button click, without sacrificing functionality, then it should be. Ease of use is a major factor in the decision to use a tool in a pipeline.

Front-end tools are made purely to assist artists. A front-end tool is usually an easy way for artists to interact with the system tools. For instance, one-word commands which take users to different directories in the system, GUIs (Graphical User Interfaces) which allow users to select and move assets, and version control commands, which allow artists to safely create backups of their assets [8].

Studios require various software packages to allow artists to create assets. These packages can vary across studios. An animation studio may have particular painting, 3D modeling, surfacing, and rendering software packages. Another animation studio may require all of the same types of software packages, but choose to use completely different software from the first animation studio. On the other hand, a gaming studio could use the same 3D modeling, painting, and surfacing software packages as one of the animation studios, but require software including a gaming engine instead of rendering software. Studios can also create their own software packages, which they can make proprietary or available to other studios.

Studios often make their own software tools to integrate software packages into their pipeline environment. These can be tools that work within a software package to improve artist workflow, tools that work to communicate between software packages, or tools that work to communicate between the software package and system tools.

A common use of pipeline tools is to automate repetitive and common tasks. This is common throughout the three classifications of tools. An artist using a 3D modeling software might use a software tool that matches naming conventions across all objects in a scene, or a system tool could be set up to back up all new assets overnight.

Certain employees of the studio are tasked with keeping the pipeline tools operating smoothly. These employees have slightly varying titles at every studio, but are commonly referred to as technical directors (TDs). TDs have a working knowledge of the artists' workflow and technical know-how. TDs are essential to keeping up productivity and running an effective production environment.

When artists have problems with software packages or any pipeline tools, they alert the TDs assigned to their department. TDs must be able to troubleshoot and solve the problem, if they are able, or communicate the problem clearly with the software engineers. Since TDs are highly involved in the day to day needs of artists, they are often critical in the process of updating the pipeline tools and software.

Pipeline technology has to be changed and updated often to meet studio needs. These changes must be handled effectively to minimize production setbacks. For example, new versions of software can be deployed studio-wide in the middle of a large production. Some of the artists' work that was made in the old software could become unusable in the new software. That work would have to be redone. Special care has to be taken during pipeline technology updates in order to minimize production setbacks like this one.

This thesis is organized as follows: Section 2 summarizes the literature review, Section 3 discusses the methodology of the research, Section 4 summarizes the survey answers, Section 5 analyzes the results of the survey and literature review, and Section 6 concludes and discusses future

work.

1.2 Motivation

Fall semester of 2018, students in the Department of Visualization at Texas A&M had to make the choice between using the department pipeline or their own computers. The department pipeline consisted of outdated software which was incompatible with the current versions at the time. Students then had to choose between using the current software, which had better tools more like the software used in industry, or using the pipeline, which had access to the department render farm.

A further inquiry into the reasoning behind the update delay revealed the following: The software could not be updated until the operating system of many of the department computers had also been updated, the combination of necessary updates could potentially cause downtime when the students would be unable to use the software, and major updates like this one could create new errors in the pipeline that would have to be fixed.

This thesis intends to assess how these types of problems are dealt with in professional studios of varying type and scale.

2. LITERATURE REVIEW

This section discusses past published works which relate to this thesis. Due to the speed of technological change and to reduce the likelihood of using outdated information, only works published in the last decade will be discussed if the work pertains to technology. Older works may be discussed if they focus on ideology rather than specific technology. This thesis will focus primarily in works specific to computer animation, games, and visual effects. There are several other fields, such as engineering and data science, which use procedures and tools to create products, but these "pipelines" are not as complex or at the same scale as most production pipelines in the fields of animation, games, or VFX. Section 2.1 discusses the definition and application of a pipeline. Section 2.2 discusses the tools and technology of a pipeline, including pipeline tool updates.

2.1 Definition and Application of a Pipeline

There are very few publications on the topic of the production pipeline. This section discusses the three works which the researcher could find. In section 2.1.1, the works of Bettis [2], Jarratt [8], and Polson [13] are discussed. In section 2.1.2, the work of Alsup [1] is discussed.

2.1.1 Conceptual Definition of a Pipeline

In his 2005 master's thesis [2], Bettis' focus was "to accurately describe a generalized model of digital animation production pipelines." Bettis relayed the history of computer animation and performed a case study on a single studio. The study of only one studio does limit the work, but the research still provides a useful conceptual definition.

The results were compiled into a conceptual definition of a production pipeline, which is split into three parts. The first part is all about people. According to Bettis, a person involved in the production pipeline must have a specific role to play, have the freedom to make contributions to that role, and be held accountable for those contributions, or lack thereof. The second part is that computational power has the potential to benefit particular sections of the production process, but will not necessarily benefit all areas equally; therefore computing hardware and software must be

put to use in a specific way so as to "facilitate human work" in the process of creating a product. The third part is about optimization. How should the people, hardware, and software involved in the pipeline be arranged in order to create the most efficient system? This part also involves the question of speciality vs. generalism. A pipeline should allow for an equal amount of both. It is also important to note that a major part of Bettis' final definition of a pipeline included the possibility for change. A pipeline must be malleable.

Jarratt's 2013 master's thesis [8] also provides generalized aspects of a pipeline; however, Jarratt's work sought to provide generalized principles for successful pipelines through a series of seven interviews with industry professionals.

The results of Jarratt's work are presented as five general principles. The first is stability, meaning pipeline technology must be reliable. The second is clarity. Data and feedback flow should be clear and easy to understand. The third is unobtrusiveness, simply meaning the pipeline should make life easier for artists, not harder. The fourth is modularity. Pipeline tools should be made to do one simple task, instead of many tasks. That way, if something goes wrong, only one function is broken. The final principle is generality. A pipeline should be usable for more than just one project.

Bill Polson's website/ongoing book, *Pipeline Design Patterns*, describes pipelines conceptually and practically with the goal of standardizing pipeline vocabulary, theory, and design patterns [13]. Currently, the work is an ongoing and collaborative process, so there are no concrete definitions; however Polson offers some problems that a good pipeline will solve: "How to produce digital graphics at large scale?" and "How to organize the infrastructure and workflows?"

2.1.2 Application in Industry

In 2009, Alsup analyzed the concept of a pipeline based on his own experience in the VFX industry. The analysis [1] was written up in a series of blog posts and includes evidence from his own experience and references to Bettis' work from 2003. Alsup's analysis is limited to his experience in the VFX industry, but while his points are targeted to VFX pipelines, they are general enough to be applicable to all types of pipelines.

Alsup breaks down the pipeline into three parts: the production pipeline, data pipeline, and approval pipeline. These correlate with his interpretation of Bettis' three layers: personnel, tools, and procedure. Alsup goes on to define a pipeline using seven points:

1. A VFX pipeline belongs to one of three classes:
    - production (task) - primary
    - material (data) - secondary
    - approval (meta-data) - tertiary
2. A VFX pipeline is comprised of four structural dimensions:
    - leadership
    - personnel
    - tools
    - methods
3. A VFX pipeline utilizes technology but is not the technology
4. A VFX pipeline divides a work-flow into separate and meaningful tasks assigned to two or more persons
5. A VFX pipeline tasks divisions are determined using a tree of specialization across the three dimensions
6. The VFX pipeline structural form is dictated by
    - the functional mission,
    - resources available and
    - company culture
7. A VFX pipeline is malleable

2.2 Pipeline Tools and Technology

As discussed previously, the technology is only one part of the pipeline, but it is integral to a pipeline's success. A pipeline's technology consists of both hardware and software, but only works relating to the software will be discussed in this thesis. The following works are limited in that the researcher could only find works published by either animation or VFX studios, but no gaming studios. Section 2.2.1 discusses the importance of pipeline tools in regards to production. Section 2.2.2 discusses the various types of pipeline tools with examples from industry. Section 2.2.3 discusses tool updates within a pipeline with examples from industry.

2.2.1 The Importance of Tools

Studios have to manage extremely large numbers of digital assets across potentially hundreds of artists. Pipeline tools are used to manage those assets in the most effective manner possible. For DreamWorks Animation's *How To Train Your Dragon 2*, 495 artists worked to create 395 terabytes of data which included more than 500 million digital files [14]. A single frame of the movie could contain thousands of assets. Those 495 artists had to be able to access those assets and collaborate effectively.

Pipeline tools also have to effectively create backups of all of the studio's data and prevent artists from mistakenly altering the wrong data. In production of Pixar's *Toy Story 2*, a single user was able to accidentally delete the entire film [12]. All of the assets that the artists had created had either been deleted completely or corrupted beyond repair. That was 100 million dollars' worth of data, destroyed in a single accidental command [11]. Unfortunately, that incident was also how the technical teams discovered their flawed backup systems. This is just a single example of two failings of a studio's pipeline tools. The first is that the user was able to delete the files at all. The second is that the backup system was unable to recover the data.

2.2.2 Types of Tools

Two of the main types of pipeline tools are front-end and system tools. Data flow, or data management tools are used to keep track and move large numbers of assets used in production.

For instance, Industrial Light + Magic (ILM) had to implement an entirely new system for keeping track of their materials library for their film, *Rango* [5]. System tools also include ways for assets to travel between departments effectively and provide feedback/approval on a per-asset basis [10]. Both of these examples include the system tools, which actually keep track of the data, and the front-end tools which allow the artists to access the data.

Another common type of pipeline tool is a tool that's sole purpose is to move data between software packages. Many software packages made outside of the production environment are not built to communicate data with software packages made by different companies. Studios often build their own import and export tools in order to transfer data. For example, Digital Domain developed a tool which would allow artists to use their preferred software while keeping important object hierarchies [9].

Software tools are tools which add functionality to software packages. This includes software made by the studio and software made by other companies. Software tools are used by artists to actually create assets. Animal Logic's tool, Quill, is a software tool which allows artists to create feathered structures which they could not make in their animation software alone [6].

2.2.3 Pipeline Tool Updates

Pipeline tools are constantly updating to make pipelines more effective. As stated previously, a successful pipeline will make the artist's lives easier. The Moving Picture Company (MPC) had to create an entirely new system to handle assets for *The Chronicles of Narnia: Prince Caspian* because of the extremely large number of assets [3]. Soon after, MPC had to update the system again for *Prince of Persia* [10]. ILM was forced to do the same for *Rango* [5].

Pipelines are also updated out of artistic need. Quill, the software tool made by Animal Logic that was mentioned previously, was needed to make *Legend of the Guardians: The Owls of Ga-Hoole*. Their previous tools weren't capable of creating or handling the number of feathers necessary for the film. Walt Disney Animation Studios had to modularize and restructure their system for crowd simulation to accommodate for their film, *Zootopia* [4].

Sometimes these updates occur during production. This can cause a stall in work from the

artists who need the tool or cause work to have to be redone. During the production of *Finding Dory*, Pixar decided to change their shading and lighting system. The switch meant that artists had to first take the time to learn the new software and then recreate sixty percent of the character work that had already be completed [7].

Large workflow updates can also cause major upheaval. Every person in the studio might have to change how they do work. In 2015, Pixar Animation Studios completed a huge pipeline overhaul, which caused artists and technical personnel to have to relearn how to do their jobs properly [13].

3. METHODOLOGY

The methodology of this thesis is in two parts. The first part is a look into current industry pipelines in studios, and the procedures used by those studios to go through the pipeline tools update process. The second, is an analysis of those procedures with the intention of finding general practices among studios.

3.1 Literature Review

Production studios often give presentations and publish papers at relevant conferences such as ACM SIGGRAPH, E3, SXSW, etc. Much of the background information for this research was found in talks and papers from conferences like these. Studios typically use these opportunities to discuss high-level problems and their solutions including tools or procedures.

The Texas A&M Library system provided an excellent resource for locating works relevant to this research. Keyword searches for just the word 'pipeline' were unhelpful, as they yielded mainly research on physical pipelines or data science pipelines. The addition of keywords like 'animation', 'production', and 'studio' proved to be more useful.

3.2 Surveys

The main source of data for this thesis is provided through a set of eight survey responses from various industry professionals, which will be referred to as the 'participants' from now on. Each participant works at a different studio, and was asked to answer the survey questions based on their current place of work, even if the participant's knowledge extended to different studios. The studios selected are of varying type and size for the purpose of finding general practices and for comparison.

Participants were either recommended to the researcher or previously known. Participants were chosen based on their current positions in a professional studio environment. Participants had to have a working knowledge of their individual studio's pipeline update procedures. Before contact, this knowledge was typically determined by the participant's job title and description.

Most participants who were contacted had a job title which included "Technical Director."

Keeping with International Review Board (IRB) human subjects research protocol, participants were contacted by email with preliminary information about the research. Pertinent IRB information can be found in Appendix A. After the participant agreed to participate, a link to the online survey was sent by email.

Over all, eighteen people, all from different studios, were contacted by email with an explanation of the research and an invitation to do the survey. Ten of those people agreed to participate and were given a link to the survey. Only eight actually completed the survey.

All data from the surveys are anonymized in this thesis. Any information which could lead to the identification of either the participant or the studio was removed from the data. Only the researcher is able to access this information for the purpose of analysis.

The survey consisted of two parts. The first was a set of questions gathering background information about the participant. These questions were for organizational and analysis purposes. The questions are as follows:

1. What is your name?

2. What is your current position?

3. What is your work background?

The second set of questions were the core of the survey. These questions were chosen based on the literature review and the researcher's existing knowledge on pipelines. The questions were also based on suggestions from consulting industry professionals. The questions are as follows:

1. How would you define a pipeline?

2. Which programming languages do you use in your pipeline?

3. What qualifies a small change to a pipeline versus a large pipeline change?

4. What factors need to be considered when making a small change in the pipeline?

5. What factors need to be considered when making a large change in the pipeline?
6. Who is involved in deciding when to make a small change in the pipeline?
7. Who is involved in deciding when to make a large change in the pipeline?
8. How many people are involved in implementing a large versus a small change in the pipeline?
9. How often are small changes made?
10. How often are large changes made?
11. How long does it take to implement a large change versus a small change?
12. Do big or small changes often cause any downtime in the pipeline?

The results of each survey question were compiled and summarized across all participants. A list of the answers to questions one through twelve from the main set of questions can be found in Section 4.2, along with plots of the data for each question. Summaries and important notes about each question can also be found in Section 4.2. The results were then analyzed further across questions to compare between studios and find general practices, which is found in Section 5.

4. SURVEY RESPONSES

Eight participants from eight different studios filled out the online survey described in Section 3.2. The studios varied in size, age, and type. Section 4.1 discusses how each studio was classified for this research. Section 4.2 provides a report of the survey answers.

