Creative Storage Solutions for Theatre Programs:

The Time and Cost of All Those Props

by Timothy J. Phipps

A thesis submitted to the faculty of Radford University in partial fulfillment of the requirements for the degree of Master of Fine Arts in the Department of Design Thinking

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Abstract:

Technical theatre is not a field commonly researched. Even within the world of academic theatre, there is limited scholarly work taking place. In most cases, contributions to the body of knowledge occur through design work or innovations despite the fact that there are challenges affecting many small theatre groups. This causes the individual theatre groups to develop solutions independently. One of the primary problems faced by small theatre groups is the acquisition and storage of props. Props are acquired in various ways including purchasing, renting, building, or pulling from an internal collection (Gillette, 2013). Each method has its own strengths and weaknesses. With limited resources, this process can be time consuming and expensive. Because of this, many theatres maintain an internal collection of pieces acquired over time (Strawn, 2013). These collections of properties can help in addressing some of the financial and time-related issues posed by the other methods, but create additional logistical problems, primarily related to storage space requirements and costs. In addition to these challenges, there is a heightened sense of environmental consciousness, calling for increased conservation efforts within the theatre community.

The purpose of this study is to use design-thinking methods to understand how small theatre programs acquire and store props for productions and to propose innovative solutions. Three theatre professionals completed a stakeholder map in order to determine those positions most involved in the storage and acquisition of theatre set props. They identified six key stakeholders: director, designer, technical director, producer, properties master, and theatre program director. In stage two, six individuals representing each of the key stakeholders were interviewed and their typical experiences were diagrammed. The individuals echoed the challenges from the research. They had a desire to develop a more efficient system to find and store their properties. Stage three included 14 participants from a variety of industries that inform acquisition and storage solutions participating in a design-thinking

workshop including three strategies: alternative worlds, round robin, and visualize the vote. Alternative worlds led the group to explore libraries, warehouse automation systems, and multi-site churches further. The participants then completed a round robin session, where they developed potential solutions including improved inventory and networking options. Finally, visualize the vote led the group to focus on supporting the individual programs and developing a system to provide inventory creation solutions and opportunities to rent or sell props. Discussion following the voting focused the group on the concept of standardizing inventory systems. Stage four used a system of schematic diagrams with stakeholder critiques to refine the ideas that developed out of the stage three workshop. After two rounds of critiques and revisions, the concept was refined into the proposed solution. This solution involves a web/mobile application to help theatres standardize their inventories as well as open up channels between theatres for rentals and sales. Finally, for stage five, a video scenario was created to communicate the proposed solution to future stakeholders. This included the creation of a five-minute narrated presentation explaining the key elements of the proposed solution.

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Introduction:

Theatre is a collaborative art form with various people with different skills working together to bring the director's vision to life. Within this team of performers, technicians, and designers, there are many behind the scene roles that go unnoticed. One of these major roles is the acquisition of the required properties. Properties generally fall into one of three categories: set props, hand props, or decorative props (Gillette, 2013). Set props are larger movable pieces such as furniture, rugs, floor lamps, appliances, etc. Hand props include items carried by actors such as fans, books, lanterns, cups, and similar items. Finally, decorative props, also known as set dressing, are pieces not specifically used by the actors, but help create the environment. Decorative props include pictures or artwork hanging on walls, dishes in cupboards, curtains, and other items helping to visually enhance the scene (see Figure 1).

Figure 1: Dishes and Misc. Kitchen Items for Use in Theatrical Productions; Cedarville University

In addition to the variety of props found in the world of theatre, there are also different sizes and types of programs. To illustrate, larger theatres tend to have a dedicated properties director whose main job is to acquire, maintain, and organize various properties for the theatrical production (Strawn, 2013), while smaller programs might have one person who covers many roles including scenic design, construction, properties, and more.

Most theatrical productions have a strict schedule they follow in order to complete the various tasks needed to have the show ready for performance by opening night. The length of these schedules varies program-to-program. Some programs have flexibility in the schedule and have months to put together their production, while others have a few weeks. In both cases, time is needed to create, find,

and secure the various types of props required by the script and the designers. The constraints of the production's schedule may be especially difficult on smaller theatrical groups where one person is filling multiple roles.

Along with time, budgets have an important role in the acquisition of props. For each production, a portion of the budget is allotted to cover the cost to create, purchase, or rent properties (Strawn, 2013). One way to attain the necessary properties for a production is to maintain an internal collection that can address time and budget issues (Strawn, 2013). These collections allow theatres to collect pieces throughout the year for use in future productions, yet the sheer number of pieces and amount of time required to maintain and catalog the props can be daunting (see Figure 2). Furthermore, storage facilities can become full and unorganized. Using various design-thinking methods, the purpose of this research study is to understand the current small theatre program storage needs and propose innovative solutions to this problem. For this investigation, we seek to identify the primary individuals involved in properties acquisition and storage, understand the problems of the current systems, and develop potential solutions that address the various challenges.

Figure 2: Cedarville University Dept. of Art, Design, and Theatre Set Prop Storage Facility

Definition of Terms:

Alternative Worlds:
A strategy for innovation by investigating other domains in order to gain a new perspective on an issue or challenge within a domain you are researching (Luma Institute, 2012).

Experience Diagramming:
A process of mapping a person's journey through a task (Luma Institute, 2012).

Internal Collection:
The properties owned and stored by the theatre for use in productions.

Properties/Props:
Elements including furniture, lamps, pictures, linens, and other bric-a-brac used to create the finished theatrical set or used during the production by an actor.

Pulling:
To remove a property from storage for use in a production.

Round Robin:
A method of idea generation in which an idea is passed person to person allowing the idea to evolve (Luma Institute, 2012).

Schematic Diagramming:
A method of outlining the structure and key elements of a system (Luma Institute, 2012).

Stakeholder Mapping:
A process for diagramming a network of people who have shared interest or involvement within a given system (Luma Institute, 2012).

Strike:
The time after the end of a theatrical production when the set is torn down, the props are put away, and rentals returned.

Video Scenario:
A method of showing the attributes of a new system or concept through the use of a short video (Luma Institute, 2012).

Visualize the Vote:
An activity in which people vote on their preferences between proposed concepts (Luma Institute, 2012).

Literature Review:

Limited Research

Due to the nature of the field of technical theatre, scholarly research is limited or non-existent. Research that does exist addresses historical research, acting styles, and techniques, or the use of theatre in other fields. In many cases, the scholarly work within technical theatre deals with actual technical or design work and focuses on practical experience over research. However, there are many standard theatre textbooks that mention properties, but few that address the acquisition and storage of set props (Campbell, 2016; Cohen, 2014; Parker, Wolf, & Block, 2003; Rogers, Rogers, & Jones, 1995) (see Figure 3). Even if acquisition and storage are discussed, it is often limited to a single section or paragraph within the text (Gillette, 2013; Hart, 2014; Strawn, 2013).

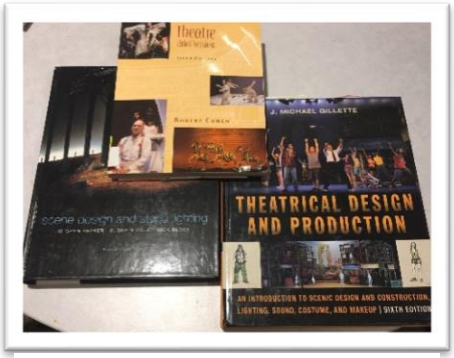

Figure 3: Three common Theatre Textbooks

In addition, in recent years, there has been a focus on addressing environmental concerns within the theatre industry (Goldman, 2017). The majority of productions run for a short period of time, are taken down, and much of the materials are never used again. With the potential for large amounts of waste generated by theatres, conservation efforts have been the focus of multiple studies. Exploring the ways theatres acquire and store resources could identify ways to help theatres waste less material and limit the number of pieces being disposed of.