4.1 Participants

Table 4.1: Table of participants

Studio Pseudonym	Studio Type	Studio Size Classification	Studio Age Classification
Studio A	Animation	Large	Over 20 years
Studio B	Animation	Medium	Over 20 years
Studio C	Animation	Medium	Over 20 years
Studio D	Game	Medium	Over 20 years
Studio E	Game	Small	Under 20 years
Studio F	VFX	Large	Over 20 years
Studio G	VFX	Small	Under 20 years
Studio H	VFX	Small	Over 20 years

All participant and studio information is anonymized in this work. Table 4.1 lists the pseudonyms for each studio, along with that studio's type, size, and age classifications. Pseudonyms will also apply to participants, so that the participant from Studio A would be Participant A. Studios are classified as either animation, game, or visual effects studios. Some of these studios have made more than just one type of product in the past, but for the purpose of this research, their main product type is used. To avoid confusion, participants were asked to answer survey questions on

the pipeline for which they were classified. For example, if a studio mainly makes games, but they have also made some short films, that studio would be classified as a game studio, and the participant would be asked to answer the survey questions based on their game pipeline.

Studios were also categorized based on their size, or number of employees, and their age based on when each studio was founded. Studios were classified as small if they maintain less than 500 employees, medium if they maintain between 500 and 999 employees inclusively, and large if they maintain 1,000 employees or more. Studios' ages were split between being less than or greater than twenty years old.

4.2 Response Summaries

As discussed in Section 3.2, two sets of questions were asked in the survey. The first set consisted of three background questions which were used only by the researcher for organizational purposes. The second set consisted of twelve questions about a participant's studio pipeline. These are the twelve questions that will be referred to for the remainder of this thesis. Section 4.2.1 will discuss the purpose and answers to the first two questions. Sections 4.2.2 through 4.2.11 will summarize the answers, across studios, to Questions Three through Twelve.

The survey answers from all eight participating studios are presented in the form of a table for each question in the appropriate sections. A corresponding plot of the answers to each question (aside from Question One) is also presented in the appropriate sections. In the plots, a studio is given a gray bar if no answer was given.

4.2.1 Questions One and Two

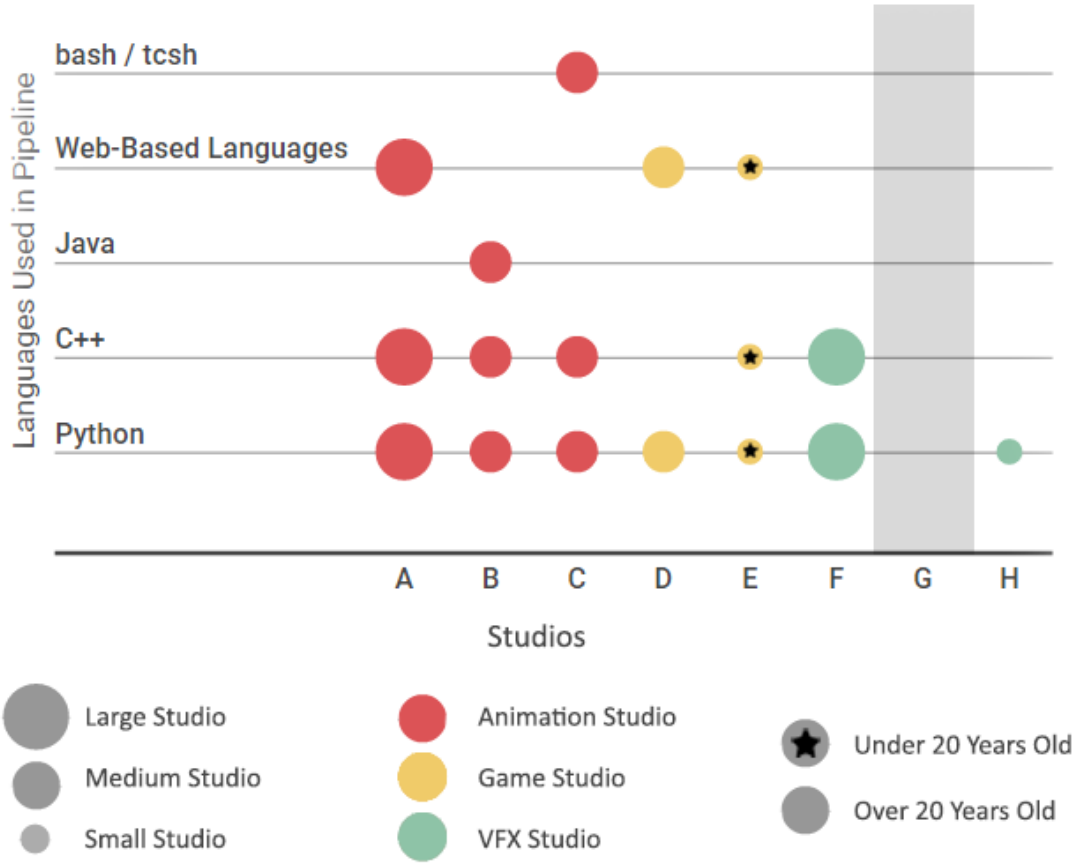
Table 4.2: Survey answers to Question One: How would you define a pipeline?

A	The flow of data (models, textures and images) between departments throughout the course of a film.
B	The tools and processes that enable data to travel through asset and shot production, from story to final frame.
C	a set of tools and processes, defined by a workflow, that aid in the creation, propagation, and delivery of data.
D	workflows and tools built to ensure the efficient and secure transfer and manipulation of data between artists in a production studio.
E	A sequence of connected processes and tools used to generate product
F	The software stack that helps move data from one stage of work to the next - from ingesting data from clients to asset creation to shot work (layout, anim, cfx, fx, comp, etc) to client delivery and every stage in between.
G	It's not the biggest, but it is pretty tight. We have two data servers, render servers as well as a domain and license server. We're a small studio so we don't need much.
H	A pipeline consists of all the software tools and workflows that are used in the production of a film or game. A good pipeline allows a production to scale the number of individuals that can successfully collaborate on the production, increase the speed and efficiency of artists, and enable the level of artistic complexity required for the project.

Table 4.3: Survey answers to Question Two: Which programming languages do you use in your pipeline?

A	Python and C++. Some web code is also used.
B	Primarily Python and C++, occasionally Java.
C	C++, Python, bash/tcsh
D	mostly python. some javascript.
E	C++, Python, JavaScript
F	Python and C++
G	Not sure.
H	Primarily Python

Figure 4.1: Question Two Plot: Pipeline Languages by Studio



Questions One and Two of the survey are included to check for outliers. Question One is "How would you define a pipeline" and Question Two is "Which programming languages do you use in your pipeline." Making sure that these answers were similar across studios allowed the researcher to avoid including data which does not line up with the purpose of this thesis. All eight participants answered both questions similarly and to the satisfaction of the researcher.

All participants answered the first question with similar conceptual definitions to what was discussed in Section 2.1, which can be seen in Table 4.2. To summarize: A pipeline is a set of tools and processes which "aid in the creation, propagation, and delivery of data" (Participant C). The answers to Question Two were also very similar, which can be seen in Table 4.3. Studios use a mix of Python, C++, Java, and some web based languages for their pipelines, as can be seen in

Figure 4.1.

4.2.2 Question Three: What qualifies a small change to a pipeline versus a large pipeline change?

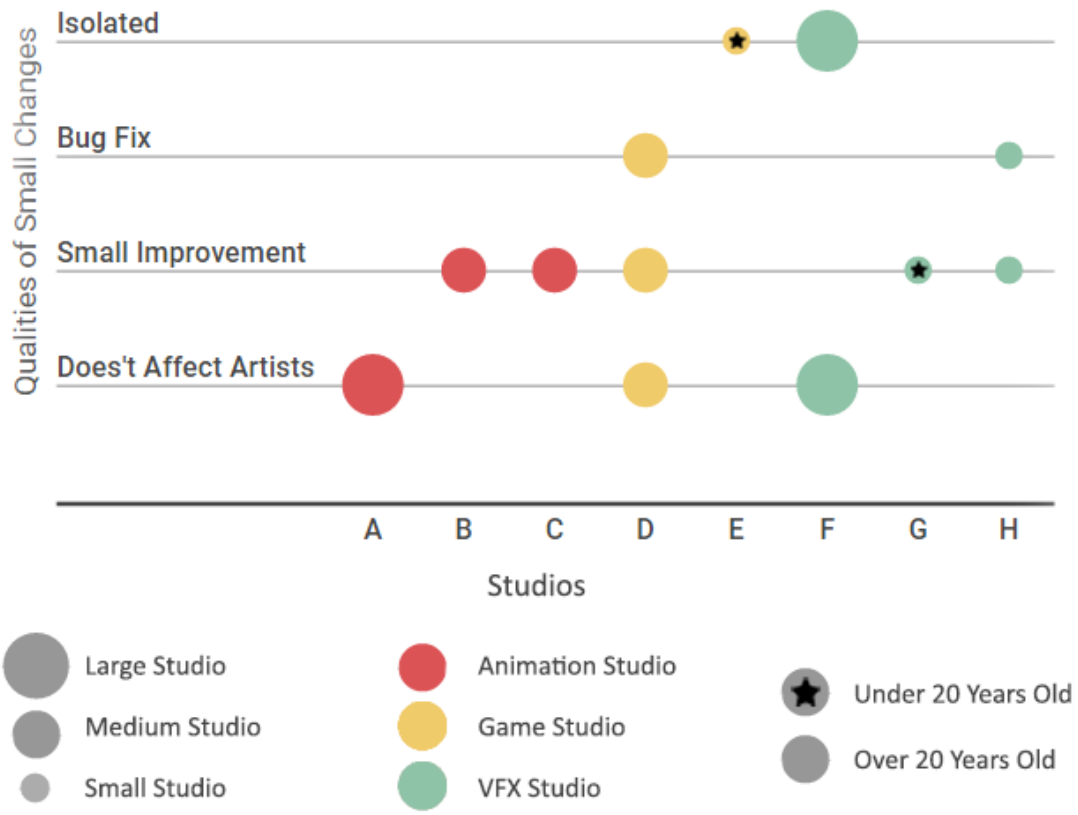
Table 4.4: Survey answers to Question Three: What qualifies a small change to a pipeline versus a large pipeline change? (Studios A-D)

A	Whether or not artists need to make a change on their end as a result of the pipeline change. The severity can vary based on the number of artists affected, how much work is done to accommodate and whether the project is in crunch mode.
B	Small, evolutionary changes occur regularly. New ideas come along often that can improve things. Large pipeline changes happen when the needs of production have outgrown the current pipeline. Major overhauls usually implement a whole new way of working, to improve things in substantial ways.
C	a small pipeline change would probably be something like adding a new feature or tool; a large pipeline change would be something that impacts the overall data architecture or working model.
D	examples of small changes include bug fixes, improvements, or new features that do not alter existing artist workflows. large changes include the rolling out of new workflows, new backend systems/services, or altering existing workflow in a way that changes how an artist does their work.
E	Small would be anything that is isolated to a single team (e.g. the 3d art team deciding to model with Modo instead of Max). Large would be anything that affects multiple teams (e.g. using SVN for version control instead of Perforce)

Table 4.5: Survey answers to Question Three: What qualifies a small change to a pipeline versus a large pipeline change? (Studios F-H)

F	A small change is one that is isolated - it only affects a subsection of artists at the company and/or department, or it is a change that no artist will notice. For example - adding some data collection to a button to track how many times it's clicked, or updating the default values on UI. Or cleaning up the code for a tool without changing the artist experience. It's something that doesn't affect version streams on in-progress shows. A large change would be studio/pipeline-wide large changes - such as changing the core API, core publishing tools, or database. Things that affect the entire pipeline regardless of department. Then I'd say there are actually medium changes: something that affects the data going out of a department. Such as version stream naming or file types. It could also be something that changes a common function call - where many other files would need to be updated. These are significant enough that I wouldn't call them small - changing what data passes between the pipeline can be very significant. But they're still more isolated than major core changes. For the sake of this survey I'll consider these changes small though - frequently you ask the same questions when working on small and medium changes.
G	Adding licenses and cleanup to obsolete systems would be small. Upgrading our data storage, render servers or moving to a new office is considered big and we've done all of these in the past year.
H	A small change is a bug fix or minor additive new feature in a software tool.

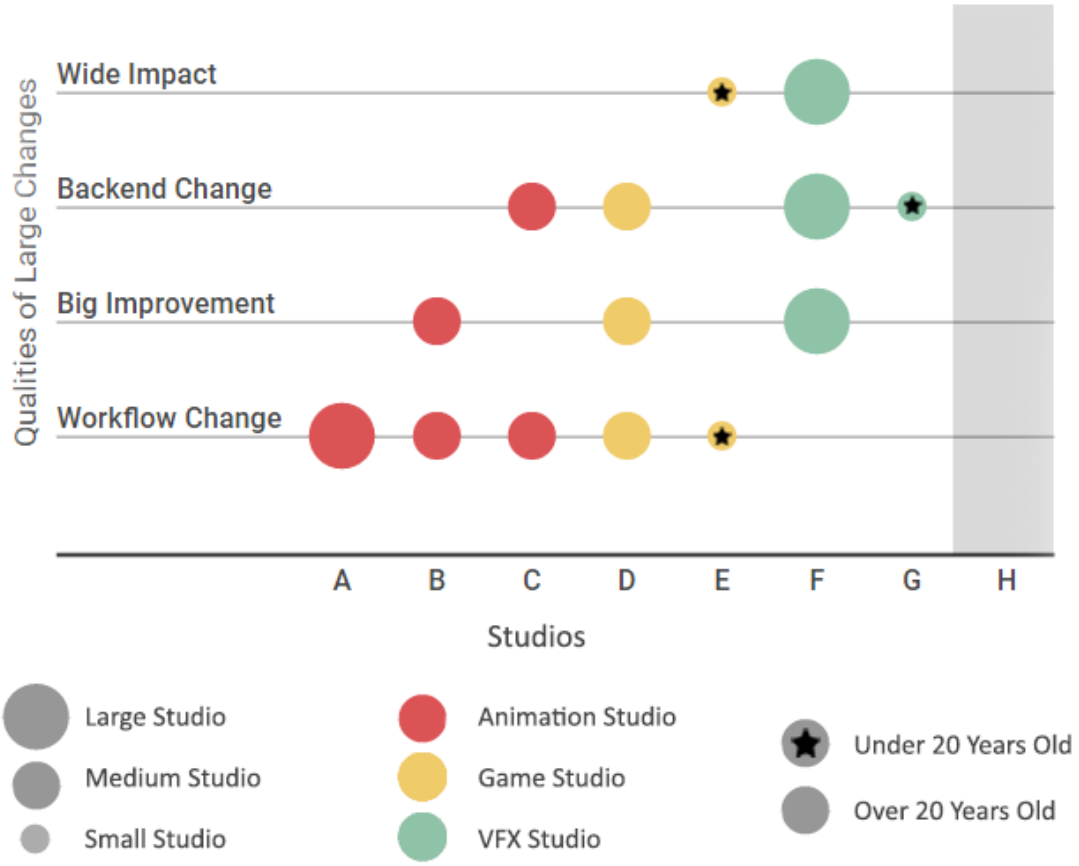
Figure 4.2: Question Three Plot A: Qualities of Small Changes by Studio



Answers to Question Three can be found in Table 4.4 and Table 4.5. There are no apparent trends in the qualities of small pipeline changes across studio type or age. Medium and small studios appear to qualify small improvements and bug fixes as small changes over large studios, which can be seen in Figure 4.2.