Time and Cost

There are four primary ways properties can be acquired: building, buying, renting/borrowing, or pulling (Gillette, 2013) (see Figure 4). Building props is the creation or modification of a piece for use in the production. This method is generally used when a piece is not available or needs to be used in a non-standard way (Hart, 2012). At times when specific pieces cannot be acquired, other items can be altered to fit the design or need of the production. Many times, alterations include strengthening the items to handle the rigors of the production (Gillette 2013). In these cases, the designer will provide specific designs or researched images of the piece they want to use and it will be up to the crew to build or recreate the property. This can include using a piece the theatre already has procured and modifying it to create the desired look or an original piece built from scratch (e.g., actors having to stand or dance on a piece or pieces built to fit the image of the play). In these cases, the pieces will be constructed and finished based on the designer's drawings and research (Strawn, 2013). Unfortunately, building props is time-consuming and often more costly than the other options for acquisition (Hart, 2012). In the end, these pieces are often moved into the theatre's stock collection, which can expand options for future productions (Strawn, 2013).

Figure 4: Misc. Furniture for Use as Set Props; Cedarville University

Buying pieces for use within the production can take several forms as well, including auctions, consignment shops, retail stores, thrift shops, salvage yards, garage sales, or various online marketplaces. The renting/borrowing of pieces may be done through large companies or through other connections the theatre might have developed. Finally, pulling pieces is the process of finding properties already owned and stored by the theatre group itself. Many theatre groups maintain a collection of properties for use in

future productions. These collections can range from bins of hand props or set dressing to vast warehouses of furniture (Strawn, 2013). Each way of acquiring the needed properties has many implications on the theatre group, including time, money, and storage.

Buying set props can also be very time consuming; however, the internet has revolutionized the process making it easier to locate the pieces for purchase (Gillette, 2013). When purchasing pieces, it is recommended that you photograph the options and share them with the designer, allowing the designer to choose the pieces they want to use (Strawn, 2013). Even though buying pieces may be the easiest option, the pieces often need to be altered to fit within the design of the production (Gillette, 2013).

DAMAGE WAIVER

A DAMAGE WAIVER IS NOT INSURANCE.

You are still responsible for the props that you have rented. You may not change the props (including putting screws or nails into them under the misguided idea you are repairing them,) and you must care for them. The contract as specified on the back of your rental contract is still in force. However, in return for your acceptance of the damage waiver we agree to waive our right to collect damage fees except as specified below. If you have insurance the damage waiver becomes secondary and you agree to exercise all rights available to you under your insurance coverage and assign all claims and proceeds from your insurance coverage to us.

Notwithstanding the foregoing, Your liability for loss of, or damage will not be waived in the following circumstances:

1. Any item or part thereof, which is not returned, irrespective of the reason, including theft.
2. Reckless, careless or abusive use of items.
3. Use of items in ways not intended i.e. dancing on tables, standing on chairs.
4. Damage resulting from vandalism, malicious mischief or intentional abuse.
5. Damage due to your neglect or misuse.
6. Damage so severe the item can not be repaired.

You must care for the Rental Items

1. You must clean items before returning them. Remove moreflight, tape, wax, food and drink residue, make up, etc. Sweep or vacuum rugs. Wash dishes & glassware.
2. Roll up rugs neatly.
3. Use packing blankets when moving furniture, bubble wrap or tissue to pack fragile items.
4. Do Not use any screw, nails or glues on rented items with out permission.

Do not paint or alter any props with out permission.

RENTAL CONTRACT

ANYTHING BUT COSTUMES does not guarantee, assume responsibility or make any representations for the condition or performance of the rental items. Most items are antiques or used & must be treated accordingly.

Accrued rental prices do not apply against purchase prices and do not include tax, delivery, pickup, or shipping.

The renter agrees to pay an additional rental fee if equipment is returned after the due date. Rental time applies to all items for the length of time they are absent from ANYTHING BUT COSTUMES, this includes items taken but not used, or items not in use and waiting for return.

All items are to be returned in the same (or better) condition unless alterations were approved and discussed. The renter will at his own expense keep and maintain the items rented in good condition during the term of the contract. If any items are lost, stolen, missing, broken or damaged the renter agrees to replace them with items of similar value and nature or pay ANYTHING BUT COSTUMES compensation.

The renter agrees to be responsible for the safe and proper use of all items. The renter agrees to be an insurer of the items and to take full responsibility and assume all risk for the rented items for the entire period they are away from ANYTHING BUT COSTUMES. The renter will take full responsibility whether it is the renter's fault or not. The renter further agrees to compensate ANYTHING BUT COSTUMES for replacement or for the cost of repairs.