It is important to take note of Participant F's mention of "medium" changes, which includes changes which can go between departments or include multiple file changes but do not change the structure of the pipeline. Participant F stated that for the sake of this research, these can still be considered small changes, since "frequently you ask the same questions when working on small and medium changes."

Figure 4.3: Question Three Plot B: Qualities of Large Changes by Studio



There are no apparent trends in the qualities of small pipeline changes across studio type, size, or age, as can be seen in Figure 4.3. Large changes were considered to be changes which are studio-wide and alter artist workflow. Participant B noted that large changes occur when the "needs of production have outgrown the current pipeline." These changes include backend system changes like database or core API changes, as well as major workflow changes.

4.2.3 Question Four: What factors need to be considered when making a small change in the pipeline?

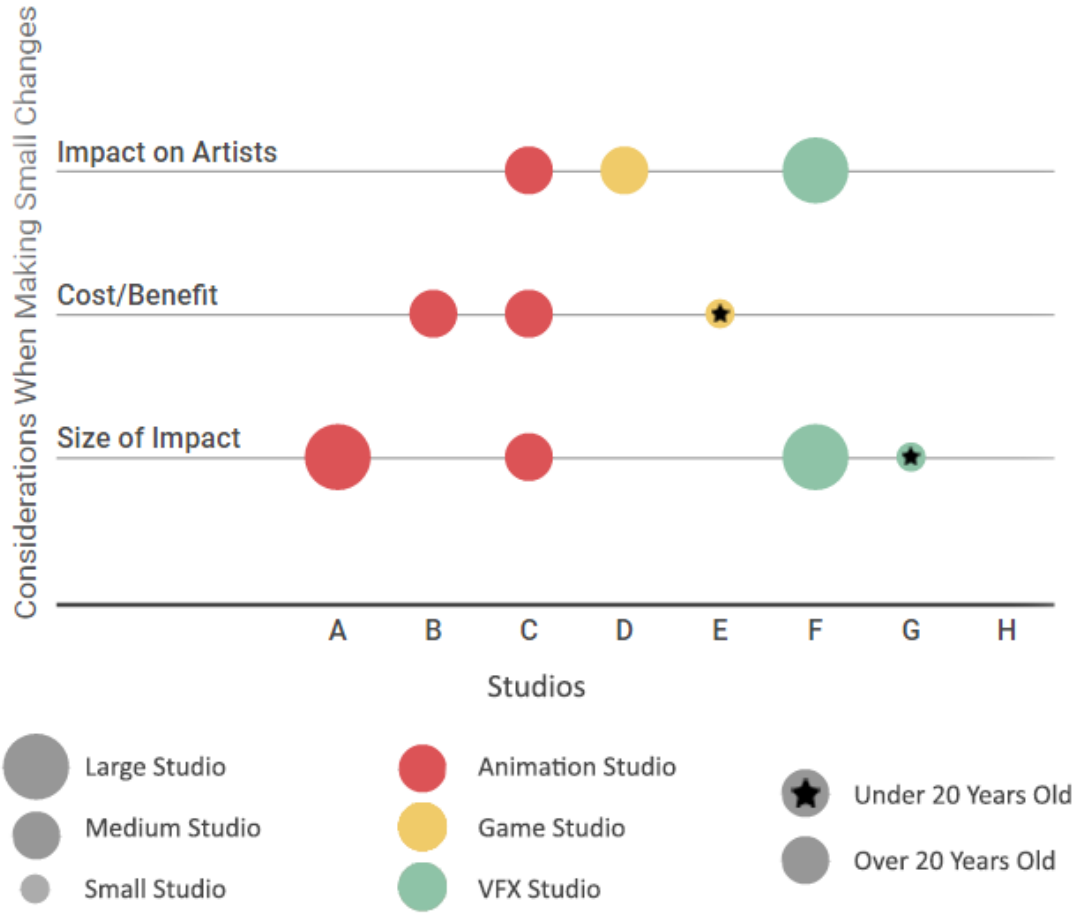
Table 4.6: Survey answers to Question Four: What factors need to be considered when making a small change in the pipeline? (Studios A-E)

A	Who needs to be notified of the change - too few and people get burnt, too many and it becomes white noise. Potential issues that could arise from the change, what else could you be breaking? Is this one of a thousand other changes? A lot of little changes can amount to a large change accidentally.
B	It's always a cost/benefit analysis. How much will this focused change increase productivity, how costly is the implementation, what will it do to other connected parts of the pipeline, and so on.
C	1) how the change will impact the user experience for artists 2) how the change will impact data integrity in departments upstream and downstream from the change 3) whether the potential instability introduced by the change is worth the usability benefit of the change
D	how does this change fit within the long term goals of the pipeline? how will this change affect the artist/user? when is the ideal time to release this change? have i properly documented this change? are the artists aware this change is coming?
E	Quality gains, time savings, cost of software, ease of use (this covers both quality of life for the existing team as well as ease of training for new team members - so industry adoption may be a consideration). Given it's small change, we may be more receptive 'giving it a whirl' to see how it works.

Table 4.7: Survey answers to Question Four: What factors need to be considered when making a small change in the pipeline? (Studios F-G)

F	Ripple effects - is it really as isolated as you think? Or does another department use this tool? Will it affect in progress work? How easy is it to roll back? Can you isolate shows that don't want the change? What behavior will the artists see change?
G	Will it bring the company to it's knees.
H	As long as the update is truly a bug fix or minor additive new feature, nothing special needs to be considered for rolling it out. We will pick it up automatically in our next software update cycle.

Figure 4.4: Question Four: Considerations for Small Changes by Studio



Answers to Question 4 can be found in Table 4.6 and Table 4.7. There are no apparent trends in the considerations for small changes across studio size, age, or type, as can be seen in Figure 4.4. The most common consideration was whether or not the small change would influence anything else in the pipeline. Another common factor listed was the cost benefit analysis. Is the implementation of this change costly? Will this change increase productivity? Will this change affect any in-progress work? In the end, will this change be worth making? The third most common question was whether or not the artist would be affected by the change.

4.2.4 Question Five: What factors need to be considered when making a large change in the pipeline? (Studios A-D)

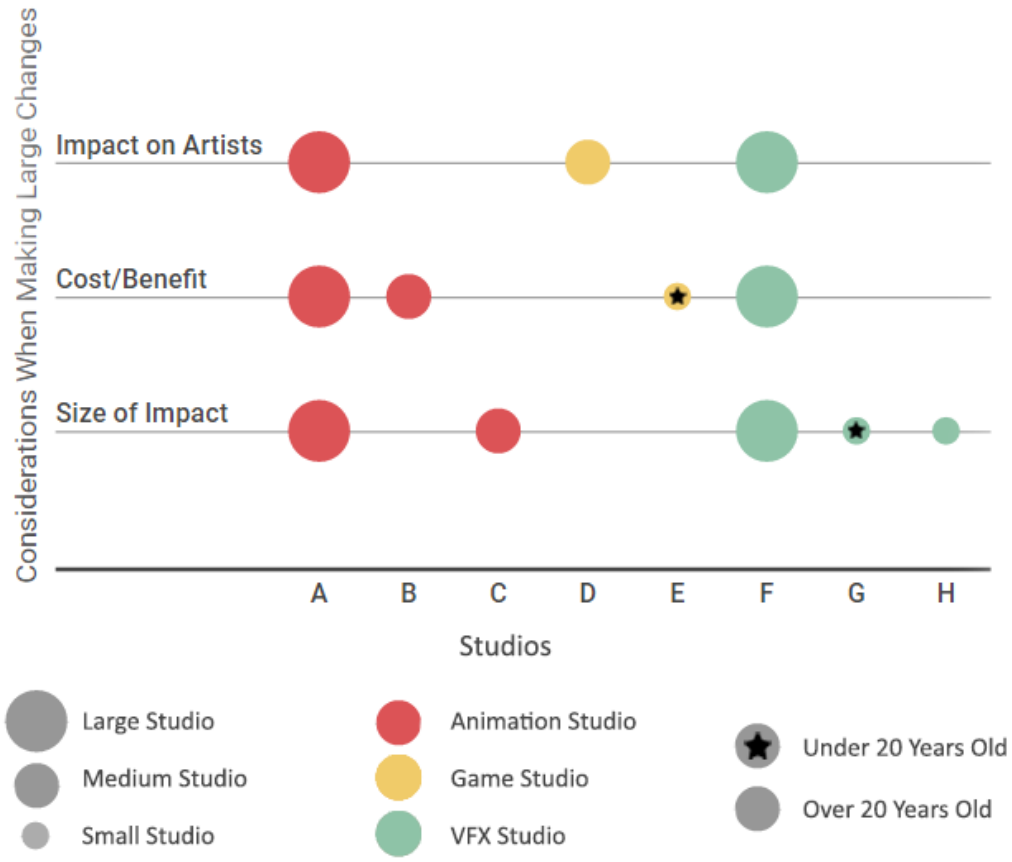
Table 4.8: Survey answers to Question Five: What factors need to be considered when making a large change in the pipeline?

A	Generally, those are discussed with heads of the show and are done in steps where possible. Otherwise, change on a Monday not Friday. Notify people when the change is made and how they can pick up the change. Sometimes pieces of the project, like a sequence of shots, is insulated from the change because the benefit doesn't outweigh the cost. Also, change can be frustrating to people so be on the lookout to help people adjust.
B	Large change means probably a year to 18 months of serious upheaval, as the new pipeline comes online, and the bugs get shaken out. The potential benefit of the new pipeline has to be significant enough to be worth this.
C	1) how the change will impact data flow in the pipeline 2) what other tools and processes will need to be modified as a result of the change 3) what development and testing resources will be required to implement the change
D	all of the same factors as making a small change.

Table 4.9: Survey answers to Question Five: What factors need to be considered when making a large change in the pipeline? (Studios E-H)

E	Same as above only the evaluation process is much more disciplined as requirements and risks are gathered from a larger number of stakeholders.
F	How are you deprecating the old way? How are you documenting and communicating the change? How are you protecting shows from breaking changes? Has it been properly tested to make sure you understand the full consequences of the change? What's the cost/benefit - is it worth the risk? What impact does this work have on the team's ability to do support work? How does this affect future development or shows? If the studio is multi-site, how will this change affect different sites?
G	Am I ready to spend a week fixing something I broke?
H	If a change will be backwards incompatible with older versions of code, it requires a major version update to the package it lives in. Major version updates require developers to communicate to the rest of the pipeline team about the change. Also, packages dependent on that package may also need to version up. Other large pipeline changes may include versioning up 3rd party packages like Maya or Nuke. Before deploying major package version updates to a show or the studio, we usually send email notification to artists and supervisors about the change. We also try to have more users test these changes before rolling them out.

Figure 4.5: Question Five: Considerations for Large Changes by Studio



Answers to Question Five can be found in Table 4.8 and Table 4.9. There are no apparent trends in the qualities of large pipeline changes across studio type or age; however, large studios stated that the impact on artists, cost/benefit analysis, and the size of impact are all considerations necessary for large changes, as seen in Figure 4.5, while medium and small studios put emphasis on only one area. Participants (A, B, E, and F) put extra emphasis on the cost benefit analysis, as a large change would have longer upheaval times, a larger area of influence, and require more staff. More testing would also be involved (C, F, and H). Many participants (A, F, and H) also added that more people would have to notified of the change, more documentation would have to be made, and the change should be released on a Monday rather than a Friday to provide more time to help people struggling with the change (Participant A). Participants A and F also stated that there has to be something put in place to protect certain products from getting the change. Participant F

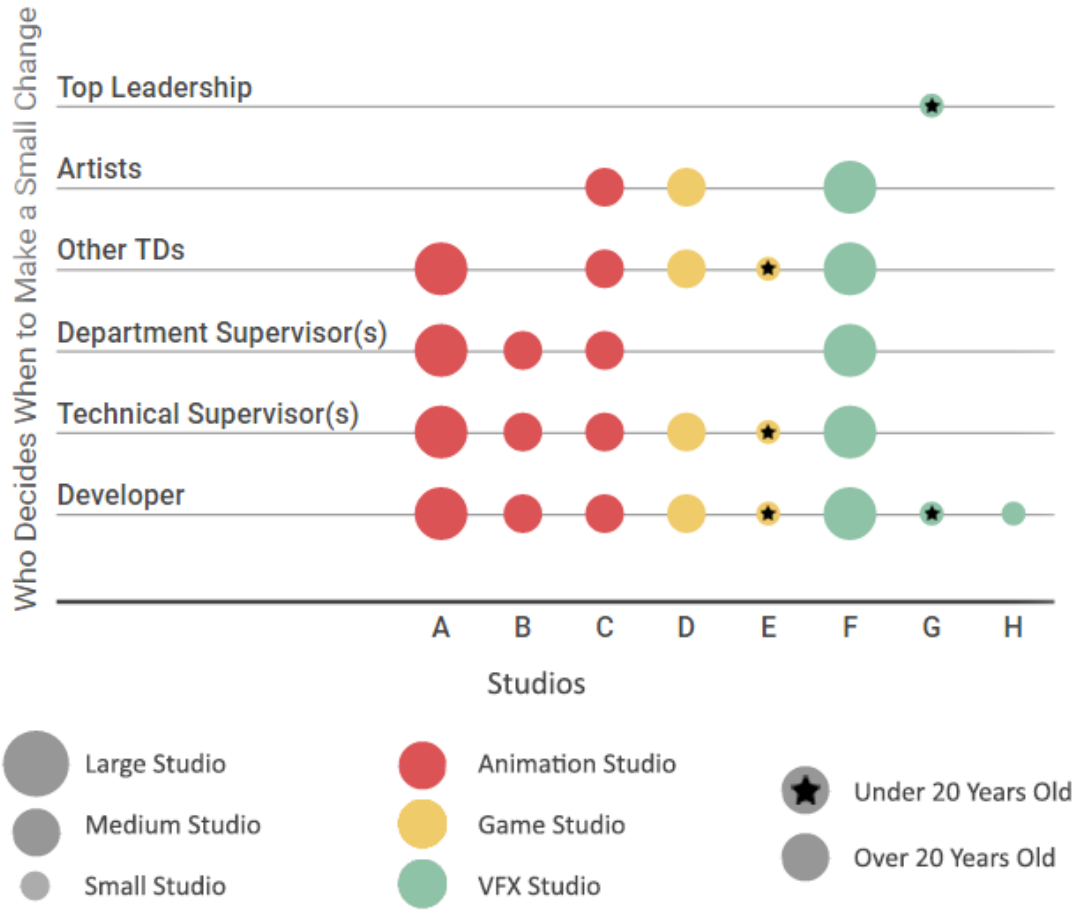
also brought up questions like how the old way will be replaced, and how this change would affect future shows.

4.2.5 Question Six: Who is involved in deciding when to make a small change in the pipeline?

Table 4.10: Survey answers to Question Six: Who is involved in deciding when to make a small change in the pipeline?

A	Could just be the TD or developer making the change if it's small enough. So many things change so often that you really need to pick which messages get bubbled up. Slightly larger changes will involve a TD supervisor and the supervisor of that department, or at least some point person that is an artist. We also review each other's code and talk among the TD's to keep updated about changes.
B	Department leadership and the technology leadership that cover the particular discipline.
C	usually a small number of TDs, artists, and their direct supervisors on the film.
D	everyone on the pipeline team should be aware of what everyone else is working on. regular standups allow other team members to give input and object if they don't agree with changes being made. the artists should also be aware of changes being made and how they will be affected. staged and scheduled rollout of new features/fixes is a good thing when possible. hot fixes should also be coordinated.
E	Usually an individual contributor either has prior experience with a tool or process and proposes to his or her immediate team members. If the benefit is apparent, the team lead and/or a producer will make any official purchases and document.
F	Depends on what team is responsible for the change - where I sit, with the department, a small change can be okay-ed by a single show's supervisor if it's only affecting one show, or the Head of Department if it affects multiple shows, and the developer. This is scalable depending on the scope of the project - a bigger change will need a more robust team for feedback including pipe supervisors, artists, production supervisors, and peer developers.
G	Me and my partner.
H	Usually just the developer.

Figure 4.6: Question Six: Decision Makers for Small Changes by Studio



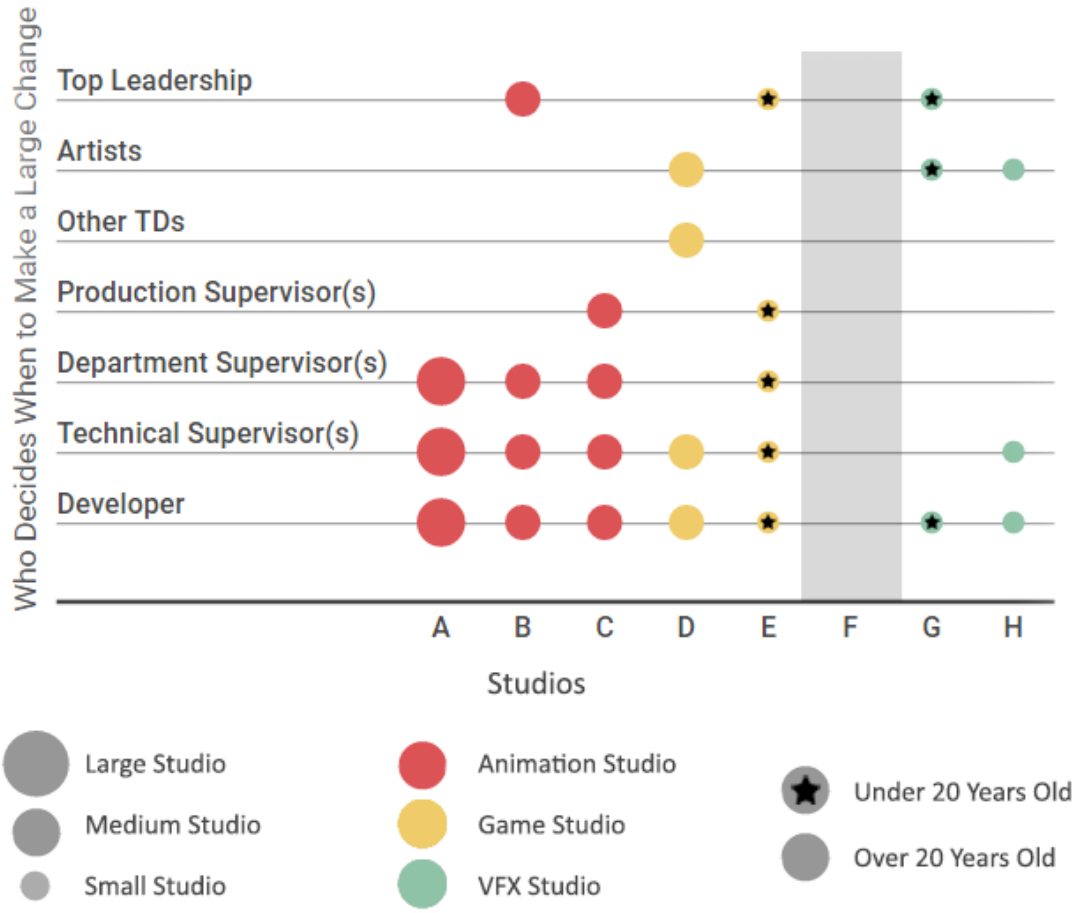
The answers to Question Six can be found in Table 4.10. There are no apparent trends in the qualities of small pipeline changes across studio age or size, as can be seen in Figure 4.6. The small VFX studios involve either one or two people in the decision making process while the large VFX studio (Studio C) includes five people. Participant F stated that the number of people involved in the decision is scalable. This is an important point, as each decision could involve any combination of decision makers. The animation and game studio answers are fairly consistent within each type.

4.2.6 Question Seven: Who is involved in deciding when to make a large change in the pipeline?

Table 4.11: Survey answers to Question Seven: Who is involved in deciding when to make a large change in the pipeline?

A	Heads of any departments affected, as well as the supervising TD on the show. If the change comes from R&D, there will be a few developers involved also. Emails get sent months/weeks in advance, meetings are had about the change and what could break. Of course, this only applies to intentional large changes. Sometimes a small change becomes a huge change and the proper communication isn't had. Rare though.
B	The whole studio. Every layer of leadership participates in the discussions.
C	technical supervisors, workflow supervisors, technology managers, artist department supervisors.
D	same as small changes.
E	All team leads, project producers, and directors (Art Director, Tech Director, Design Director, Director of Production).
F	NA - I'm not involved in those choices and can't answer accurately.
G	Me and my partner. Sometimes we get the team's input.
H	The developer along with a lead TD. Depending on the change, artists and supervisors may be part of the decision making process as well.

Figure 4.7: Question Seven: Decision Makers for Large Changes by Studio



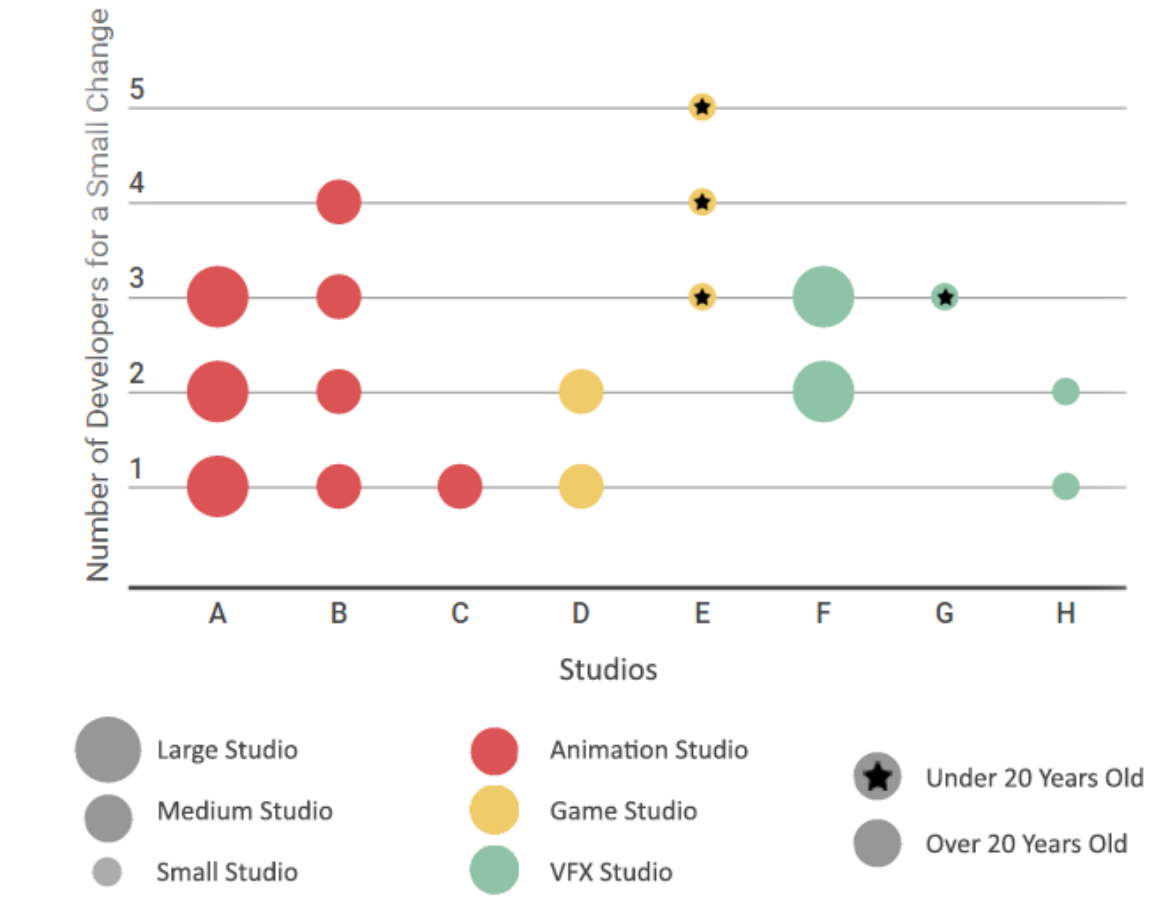
Answers to Question Seven can be found in Table 4.11 There are no apparent trends in the qualities of small pipeline changes across studio size or age, as can be seen in Figure 4.7. Like with small changes, the small VFX studios involved fewer people in the decision. The animation and game studios remained consistent.

4.2.7 Question Eight: How many people are involved in implementing a large versus a small change in the pipeline?

Table 4.12: Survey answers to Question Eight: How many people are involved in implementing a large versus a small change in the pipeline?

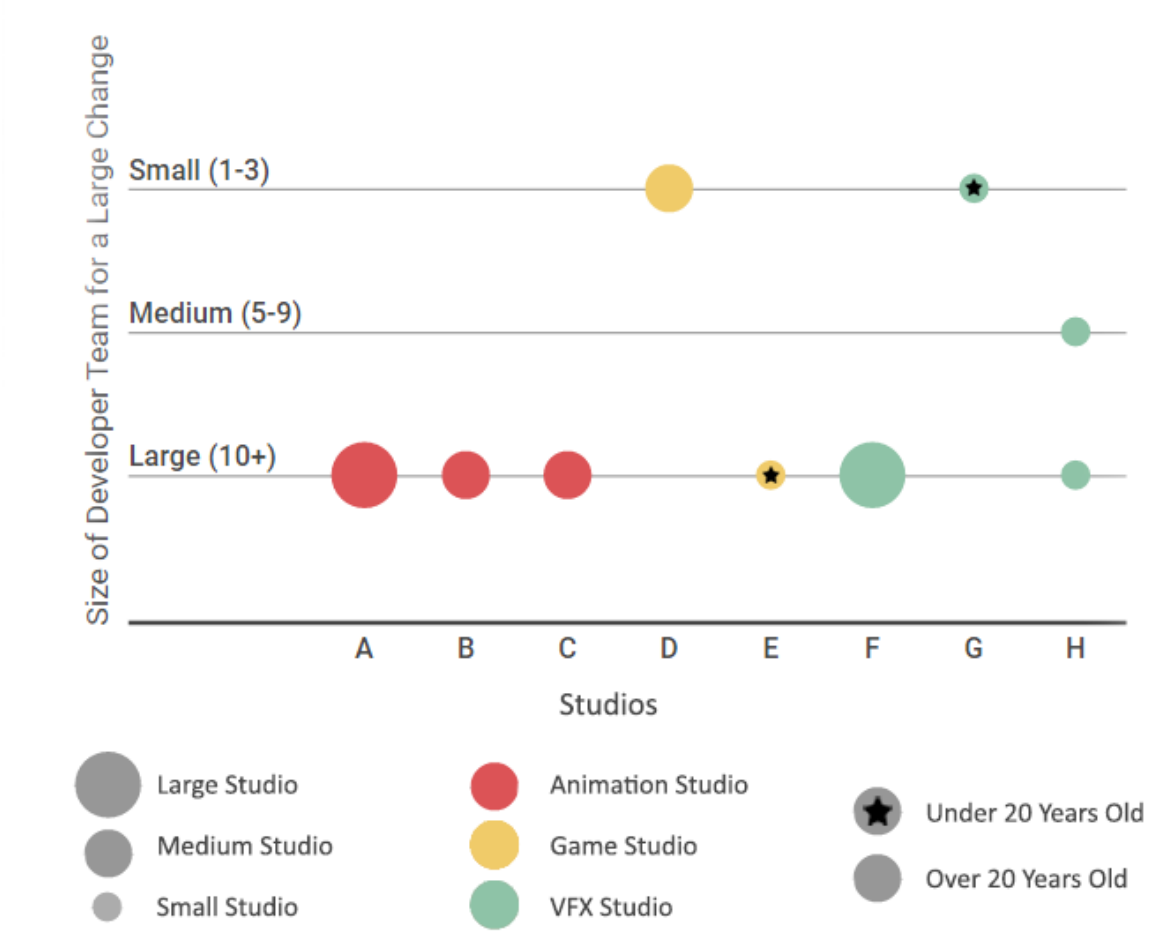
A	Depends. Small change could be one person. Once it get past three people, it probably isn't small anymore. Cataclysmic-scale large changes involve everyone who writes code, but some large changes are made by a handful of people.
B	Small changes are sometimes just one developer, sometimes a team of 3-4 or more, and some artistic involvement in planning and testing. Large changes can engage half of the technology team or more, as well as significant artistic involvement. All in, could be 50 people or more.
C	a large change can take dozens of people working across multiple teams to implement, versus a small change which might require only a single TD.
D	small changes are typically done by 1 or 2 developers. large changes can also be 1 or 2 developers. really it depends on the task and its scope.
E	Small (3-5) | Large (12-20)
F	The scope is extremely scalable - the smallest changes can have 2-3 people involved. The largest ones can have dozens at different stages of planning and implementation.
G	3
H	Large changes involve on the order of 5-10+ people; small changes can be just 1 or 2 people.