The renter agrees to pay all reasonable attorney fees and costs incurred by ANYTHING BUT COSTUMES in protecting its rights or property under this agreement or in any action.

Acceptance of returned items is not a waiver of any claims ANYTHING BUT COSTUMES may have against the renter, nor a waiver for damage to any items.

The acceptance of rent or other payments or portion thereof will not be seen as a waiver of ANYTHING BUT COSTUMES' right to enforce payment of rent or other payments as provided by this agreement.

The renter agrees to indemnify and hold ANYTHING BUT COSTUMES harmless from any and all claims arising out of any violation of any law, rule, regulation or order, and from any and all claims or liabilities for loss, damage or injury to persons or property of whatever kind or nature arising from the use or misuse of the rented items, or from carelessness of the renter's employees, or people under the supervision of the renter.

If the renter shall default on any of these terms, or conditions, or in punctually making payments, or if any execution of other writ or process shall be issued in any action or proceeding against the renter, whereby the rented items may be seized or taken or instituted by or against the renter or his property, or if the renter shall enter into any arrangement or composition with his creditors, or in the event that any judgment is obtained against the renter, then and in any such event, ANYTHING BUT COSTUMES, its agents or employees, may enter upon any premises where said items may be, & may remove the same therefrom, with or without force & with or without notice of intention to retake the same, without being liable to any suit or action or other proceeding by the renter.

No terms, representation or warranty, express or implied, not herein set out shall bind ANYTHING BUT COSTUMES. This agreement contains the entire understanding between the parties, including representations, and may not be modified except by another agreement in writing, signed by both parties.

Figure 5: Sample Damage Waiver for Prop Rental

Building relationships with other theatres or businesses with collections of usable properties can be beneficial when trying to locate specific pieces. Through borrowing/rental agreements, groups can help each other with the need to purchase and store items (Strawn, 2013) (see Figure 5). When borrowing/renting pieces, how the item is going to be used needs to be considered. Most companies or groups will not allow modifications or alterations without written consent (Strawn, 2013). When lending or borrowing, a written agreement should be used to ensure the items are returned in good condition or the borrower will cover any needed repair costs (Gillette, 2013). However, it is highly recommended that the lending party has insurance to cover the costs of lost or damaged items (Strawn, 2013). It can be difficult to develop and maintain these loan relationships with the potential for damage to the items used (Gillette, 2013). Costs need to be considered when renting pieces as the process may save time, but cost more than actually purchasing a workable piece (Mussman, 2008).

Pulling

The final way theatres use to find properties for their productions is through the use of an internal collection. Using pieces from collection or stock is generally referred to as pulling (Mussman, 2008). Using one's own inventory can be very cost effective and provide quick access to the needed pieces (Strawn, 2013) (see Figure 6). These collections are usually used with the understanding that alterations can be made to help fit the piece into the production. These alterations can range from painting to changing the upholstery or even disassembling to be used to create a new piece (Mussman, 2008). Maintaining a computerized inventory of the collection can be a helpful tool, but can be difficult and time-consuming (Strawn, 2013). These electronic inventories can allow designers, especially if they are not on-site, to view and select potential pieces for use (Gillette, 2013). Often the databases are made searchable by adding descriptors to the pieces including era, material, type, etc. However, anytime a piece is altered, added, or eliminated, updating the inventory is necessary (Strawn, 2013).

Figure 6: Rows of Chairs from the Cedarville University Internal Collection

Storage and Cost

One of the primary considerations with having and maintaining an internal collection is storage. In order to save money, most theatres maintain some form of properties collection for use in future productions (Strawn, 2013). Ideally, these storage locations would be clean and climate controlled; however, most tend to be found spaces using old facilities such as converted warehouses or barns (Mussman, 2008). Many times, these facilities are not located near the theatre and may have limited access. Many organizations struggle with limited storage space and need to constantly evaluate which pieces to keep and which pieces to discard (Strawn, 2013).

Unfortunately, there are also costs involved in maintaining these internal collections, many of which are connected with facility needs. Theatrical programs try to have extensive collections covering pieces from various eras and locations. With years of acquisitions, this collection may grow to house hundreds or even thousands of pieces. This is especially true with small hand props and decorative props (see Figure 7). However, set props take more room to store and may require a larger warehouse or barn space. Some properties are affected by humidity and temperature and require climate control to preserve the pieces (Mussman, 2008). Another factor when maintaining an internal collection is the location. Some programs may have space available to house or build a storage facility while others need to rent a facility from a third party. Both maintaining a facility or renting a facility can be expensive.

Figure 7: Shelves of Hand Props and Decorative Props; Cedarville University

Conservation

In recent years, many theatres have begun looking into ways to decrease their environmental impact. Two studies have been published looking at different ways theatres can be more environmentally conscious. Branam and Nathan (2016) investigated the use of alternative materials in scenic construction. Their study focused on the construction techniques of rocks used as set props. For use in the show, the approximately 20”x20”x20” rocks needed to be lifelike, while being easily moved by the actors on stage. The study found a system of latticed fiberboard, considered to be a green product, covered in muslin gave the desired effect without the need for Styrofoam. While more time-consuming, their technique utilized scrap material and eliminated the need to use Styrofoam, which has a much slower decomposition rate.

For the second study, Goldmark (2017) focused on conservation through the reuse of theatrical elements including scenery, costumes, and properties. This study examined four collegiate productions and investigated how the theatres balanced the use of stock, rented, new, and used/reclaimed elements

within their productions. The study found that transportation and storage were important factors in the use of used and stock materials. In many cases, new items are easier to acquire, but long-term storage needs to be considered. The study calls for theatres and designers to consider environmental and social impacts, not only financial when it comes to the acquisition of theatrical elements.

So What?

Theatre productions require many people to work together to create a cohesive product. Within the world of theatre design, there are many elements that need to work together to bring the director's vision to life. One of these elements is properties. Whether it is the teacups used by the actors (hand props), the chairs the actors sit in to drink their tea (set props), or the old books in the bookcase to bring realism to the sitting room (decorative props), properties play a key role to advance the story and enhance the production (see Figure 8). As part of each production, there is a need to acquire the various props required for the production (Strawn, 2013). Depending on how these items are acquired, this process can take a great deal of time, money, or both (Gillette, 2013). In order to address the challenges created by the acquisition of props, many groups choose to maintain an internal collection of props for use in their productions (Mussman, 2008). Many theatre textbooks discuss the importance of props and some even discuss the various time and monetary challenges created by both the acquisition and storage of these items; however, there has been little to no scholarly research investigating these problems and their potential solutions. Because of this lack of research, theatre groups are left to find their own solutions. Currently, the only recent research in properties seeks to address conservation efforts

Figure 8: The Importance of Being Earnest; Cedarville University, Fall 2010

and help eliminate the waste created by the disposal of props following the end of the theatre production (Branam & Nathan, 2016; Goldmark, 2017). With the importance of properties in theatrical productions and their overarching time and budget considerations, there is a need for broader research into acquisition and storage practices used by various theatre groups.

Methods:

Purpose: The purpose of this study was to understand how small theatre programs store props for shows and to propose innovative solutions. Using various design-thinking methods, we sought to identify the primary individuals, understand the problems of the current systems, and develop potential solutions to the various challenges associated with the acquisition and storage of props.

Sample: This study is qualitative and uses various design-thinking methods to identify the stakeholders, understand the challenges within the current acquisition and storage systems, and propose potential solutions to address these challenges. The study used a non-random sampling method to build three purposive sample groups for the different stages of the research. Group One consisted of four theatre professionals with at least five years of experience in the field. The members of Group One came from diverse backgrounds with various experiences within the different types of small theatre programs (community, collegiate, school-aged, etc.) as well as jobs within the theatre field. Knowledge and experience in the field were crucial in identifying the key stakeholders that made up the sample for Group Two. The six members of Group Two had at least five years of experience in their stakeholder roles as identified by Group One. As stakeholders, the participants from Group Two used their knowledge and experiences in prop acquisition and storage to inform the research and provided insight into the theatre industry for the members of Group Three. Group Three consisted of 14 individuals with experiences in various fields that gave insight into potential solutions dealing with acquisition and storage issues. Each member of Group Three had at least one year of experience in their respective fields (see Table 1).