Figure 4.8: Question Eight: Size of Team for Small Changes by Studio



Answers to Question Eight can be found in Table 4.12. There are no apparent trends in the size of the developer team for small changes across studio type or size, as can be seen in Figure 4.8. The younger studios had more than the average number of developers.

Figure 4.9: Question Eight: Size of Team for Large Changes by Studio



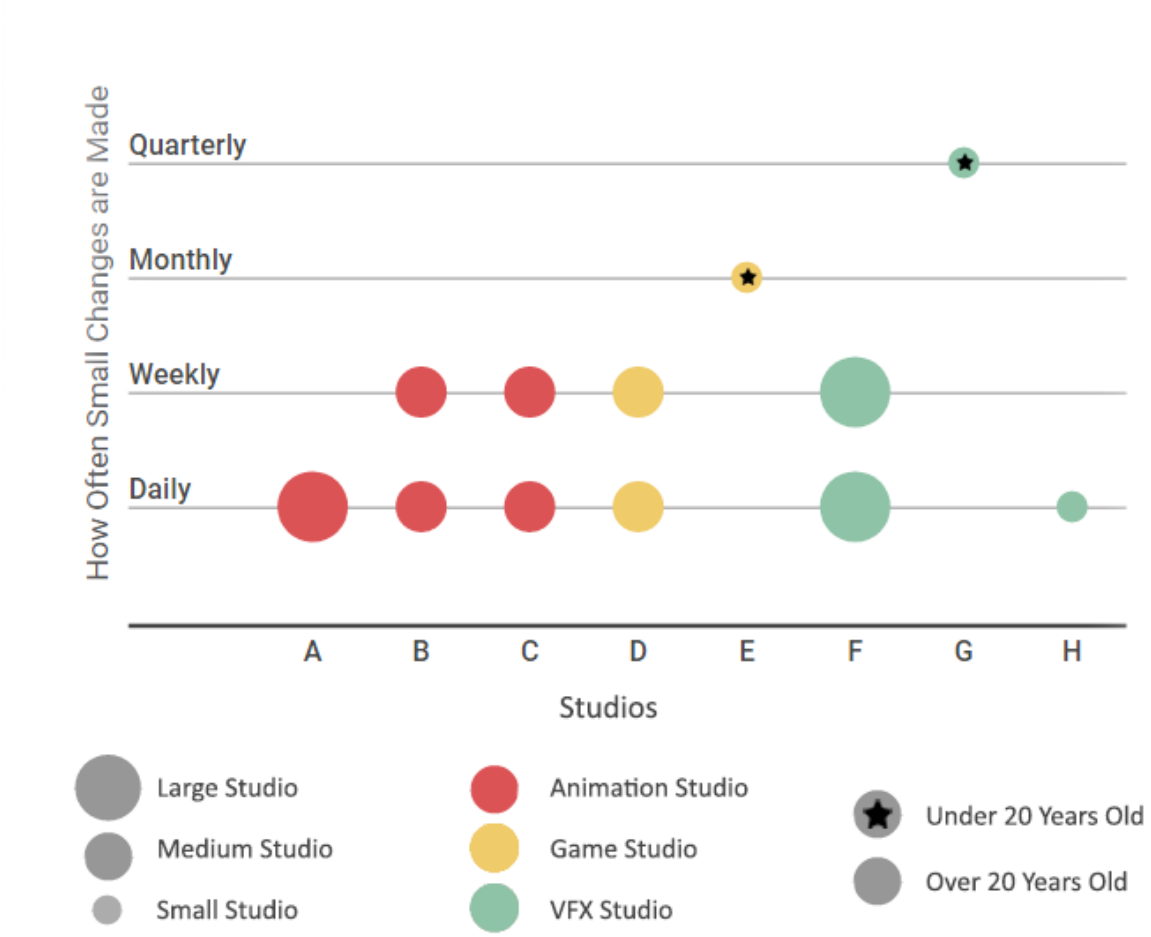
There are no apparent trends in the size of the developer team for large changes across studio age or size, as can be seen in Figure 4.9. Animation studios all stated that large groups are used to implement large changes. Game and VFX studios were not consistent. All but two studios (D and G) stated that large groups were necessary; however, Studio D did state that the number could always be scaled up based on the change.

4.2.8 Question Nine: How often are small changes made?

Table 4.13: Survey answers to Question Nine: How often are small changes made?

A	Daily.
B	Very often. During preproduction of every film, the pipeline is examined for areas to improve.
C	at least weekly, sometimes more frequently depending on the stage of production we are in on a film.
D	daily to weekly. we're pushing out small fixes all the time depending on what's needed. often these are bug fixes or low hanging fruit in addition to the regular, scheduled development tasks.
E	1/mo
F	Depending on the current scope of priorities - usually weekly, patches and show-specific things can go out daily.
G	As seldom as possible. Maybe every few months.
H	Developers implement small changes multiple times per day. Small changes are automatically deployed to production Tuesday, Wednesday, and Thursday mornings.

Figure 4.10: Question Nine: How Often Small Changes are Made by Studio



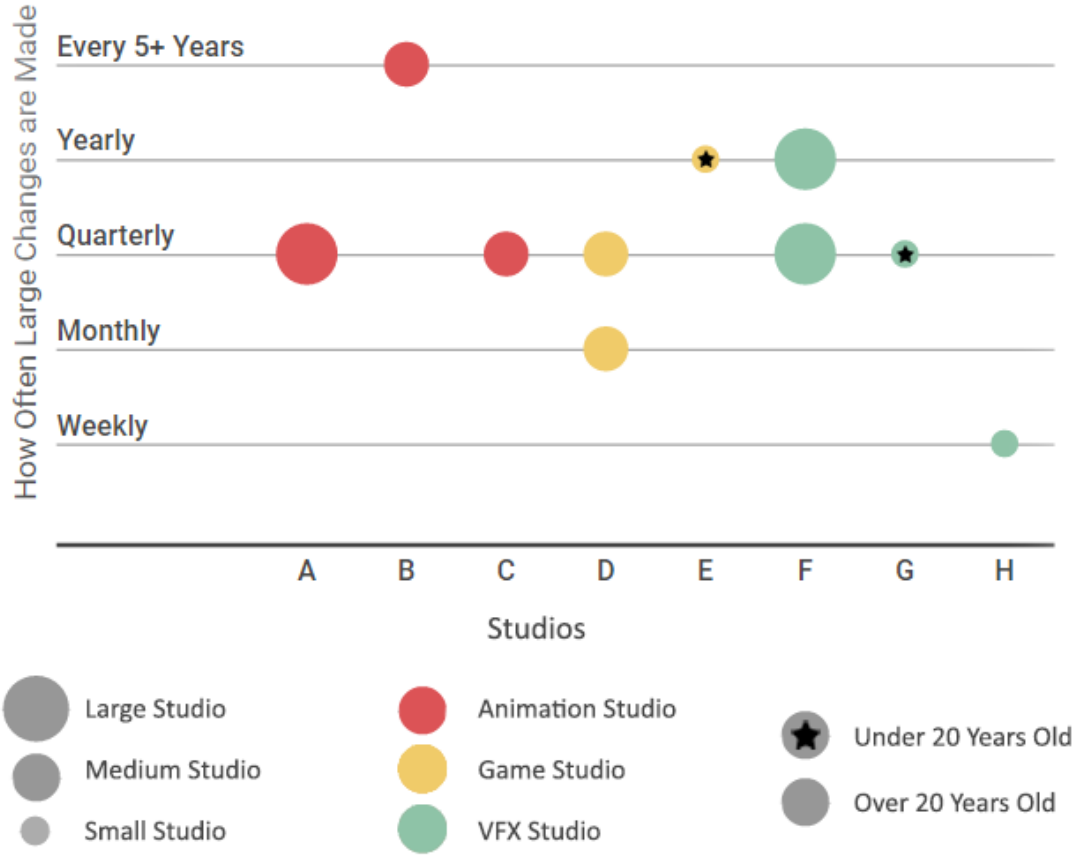
Answers to Question Nine can be found in Table 4.13. There are no apparent trends in how often small changes are made across studio type or size, as can be seen in Figure 4.10. The two studios under twenty years old both make small changes far less often than the medium or large changes.

4.2.9 Question Ten: How often are large changes made?

Table 4.14: Survey answers to Question Ten: How often are large changes made?

A	Only a few across the length of the show, usually.
B	Depending on how much the needs of the studio change, could be anywhere from 5-10 years between major overhauls.
C	only a few times a year (at the most).
D	monthly-quarterly. we always have long term pipeline goals in mind and in development. we try to balance these so that we are building for the future and maintaining current productions simultaneously.
E	Between projects is ideal (1-2 every two-three years)
F	Infrequently - large changes can be extremely disruptive to productions, so they're avoided unless the risk can be mitigated and the reward is clearly worth it for the company.
G	Too often. Every few months.
H	We usually deploy about 3-5 large changes per week on a Tuesday morning.

Figure 4.11: Question Ten: How Often Large Changes are Made by Studio



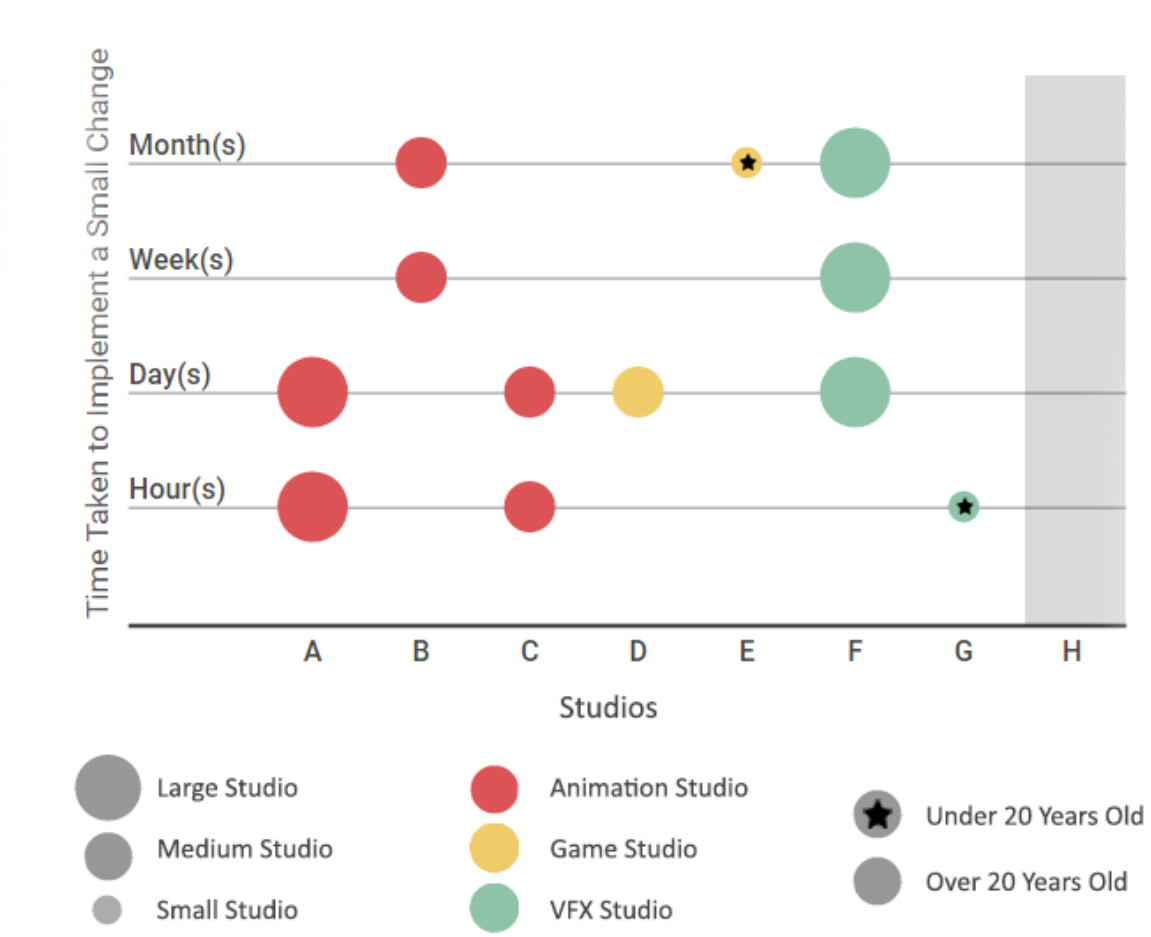
Answers to Question Ten can be found in Table 4.14. The answers to Question Ten vary greatly, as can be seen in Figure 4.11. There are no apparent trends in how often large changes are made across studio type, age, or size.

4.2.10 Question Eleven: How long does it take to implement a large change versus a small change?

Table 4.15: Survey answers to Question Eleven: How long does it take to implement a large change versus a small change?