Table 1: Explanation of Sample for Each Group Session

Group One	Group Two	Group Three
Theatre Professionals 4 Participants Participants experience included: Directors Designers Technical Directors Technicians Five years or more of experience with small theatre programs **Strategies participating:** (see Figure 9) **Stakeholder Mapping**	Stakeholders as identified by Group One 6 Participants Five years or more of experience in the role identified by Group One: Prop Master Technical Director Designer Theatre Program Director Director Producer **Strategies participating:** (see Figure 9) **Interviews** **Critique**	Various individuals able to inform acquisition and storage issues/solutions 14 Participants Participants included: Post Office Event Services Library Law Enforcement Pharmacist Inventory Control Retail Services Large Church Production Information Technologies Used Auto Sales 1 year or more of experience in their field **Strategies participating:** (see Figure 9) **Design-Thinking (DT) Workshop**

Instrument and Procedure: This study consisted of five stages. Stage One involved stakeholder mapping. Stage Two contained two parts: interviews and experience diagraming based on the information gathered during the interviews. Stage Three included three design-thinking strategies: alternative worlds, round robin, and visualize the vote. Stage Four was comprised of a cycle of schematic diagramming and critique. Stage Five was the creation of a video scenario to communicate the proposed solution (see Figure 9).

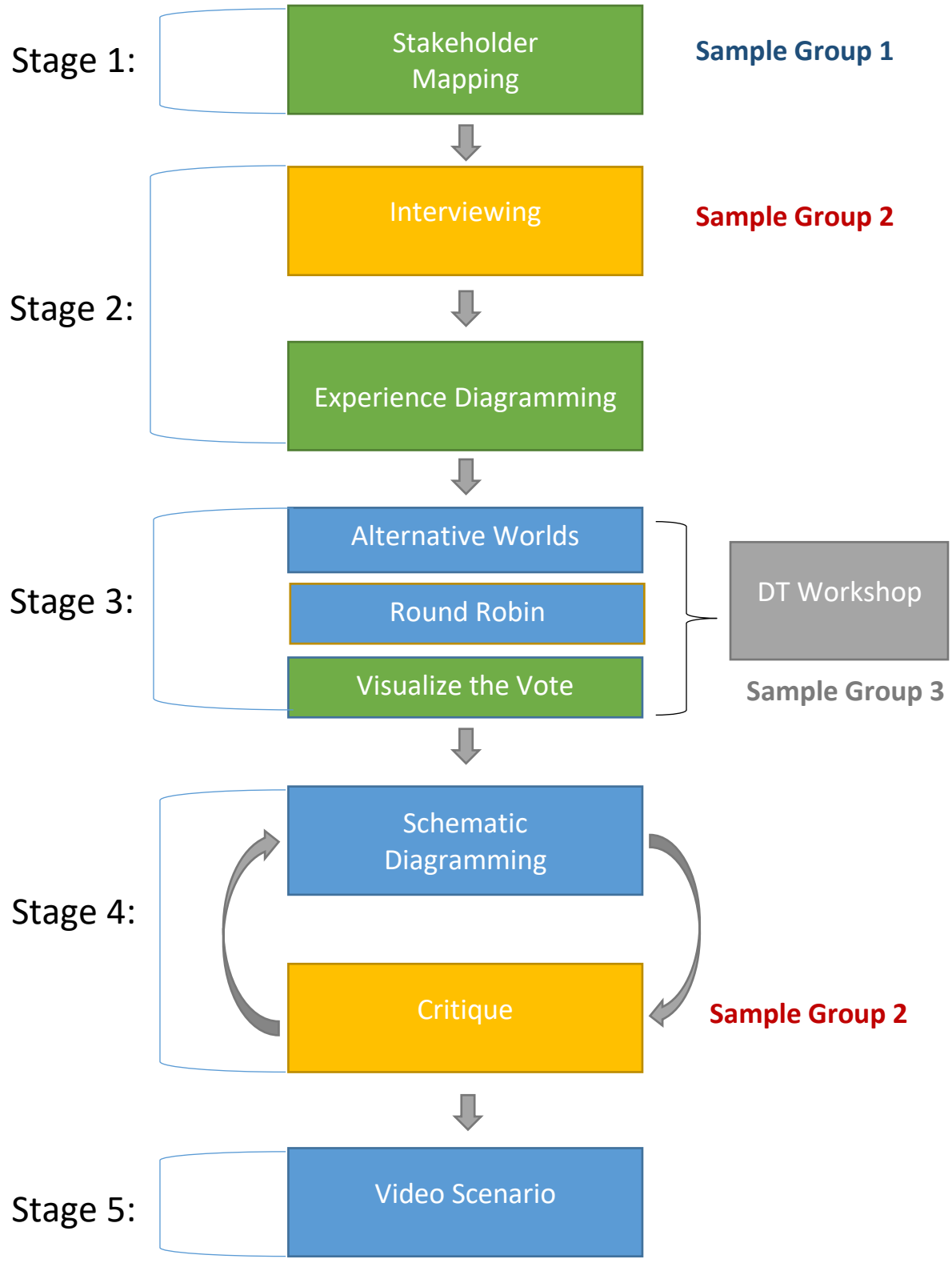

Figure 9: Sequence of Design-Thinking Strategies

Stage One

Stage One took place in a classroom at Grace Baptist Church in Cedarville, Ohio. At the beginning of the session, the researcher provided the participants with consent forms and explained the purpose of the study (see Appendix A). The participants were given time to read and ask questions about the consent form. After the forms had been signed and collected, the session commenced. This session was audio-recorded for analysis by the researcher.