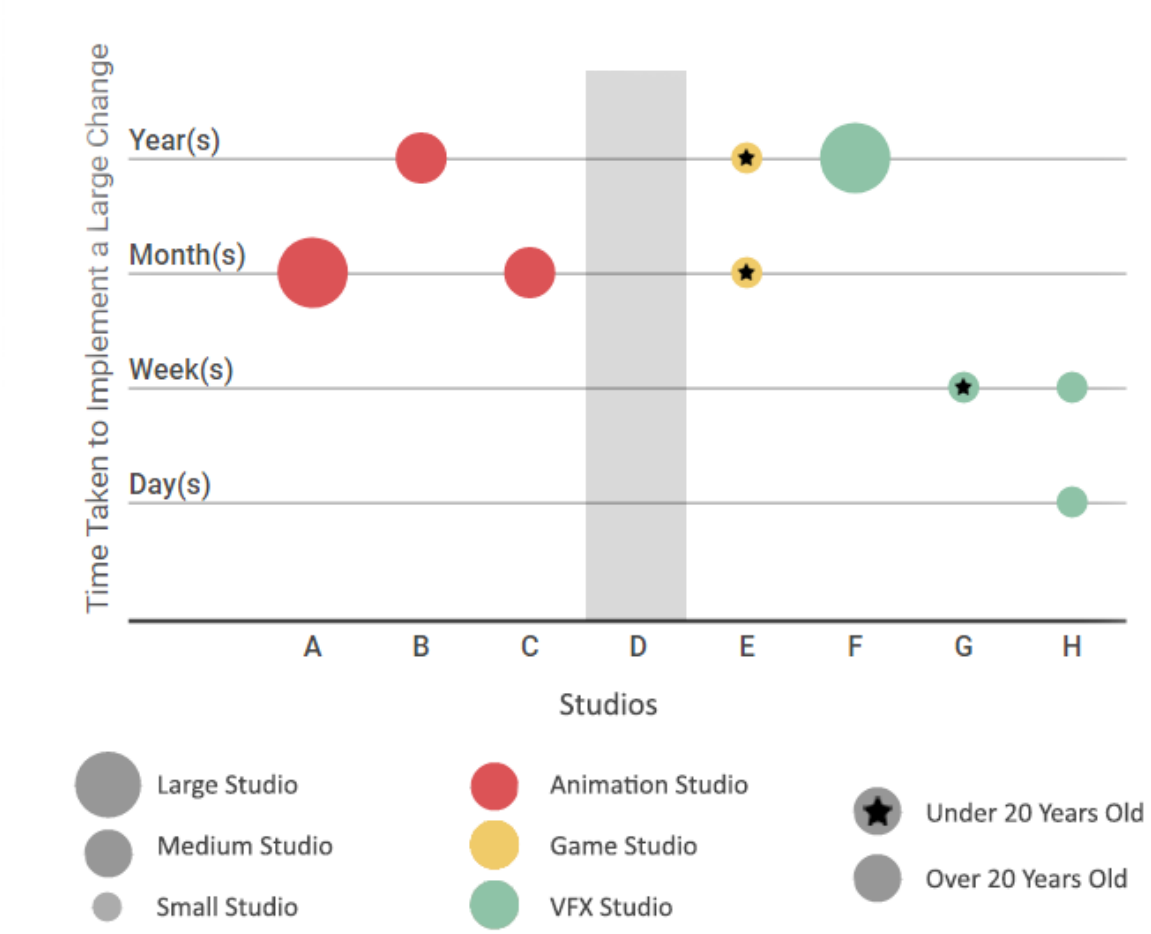
A	A small change should only take a couple days at most, down to a few hours. Large changes sometimes take months, the development before the change is a few months, a few days to change over the show, then a few more months cleaning up anything that broke and adding on top of the change.
B	Small changes are usually in the weeks-to-months range. Large changes can take over a year.
C	large changes can take months to implement, and may require weeks or months of planning and exploration. small changes can take as little as a few hours or a day to write and release the code.
D	it depends on the task. some small changes to the codebase can have a large impact on production. similarly, large backend changes may not be visible at all to production. in general though, i'd categorize small changes as work that takes less than a week to implement.
E	Small - 1-2 sprints (so a month). Large (3-12 months)
F	Small changes are on the order of days to months, large changes on the order of years.
G	maybe half an hour versus weeks of work with IT assistance.
H	The developer time for implementing a large change could be anywhere from a day to a couple weeks. The time for approval, testing, notification and deployment is usually a week, sometimes 2 weeks.

Figure 4.12: Question Eleven: How Long a Small Change Takes to Make by Studio



Answers to Question Eleven can be found in Table 4.15 There are no apparent trends in how long small changes take to make across studio type, age, or size, as can be seen in Figure 4.12. The general consensus is that the time can vary based on the change.

Figure 4.13: Question Eleven: How Long a Large Change Takes to Make by Studio



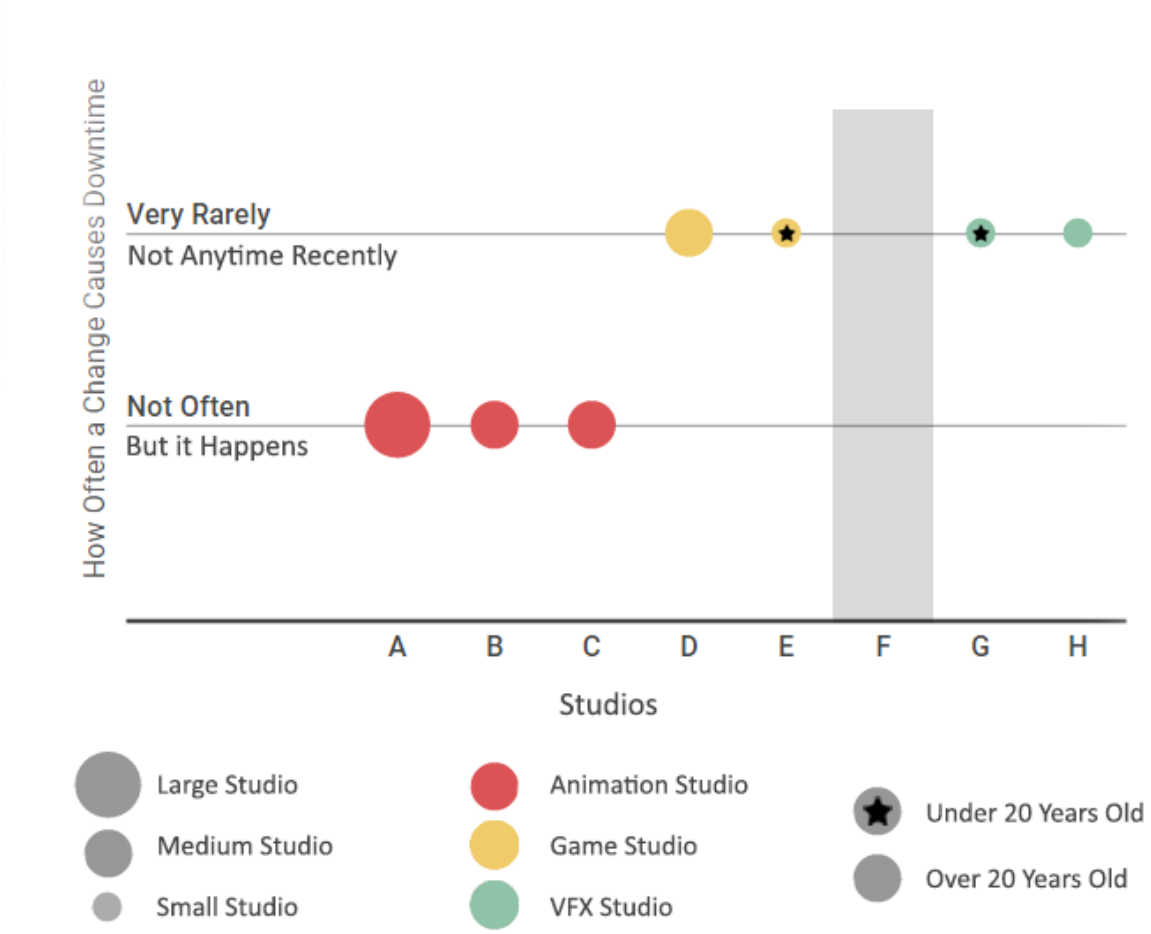
There are no apparent trends in how long large changes take to make across studio age or size, as can be seen in Figure 4.13. Mainly, studios can take anywhere from months to years to implement large changes, but the two small VFX studios can spend days or weeks.

4.2.11 Question Twelve: Do big or small changes often cause any downtime in the pipeline?

Table 4.16: Survey answers to Question Twelve: Do big or small changes often cause any downtime in the pipeline?

A	They can. We usually try to make the changes invisible, but yes they can cause a day or two of not being able to work. Most of the time it is a few artists, taking down the whole department is usually avoided at all costs.
B	The existing pipeline continues to function. Downtime is rare, and measured in hours usually. Even with a major overhaul, the rollout is phased so individual groups can shake out bugs and recover with technology support.
C	usually only if there are serious bugs in the code that gets released, and we're not frequently making changes that would lead to widespread downtime. it's not unheard of, but it's not common.
D	this depends on how the studio rolls out changes. ideally no downtime is required. typically it's just a restart/relaunch of the artist's DCC.
E	We typically avoid with phase rollouts (both over time and across teams). Previous pipeline remains in place until confidently redundant.
F	NA - the scope of "downtime" is a little too vague for me to accurately answer.
G	in the past they have. Hopefully never again. Sometimes we screw up our floating license software while updating licenses.
H	We are constantly fixing bugs and iterating on our software tools. These bugs can cause user frustration, and will sometimes slow down artists. However, we've worked hard in the last year to improve our procedures for rolling out major changes, and we've made it very rare for software updates themselves to cause serious production downtime (1 or more departments to be unable to work). In fact, in the last 6+ months, there have been no serious department downtimes due to problems caused by updating software.

Figure 4.14: Question Twelve: How Often Changes Cause Downtime by Studio



Answers to Question Twelve can be found in Table 4.16. All studios stated that downtime is rare, but the VFX and game studios stated that they haven't had any downtime recently while the animation studios admitted to having downtime more frequently. There are no apparent trends in how long small changes take to make across studio age or size, as can be seen in Figure 4.14. Several participants (B, D, E, and H) attributing their success to their phased system for rolling out updates. Participant A states that while rare, the downtime still only applies to a few artists for a couple of days.

5. RESULTS

In this section, the results of the surveys and literature review will be discussed. Section 5.1 will discuss the differences between a large and a small change in a pipeline. Section 5.2 will discuss general pipeline technology update practices, as found through the surveys and literature review.

5.1 Definitions

In order to fully understand the general practices which will be discussed in Section 5.2, this section will provide working definitions of a large pipeline change and a small pipeline change. A small pipeline change does not alter studio workflow and is usually confined to one department or area of the pipeline. Small changes include bug fixes and small pipeline improvements. A large pipeline change typically occurs when the "needs of production have outgrown the current pipeline," like the MPC instances discussed in Section 2.2.2 [10]. In these instances, the way that artists handled assets had to change, which is why they would be considered large changes. Large changes have a wide impact and typically alter artist workflow.

5.2 General Practices

When considering a change in a pipeline, studios have to consider a lot of things before making the decision to go forward with the change. One major consideration is how much of the pipeline will be affected by the change. Will it be confined to one department or involve many? A change that affects large groups could cause greater damage if it goes wrong. Another consideration that needs to be made is whether the benefits of the change outweigh the costs. In the instance of the change made in Finding Dory [7] mentioned in Section 2.2.3, artists had to take the time to learn the new system and then had to redo sixty percent of the work they had already completed for the film. The benefits of the new system were deemed to be worth this time sacrifice. For large changes, the cost benefits analysis is extremely important because the consequences of a large change can be much greater. For instance, more people, time, and documentation will be needed

to make the change. The larger the studio is, the more consideration has to be made before making a large change. The cost of a change gone wrong in a studio grows exponentially as studio size increases. The larger the studio, the larger the cost.

Since the stakes are higher when making large changes, more people have to be involved in the decision making process. Though it depends on the studioâĂŹs requirements, small changes may only require the approval of the developer and department or technical supervisor, whereas large changes typically require the approval of many levels of leadership across the studio. There appears to be a trend in small studios (especially the VFX studios), in which small and large changes require fewer people's approval than larger studios.

There is a similar difference in how many people it takes to implement changes, and how long they take to implement. Small changes may need between one and five people, where younger studios tend to fall on the high end of the spectrum. These small changes can take anywhere from hours to days, with some studios taking upward of weeks or even months. There is no trend associated with the amount of time it takes to implement a small change, as they are very scalable and even a seemingly simple change could take longer than expected. As for large changes, animation studios all stated that large groups (over ten people) were needed. VFX and game studios were not consistent. They're answers ranged between small and large groups. Large changes typically take anywhere from several months to a couple of years to implement and deploy. The small VFX studios were the only ones to state that a large change could be implemented in days or weeks.

In most of the studios surveyed, small changes are made on a daily to weekly basis; however, Studios G and E rarely make small changes. This may be due to the fact that these are the two youngest studios, which may mean their priorities currently lie outside of improving their pipeline. Studios vary greatly on how often large changes are made, with large changes being made anywhere from three times a week to every ten years. One to two changes per every two to three years seems to be the average among studios surveyed.

One of the biggest consequences of making large changes is the potential for downtime, meaning that artists who need the pipeline are unable to work. A popular method for avoiding downtime

is utilizing a phased rollout system. This could be implemented in multiple ways. One way is breaking up a large change into multiple, smaller changes, which are then released over time. This way, bugs can be found faster, without taking down the whole system. Another way is to only release the change in one department at a time, eventually releasing the change to all departments. Many successful studios use a combination of these approaches. Animation studios appear to have more instances of downtime than VFX or game studios.

6. CONCLUSION AND FUTURE WORK

Pipelines are used in both professional and academic settings. They are used to manage data, workflow, and communication in order to effectively create a product. Due to the ever increasing standards of production in the VFX, animation, and game industries, pipelines must be constantly updated to meet demand. The studios surveyed in this thesis provide an excellent basis for how pipelines in these industries are currently being updated, and the results prompt further research into the topic.

Firstly, some trends were found across studio type, age, and size; however, this research used high level information collected from only eight studios. Trends could be confirmed or denied by analysis of a higher number of studios. The data collected was high level information due to studios' reluctance to give away proprietary information. If more in-depth questioning could be done with the approval of studios' legal departments, more useful information could be acquired. For instance, the phased rollout systems for deploying pipeline changes could be used in every pipeline environment. A closer look at the methodology for these systems in each studio and an analysis of how effective those systems are could provide insight on how to create and optimize the most effective system possible.

Secondly, an analysis of how academic pipelines are being updated in comparison to how pipelines are currently updated in industry would be beneficial research to academic institutions which utilize pipeline environments. For example, Texas A&M's Department of Visualization maintains a pipeline for student use that would be categorized as a small animation pipeline over twenty years old (following this thesis's categorization standards). By this categorization, the department should be following the same update procedures as an actual small animation studio in order to keep up with industry standards and prepare its students for work in the industry. With further research and comparison, academic institutions can know what standards they should be aiming for.

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APPENDIX A

IRB APPROVAL PACKET

IRB Application (Human Research) (Version 1.4)

1.0 General Information

***Please enter the full title of your study:**

An Analysis of Pipeline Update Practices

***Please enter a reference or other description for this study. This field is required, but will not be referenced by the staff. It is for your use:**

Thesis Study
* This field allows you to enter an abbreviated version of the Study Title to quickly identify this study.

2.0 Add Department(s)

2.1 List departments associated with this study. If the study is funded, please associate it with the correct A&M System member.:

Primary Dept?	Department Name
◯	**TAMU** - *College Of Architecture* - Visualization

3.0 Assign key study personnel (KSP) access to the project

3.1 *Please add a Principal Investigator for the study:

McNamara, Ann M

3.2 If applicable, please select the Research Staff personnel. Please note if you do not find the personnel needed, please contact the iRIS support line at 845-4969. IRB Note: These personnel will need to sign off on the initial application submission.

A) Additional Investigators

Suther, Sarah
Protocol Director

B) Research Support Staff

3.3 *Please add a Study Contact:

McNamara, Ann M
Suther, Sarah

The Study Contact(s) will receive all important system notifications along with the Principal Investigator. (e.g. The project contact(s) are typically either the Study Coordinator or the Principal Investigator themselves).

3.4 If applicable, please add a Faculty Advisor:

3.5 Please select the Designated Department or Supervisor Approval(s)(not required for Animal Use Protocol):

McLaughlin, Timothy
Department Chair

For IRB and IBC, add the name of the individual authorized to approve and sign off on this protocol from your Unit (e.g. the Department Chair or Dean).

3.6 If applicable, please select the Administrative Assistant(s)(i.e., Designee) Note: These personnel will not need to sign off on the initial application submission.Please do not use for IRB applications.

4.0

Request to the Human Research Protection Program :: Please Select ONE of the options below.

4.1 I am conducting Human Subjects Research, and I want to proceed to the regular application.

(●) Yes ( ) No

Which IRB reviews your research?

(●) TAMU IRB
( ) Dentistry IRB

4.2 I am requesting a determination - is my project human subjects research?

( ) Yes (●) No

4.3 I am requesting to defer to an external IRB (that is not IRB TAMU or IRB Dentistry).

( ) Yes (●) No

4.4 I am requesting a "Delayed Onset" of human subjects research determination.

( ) Yes (●) No

4.5 A non-Texas A&M researcher is requesting to use people at Texas A&M as human subjects (staff use only).

( ) Yes (●) No

5.0

Study Personnel Qualifications

5.1 Study Personnel Qualifications

Select the Study Personnel from the list created earlier in the application. Then provide the qualifications and role information for that study personnel selection as applicable to this study.

Study Personnel	Qualifications	Role in Study and Duties delegated by PI

Suther, Sarah	CITI Training	Protocol Director, setup, run and analyze experiments
McNamara, Ann M	CITI Training, PI	PI

5.2 External Site or Study Personnel

Please list the study personnel on your study who are not associated with Texas A&M. Additional documentation and agreements may be needed for these individuals.

Will an external site review the research?

○ Yes ◉ No

If yes, what is the name of the external site?

Name	Institution	Telephone	E-mail	Role
No External Personnel has been added to this Study				

Name (from above)	Briefly describe how the person will participate in human subjects research activities	Experience, training, education for these activities	Most recent CITI /alternative training date
No records have been added			

The IRB only needs education or CITI certificate for external personnel if there is no other IRB reviewing the research or if they are a part of the TAMU team.

6.0 Texas A&M University Human Research Protection Program Project Application Form

Study Introduction

6.1 Application Checklist

The following checklist is a guide for researchers regarding supporting documents that must be considered for and/or uploaded with this application for review and approval before use.

- Informed Consent Document
- Information Sheet
- Waiver of HIPAA Authorization
- Parental Permission Form/Minor Assent Form
- Recruitment materials (i.e. flyers, emails, advertisements, telephone scripts, social media posts)
- Site Authorization Letter (for study conduct and/or access to administrative records)
- Survey/Questionnaire/Data Collection/Abstraction Forms
- Grant Applications (cover to cover), required if funded or grant submitted
- Instructions
- Protocol Investigator's Brochure (for clinical trials only)
- Case report form (for clinical trials only)
- Device Manual (if using an approved or investigational device)
- Thesis/dissertation proposal
- Waiver of parental permission/minor assent form
- Letter of cultural evaluation for international research (link to SOP)
- IRB approvals from collaborating institutions
- Any other documents related to the research
- CVs for all investigators when proposed activities are more than minimal risk
- CITI training for all personnel

6.2 Proprietary Information

This protocol includes confidential and/or proprietary information to be protected from disclosure.

○ Yes ◉ No

6.3 Is this research funded?

Please identify your funding source, if applicable.

View Details	Sponsor Name	Sponsor Type	Funding Through	Contract Type:	Project Number	Award Number
No Sponsor has been added to this Study						

Please provide the name of the PI on the funding/grant if it is different from this IRB application.

Will funds from Qatar be used to fund this research?

○ Yes ◉ No

**** If the response to this question is Yes, then approval by an IRB in Qatar may also be required.***

6.4 Has an entity conducted a scientific peer-review of this research?

○ Yes ◉ No

If Yes, please specify:

6.5 Fee for Service Information

Is a company providing contract services associated with this research in which no company personnel are considered collaborators in the research (will not receive professional recognition or included in presentations or publications about the research)?

○ Yes ◉ No

If yes, please provide the name of the company and the contact name.

If a contract exists for this study, was the fee for service information included in the primary award information?

○ Yes ○ No

If yes, please provide a copy of the contract.

Version	Title	Category	Expiration Date	Document Outcome	Checked Out	View Document
No Document(s) have been attached to this form.						

6.6 Is this project part of a dissertation, thesis, or record of study?

(•) Yes ( ) No

If available, please attach the proposal under Other Study Documents at the conclusion of the application. If not yet available, submit it as an amendment form when available.

7.0 Study Scope

7.1 Research Classification

Select all that apply:

- [x] Social/Behavioral
- [ ] Biomedical
- [ ] Both
- [ ] Clinical Trial
- [ ] Other, specify

For Social/Behavioral Research, select all that apply.

- [x] Questionnaire/Survey
- [ ] Observation (investigator observing participants)
- [ ] Retrospective study of records existing at time of this application
- [ ] Exposure to some type of stimulus or intervention (includes device or substance)
- [ ] Participant observation (investigator acts as participant)
- [ ] Interview
- [ ] Focus Group
- [ ] Other, specify

7.2 Vulnerable Populations

Identify any vulnerable populations that will be included in the study:

- [ ] Children (for example, in Texas, under 18)
- [ ] Pregnant women, human fetuses, neonates
- [ ] Individuals with physical disabilities
- [ ] Individuals with cognitive disabilities
- [ ] Economically or educationally disadvantaged persons
- [ ] Prisoners
- [ ] Other (for example, individuals with psychiatic disorders, emotional/social impairments, depression, etc.)
- [x] No Vulnerable Populations will be included.

If Other, then please explain:

Describe additional safeguards planned to protect the rights and welfare of vulnerable subjects:

If a subject transitions into one of the vulnerable populations (pregnant women or cognitively impaired), will the study procedures place them at any additional risk?

( ) Yes (•) No

If a subject becomes incarcerated (including awaiting sentencing, court-mandated treatment, or in prison), contact the IRB immediately.

Please justify the use of vulnerable/special populations.

8.0

Project Overview - Protocol Section Begins Here

8.1 Project Summary

In the space below, provide a summary of the project. Include information about background and rationale for the study including preliminary data, purpose, objectives, specific aims, and research questions. Character limit: 5,000 (applies to first box).

Every animation or gaming studio has a production pipeline, which is a combination of a workflow system and set of tools. These tools must be updated constantly to keep up with demand. There is no set protocol for how a pipeline should be updated.

RESEARCH PROBLEMS

1. Different pipeline environments allow for a wide variety of update strategies. We will ask specific questions about how the pipeline setup effects update practices.

2. Updates can be of varying scales, where some are small tool updates and others are large software suite or pipeline structure updates. We will ask questions about how update practices between large and small pipeline updates differ.

PURPOSE AND OBJECTIVES
To analyze the similarities and differences in pipeline update practices in various studio settings

To analyze the similarities and differences in pipeline update practices between large and small updates

To add to the knowledge gained from Brandon Jarratt's *From Production to Education: An Analysis of Pipeline Requirements and Practices.*

RESEARCH QUESTIONS
How does the structure of a pipeline affect the way it is updated?

How does the size of the update affect the way it is updated?

Are there any similarities between different studio's pipeline update strategies?

Procedures Involved:

In the space below, Describe and explain the study design. Provide a description of all research procedures being performed and when they are performed.

List each procedure or test and how often the procedure or test will occur for each participant.

Include a procedure schedule or table of events, if applicable - clinical studies.

Describe: All source records that will be used to collect data about subjects. This includes surveys, scripts, recordings and data collection forms; all test articles including dietary supplements, drugs and devices used in the research and the purpose of their use, and their regulatory (FDA) approval status.

PROCEDURES INVOLVED
Emails will be sent to potential participants who have been recommended to the Investigators for the study. Once the potential participant has agreed to the questionnaire, a Google Form questionnaire will be sent via email to the participant. The Consent Script will be the first page of the Google Form, and the form will only continue if the

participant agrees to continue. The data obtained from the questionnaire will then be stored separately from the name of the participant and any association to the studio. The questionnaire could take a participant anywhere from 30 minutes to 1 hour and involves no risk to the participant. This study could take anywhere from 1 to 3 months, depending on the response times of the participants.

☐ Drugs
☐ Devices
☐ Supplements

Significance:

The study will provide a start to standardizing pipeline update practices.

Subjects, enrollment, recruitment, inclusion and exclusion criteria, and informed consent:

RECRUITMENT
Potential participants will be recommended to, or already known by, the Investigators. An email will be sent to each potential participant explaining the purpose of the study. Potential participants can then determine whether or not they would like to participate.

SUBJECTS, INCLUSION AND EXCLUSION CRITERIA
At least 5 participants from different studios would be needed to achieve the study objective. Only adult employees of known studios will be included in the study. Age (as long as the participant is 18 or older) and gender will not be considered. Participants must also be involved in the pipeline process in their studio.

CONSENT

The Consent Script will be the first page presented in the Google Form. No other questions will be visible or available until the participant gives his/her consent to participate.

Will audio recordings be collected?

○ Yes ◉ No

Will visual images be collected?

○ Yes ◉ No

If visual images will be collected, are they full, facial identifiable images?

○ Yes ◉ No

8.2 Locations

List locations or facilities where the research will be conducted (e.g. building name, physical address).

1. Langford C, 3137 TAMU, College Station, TX 77840

Are any of the locations listed above non-Texas A&M facilities?

○ Yes ◉ No

What is the role of each location?

1. Base of research. Where data will be analyzed.

Is the PI of this IRB study application the lead investigator of a multicenter study (i.e. the study is taking place at multiple institutions that are obtaining their own IRB approval and you are coordinating and overseeing the research)?

○ Yes ◉ No

Has IRB approval been sought at another institution?

○ Yes ◉ No

Please submit the Site Authorization letter(s) with this application as a study document or indicate when site authorization will be obtained. Guidance is available at **http://rcb.tamu.edu/humansubjects/resources/site-authorization-letter**

8.3 Other Committee Approvals

Select all that apply.

- [x] None
- [ ] Animal Use
- [ ] Biohazards
- [ ] Chemical
- [ ] Radiation
- [ ] Other

If any committee approvals apply, please provide the permit number and approval date.

9.0 Study Population

9.1 Number of Participants

Approximately how many subjects do you plan to enroll?

5-10

Provide the rationale for the number of subjects requested (for example, power analysis, sponsor requirements, etc.).

At least 5 subjects from different studios are required to get a wide view of studio practices.

Will human subjects be used from the Qatar population?

○ Yes ◉ No

**** If Yes, then approval by an IRB in Qatar may also be required.***

Will human subjects be used from another international population?

○ Yes ◉ No

****If Yes, then approval by an international review board or government may also be required.***

Will human subjects be used from a Native American population?

○ Yes ◉ No

****If Yes, then approval by a tribal IRB(s) may also be required.***

If Yes for research in Qatar, in another country, or with Native Americans, provide justification for that research being conducted in that particular community.

9.2 Provide the age groups being enrolled into this study (Note the consent documents required for each age group listed in parentheses):

☐ 0-6 (parental consent only, Pediatric Assessment required for Clinical Trials)
☐ 7-11 (child's assent plus parental permission, Pediatric Assessment required for Clinical Trials)
☐ 12-17 (consent plus parental permission, Pediatric Assessment required for Clinical Trials)
☑ 18+ (consent only)

Enter the specific age range for study population (if overlap or specific within a category):

9.3 Indicate the gender of participants being enrolled into this study:

☐ Male
☐ Female
☑ Both male and female

9.4 Inclusion/Exclusion Criteria

What are the inclusion and exclusion criteria for study participation?

Only adult employees of known studios will be included in the study. Age (as long as the participant is 18 or older) and gender will not be considered. Participants must also be involved in the pipeline process in their studio.

Do the exclusion criteria exclude specific populations or individuals based on gender, culture, language, economics, race, or ethnicity?

○ Yes ◉ No

If Yes, then justify each exclusion:

9.5 Describe the setting where the informed consent process will take place (e.g. classroom, clinic, laboratory, office, park, personal computer, etc.).

If a waiver of documentation of informed consent is requested, then describe how participants will review the information sheet.

Consent will be documented via the first question on the Google form. It will be the first data point in the list of data from that participant.

9.6 Experience of Subjects

Describe the experience of subjects while participating in this research. (Please describe what the participant will experience from the time of learning of the study through completion.)

A participant will receive an email explaining the study with a link to the questionnaire. If they want to participate, they will open the link to the Google Form. The Consent Script will be the first page of the Google Form, and the form will only continue if the participant agrees to continue. The questionnaire can take from 30 minutes to an hour. After the participant finishes the questionnaire, they have no more involvement in the study.

How long will the participants be engaged in the research (length of time, e.g., 15 minutes, 45 minutes on Day 1, 60 minutes on Day 2, etc.)?

30 minutes to 1 hour

10.0 Privacy and Confidentiality

10.1 How will the identities of subjects be protected in all research records? The information collected/analyzed is:

Note: Data that are coded, where the key to the code is accessible to researchers, are considered confidential information and subject to privacy regulations.

- ☐ Anonymous: The identity of the participant cannot readily be determined by the investigator AND the identity of the participant is not connected to information gathered.
- ☑ Confidential: Research participants can be identified; however, information gathered will be protected.
- ☐ Neither: Research participants can be identified, and information gathered may be connected to the participant.

Summarize procedures to protect the confidentiality and anonymity of participants (e.g., replies coded, etc.).

The only data that will be collected will be the participants' answers to the study questionarre. This data will be stored in a password-protected Google spreadsheet. The data will only be stored for 1 year. The data will only be accessible to the Investigators.

What are the plans for retention and/or destruction of linkages between study data and personal identifying information? (Specify when and how personal identifying information will be destroyed.)

The studio names will be retained in the data, but the name of the participants will not be recorded.

If these linkages will not be destroyed, explain how you will maintain confidentiality of the personally identifying information.

Studio names will be necessary for analysis, but will not be included in results. Studios will be renamed as Studio A, Studio B, etc.

If personally identifying information will not be kept confidential, then justify and explain the informed consent process for sharing this information.

Will a Certificate of Confidentiality (through DHHS or another Federal agency) be utilized?
https://humansubjects.nih.gov/coc/index

○ Yes ◉ No

11.0 Potentially Sensitive Subject Matter and Procedures

11.1 Will this type of information be collected?

○ Yes ◉ No

11.2 Select all that describe the information.

- ☐ No sensitive matters
- ☐ Abortion
- ☐ Alcohol
- ☐ Body composition
- ☐ Criminal activity
- ☐ Depression
- ☐ HIV/AIDS

- [ ] Learning disability
- [ ] List of current medications
- [ ] Medical/dental problems
- [ ] Medical history
- [ ] Potential child abuse/neglect
- [ ] Psychology/psychiatry
- [ ] Sexual activity
- [ ] Suicide
- [ ] Unethical behavior
- [ ] Other

If other, please specify:

If Medical History or Mental Health History information will be collected, please describe:

11.3 Deception

Will deception be used as part of the study?

( ) Yes (•) No

If Yes, please describe the deception.

Please describe the debriefing procedures to be used.

Provide justification for the deception.

12.0 Risks and Benefits

12.1 Regulatory definition of minimal risk is that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests (45 CFR 46.102(h)(i)).

Identify the types of risk associated with participation in the study:

- [ ] Physical
- [ ] Privacy
- [ ] Confidentiality
- [ ] Psychological/emotional
- [ ] Social
- [ ] Legal
- [ ] Other

If Other, please describe the risks:

Describe the potential risks or discomforts to participants. Include justification of the known risks, which were selected above.

There is none to minimal risk involved in the study.

Describe the approaches you will take to minimize these risks and/or to minimize their impact.

What alternatives are available to subjects outside the research (i.e., what is the standard of care, is the research intervention available without participating)?

12.2 What are the potential benefits of this study to individual participants? (This does not include payments, compensation, or incentives.)

There are no potential benefits to the participant.

12.3 What are the potential benefits of this study to the population or society?

There are no potential benefits to the population.

13.0 Personally Identifiable Information

13.1 Indicate which of the following personally identifiable information (PII) will be accessed or recorded in association with this study:

- ☐ None
- ☑ Name
- ☐ Web addresses (URLs)
- ☐ Full Face Photographic Image
- ☐ Internet IP Address
- ☐ Health Plan Beneficiary Number
- ☐ Certificate/ License Number
- ☐ Any Other Unique Identifier or Combination
- ☐ Geographic Information (including city and ZIP)
- ☐ Vehicle Identification Number and Serial Numbers Including License Plate Number
- ☐ Telephone Number
- ☑ Email address
- ☐ Fax number
- ☐ Social Security Number
- ☐ Medical Record Number
- ☐ Account Number
- ☐ Medical Device Identifiers
- ☐ Biometric Identifiers
- ☐ Dates directly related to an individual (including birth, death, admission, discharge, date of procedure)
- ☐ Educational Records

Will any PII in your possession be coded?

○ Yes ◉ No

Will you have the code in your possession?

○ Yes ◉ No

Is this personally identifiable information considered Protected Health Information (PHI)? (PHI is any of the 18 identifiers listed above collected by or received by a covered entity, which includes a healthcare provider, healthcare clearing house, or as defined in the Univeristy SAP 16.99.99.M0.01.)

○ Yes ◉ No

If Yes, additional requirements may be involved such as HIPAA authorization, Waiver of Authorization, or Data Use Agreement, or other agreements.

13.2 Explain why you need to obtain personally identifiable information (list all of the data fields to be collected):

Participants must be identified as suitable candidates for the study, so their name and job title must be known. Participants must be contacted by email with a link to the survey.

13.3 Does this study involve use of Protected Health Information (PHI) being received from a Covered Entity (e.g. healthcare provider, healthcare clearing house, health plan)?

○ Yes ◉ No

Will the provider be a collaborator on this study who will maintain the code to the PHI in their possession?

○ Yes ◉ No

If yes, identify the covered entity and provide the data use agreement or business associate agreement.

Version	Title	Category	Expiration Date	Document Outcome	Checked Out	View Document
No Document(s) have been attached to this form.						

Covered Entity:

Does this study involve collection of PHI from participants or receipt of PHI from a covered entity?

○ Yes ◉ No

Does this study involve distribution of PHI to a Covered Entity (e.g. healthcare provider, healthcare clearing house, health plan)?

○ Yes ◉ No

If Yes to any of these three previous questions, PHI authorization or a waiver of PHI authorization is required. Is a waiver of PHI authorization being requested? For more information, see the additional information online: **http://rcb.tamu.edu/humansubjects/resources/consentinfo**

○ Yes ◉ No

Please attach the HIPAA Authorization as needed to the application.

Version	Title	Category	Expiration Date	Document Outcome	Checked Out	View Document
No Document(s) have been attached to this form.						

13.4 Will the PHI used in this study be stored with encryption?

○ Yes ◉ No

How is PHI transmitted electronically being protected?

How is PHI data protected?

Who has access to PHI?

14.0 Retrospective Details (Please note: This refers to the analysis of data, documents, records, or specimens that were existing as of the date of the IRB application.)

14.1 Will existing data or documents be used (e.g., patient records/charts, samples/specimens, public records, surveys, evaluation tools, etc.)?
NOTE: If you answer NO to this question, please skip the remaining questions in this section.

○ Yes ◉ No

If Yes, then:
Describe the data or documents that will be used.

What is the date range of the original data collection?

How will the existing data be obtained? Additional information may be required to establish authority to use the data previously collected.

14.2 Will your research be limited to only existing data or specimens?
NOTE: If data/specimens will be collected after submission of this application, then the answer here is "No". If you answered NO to this question and the main question above, please skip the remaining questions in this section.

○ Yes ◉ No

14.3 Will existing specimens be used (e.g., human blood, tissue, saliva, etc.)?

○ Yes ◉ No

If Yes, then describe the specimens that will be used and how they will be obtained.

Indicate the number of specimens.

How will the specimens be obtained?

Provide the documentation from the holder of the samples that gives you permission to use the samples for research purposes. If the samples were collected for research purposes, provide a copy of the approved informed consent document used to obtain the samples.

14.4 Retrospective Details – Publicly Available

Is the source of the data for your research accessible by the general public?

○ Yes ◉ No

Provide the link if applicable.

14.5 Retrospective Details – Identity

Will it be possible to determine a subject's identity directly or indirectly through a link (e.g., Medical Record Number (MRN), participant code, IP address, email)?

○ Yes ◉ No

14.6 Retrospective Details – Waiver of Informed Consent

Is it impractical to obtain informed consent from the subjects?

○ Yes ◉ No

If Yes, then please complete the Waiver of Informed Consent information in the next section.

14.7 Retrospective Details - Waiver of Document of Informed Consent

Is it possible to obtain informed consent, AND the only link between the data and the human subject would be the signed informed consent document?

(•) Yes ( ) No

15.0 Costs and Compensation

15.1 What are the costs to participants (monetary, time, expense, etc.)? Identify the costs and specify the amount.

The only cost is time, between 30 minutes to 1 hour.

15.2 Will participants receive any compensation for participation in the study?
Note: For payments to participants, please see University SAP Payment of Survey and Research Participants 21.01.99.M0.03. (http://rules-saps.tamu.edu/PDFs/21.01.99.M0.03.pdf)

( ) Yes (•) No

If Yes, then identify the amount of compensation, method of payment, payment schedule, and justification. If more than a single session with the participant, then the schedule should include incremental payments.

15.3 In case of injury, explain who will pay for the treatment. (If not applicable, then note "N/A.") Is there a contract in place - is subject injury covered by an outside entity?

N/A

15.4 What extra costs will be incurred by third-party payers because of subjects' participation?

N/A

16.0 Recruitment

16.1 How will potential subjects be identified? (How do you know who to contact to participate in the study?)

Potential participants will be recommended to, or already known by, the Investigators. An email will be sent to each potential participant explaining the purpose of the study. Potential participants can then determine whether or not they would like to participate.

16.2 Bulkmail

Will Texas A&M University bulkmail be used for recruitment?

( ) Yes (•) No

Please note that bulkmail recruitment applies to main campus, Health Science Center (HSC), Law School, and Galveston only. Recruitment to the Qatar campus may be require approval by an IRB in Qatar.

16.3 How will potential subjects be recruited? Select all that apply:

- [ ] Direct contact in a medical setting
- [ ] Direct contact in a non-medical setting
- [ ] Newspaper ad
- [ ] Television
- [ ] Radio
- [ ] Website
- [ ] Social/professional networking site
- [ ] Posted notice(s)
- [ ] Letter
- [ ] Telephone solicitation
- [x] Email
- [ ] Recruiting Pool (See next question)
- [ ] Other (specify):

If you selected Recruitment Pools option above, please identify the groups below.

- [ ] Economics
- [ ] Marketing
- [ ] Motor Behavior
- [ ] Motor Neuroscience
- [ ] Psychology
- [ ] Sociology
- [ ] TTI

**** Skip to the next section if using a Recruitment Pool.***

16.4 How will initial contact be made with potential participants?

Initial contact will be through a personal email.

16.5 How will the researchers protect subject privacy *during the recruitment process*?

The researcher will be the only one with access to the email correspondance to potential participants. All emails will be password protected.

16.6 Who will do the recruiting?

Sarah Suther, the Protocol Director

16.7 Will recruiting be conducted off Texas A&M University property?

○ Yes ◉ No

If Yes, describe (Site Authorization(s) may be required.)

16.8 Will screening or recruiting be from or through the patient base of a healthcare provider?

○ Yes ◉ No

16.9 Do you have any relationship other than as an investigator with participants (e.g. doctor-patient, teacher-student, counselor-student, family member, etc.)?

(●) Yes ( ) No

If Yes, then specify the relationship.

Potential participants will be known to the researchers through professional association.

Describe how you will avoid any type of coercion.

Through recruitment, the researchers will make it very clear that participation is voluntary and the participant can choose not to participate at any time.

16.10 If the subject is a student who is participating in the research for course credit, then how will you ensure that the subject was not coerced into participating?

N/A

16.11 If this study meets a requirement for course research credit, then how is this study suited to the course for which research credit is required?

N/A

16.12 What alternatives to the participation in the research without negative consequences will you allow (e.g., not to participate, alternative assignment)?

A potential participant will always be able to decline participating.

16.13 Will there be any penalties or other disadvantages for those declining to participate?

( ) Yes (●) No

16.14 Will any pre-screening surveys or questions be used?

( ) Yes (●) No

If Yes, then please describe and include in Other Study Documents.

17.0 Data Management

17.1 General Information

STANDARD ADMINISTRATIVE PROCEDURE

15.99.03.M1.03 The Responsible Stewardship of Research Data

http://rules-saps.tamu.edu/PDFs/15.99.03.M1.03.pdf

Do you agree to adhere to the SAP with your data?

(●) Yes ( ) No

Where will the data be stored? Indicate building and room number on TAMU property.

Most data will be digital and will be stored online and will be password protected. Any physical data will be stored on TAMU property in Langford C, room 421.

How long will the data be stored? (Note: This time period should be a minimum of 3 years post completion of the research and perhaps longer, depending on sponsor requirements.)

Data will be stored for three years past the completion of the research.

If you are storing or transmitting collected data, is the storage and transmission of the data encrypted?

(•) Yes ( ) No

Please note that PHI must be stored and transmitted with encryption.

Who will have access to the data?

Only the Protocol Director and Principle Investigator

17.2 Data Safety Monitoring Plan

( ) Yes (•) No

If so, then:
How is it managed?

With what frequency is data reviewed for this project?
How often does the DSMB meet?
What is the frequency of reports from the DSMB?
Describe any planned interim analysis.
Provide names, affiliations, and qualifications of members.

18.0 Informed Consent

18.1 Select all that apply and attach to the application:

For templates and guidance regarding informed consent, see **http://rcb.tamu.edu/humansubjects/resources/consentinfo**

- [ ] Informed Consent Document (signed consent, typically needed in Texas for research involving adults)
- [ ] Parent Informed Consent Document
- [ ] Parent Permission Form
- [ ] Assent Form (typically needed in Texas for research involving children under 18)
- [ ] Recruitment Script (verbal)
- [x] Recruitment Email
- [x] Information Sheet (also select Waiver of Documentation of Informed Consent)
- [x] Waiver of Informed Consent
- [ ] Waiver of Documentation of Informed Consent
- [ ] Other

If other, please specify:

18.2 Please provide the readability statistics for each informed consent document in terms of the Flesch-Kincaid Grade Level. In general, informed consent document for adults should be on an 8th grade level.

http://rcb.tamu.edu/humansubjects/resources/tipsconsentforms

8th Grade Level

18.3 Please describe the informed consent process. Include how participants will be adequately informed of what they will be asked to do in the study as well as how they will be protected. Include how the forms selected above will be used in the process including that the particpants will have sufficient time to review any information provided to them.

If a waiver of documentation of informed consent is requested, then the information sheet use must be described here.

The Informed Consent document will be the first page of the Googe Form questionnaire. Participants will be able to read, review, and electronically sign the document in whichever environment they choose. They will be informed that their personal information will not be recorded, and their studio information will be anonymized in the results. The informed consent process will be easy to read and understand. It should take no more than 5 minutes to read and sign the consent document, but participants will be able to take as much time as they need.

18.4 Where will the informed consent process take place (e.g. building name, physical address)?

The informed consent process will take place online. There will be no physical documents.

Where will the informed consent documents be physically stored?

N/A

Who will have access to the Informed Consent documents?

The PI and the Protocol Director

18.5 For studies involving research on children, will participants who reach age of majority be consented?

○ Yes ○ No

18.6 Have the PI, Co-I(s), and any persons interacting with study subjects completed CITI training?

◉ Yes ○ No

If No is selected, have the PI, Co-I(s), and any persons interacting with study subjects completed alternative human subjects training? If so, please provide a description and copy of the alternative training.

18.7 Please indicate the research personnel who will be obtaining informed consent from participants. (Use N/A to indicate that informed consent will not be collected.)

Sarah Suther (online)

18.8 What project-specific training/experience have individuals obtaining informed consent received (e.g. verbal instruction by the PI, practice with the PI)?

Practice with PI

18.9 Will the subject have the opportunity to review the informed consent document or Information Sheet, ask questions, and understand the details of the study prior to participation?

(●) Yes ( ) No

If Yes, then how much time will be provided?

As much time as the participant needs.

18.10 How will cultural issues, including language, be addressed?

Potential participants who are not proficient English speakers and readers will not be recruited for the study.

18.11 Will non-English speaking people be approached to participate in this study?

( ) Yes (●) No

Will a translation be available for non-English speaking subjects?

- [ ] Verbally (provide script)
- [ ] In writing (provide documents)
- [ ] Both
- [x] Neither

18.12 If the study involves minors, then describe the informed consent process of parental permission and how the assent of the minor will be sought. Attach the documents to the application.

19.0 Waiver of Informed Consent - 45 CFR§46.116

19.1 Provide protocol-specific reasons and justification on how all the following criteria are met:

The research involves no more than minimal risk to the participants.
Protocol-specific explanation:

The research consists of a simple survey. The survey involves no to minimal risk to the participants.

The waiver or alteration will not adversely affect the rights and welfare of the participants.
Protocol-specific explanation:

The waiver will not alter the rights or welfare of the participants. Participants will view the information sheet before choosing to continue on in the survey.

The research could not practicably be carried out without the waiver or alteration.
Protocol-specific explanation:

Obtaining signed informed consent documents would be impractical for the study, as participants are across the country and will be contacted purely through email.

Whenever appropriate, the participants will be provided with additional pertinent information after participation.
Protocol-specific explanation:

If any pertinent information arises after participation, the participants will be contacted and the information will be provided.