Stakeholder Mapping: Stage One was completed in a single 30-minute session. Using the participants from Group One (including at least one designer and one director) along with the researcher, the group was instructed to list the various people and positions that are involved and affected by the acquisition and storage of theatre properties. As the team named the stakeholders, the researcher drew a representation for each listed on a whiteboard. Using the stakeholders represented on the board, the team ascertained and drew the connections between the stakeholders (see Figure 10). Next, the participants determined the mindset of the various stakeholders and represented them on the whiteboard next to the appropriate item. After the map was completed, the team discussed the findings and the diagram was then photographed for use in the Design-Thinking (DT) Workshop.

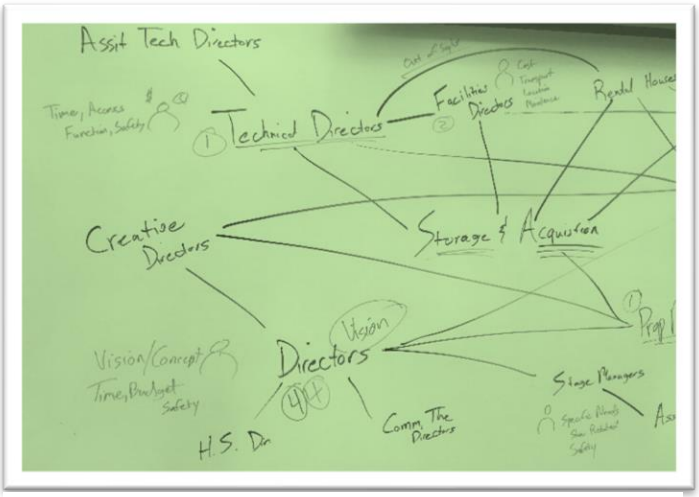

Figure 10: Stakeholder Mapping

The Stakeholder Mapping allowed the researchers to examine the issue more broadly and ensure that we identified all the individuals and positions involved with the acquisition and storage of theatre

properties. This information was used to pinpoint specific people for interviews during Stage Two. The stakeholder map was also a key tool to represent and communicate the system to the individuals in Group Three during the DT Workshop, especially for those who may not be familiar with the theatre industry and allow them to identify potential connections that were used in future strategies.

Stage Two

Figure 11: Interview

Interviews: Based on the stakeholders identified during Stage One, the researcher conducted interviews with the individuals in *Group Two* (see Figure 11). The researcher identified individuals that met the criteria for a stakeholder as determined in Stage One (see Figure 10). The potential participants were initially contacted by email. Those who agreed to participate received a consent form (see Appendix B) and were given time to read the consent form. The researcher addressed any questions and concerns the participant had before the interview began. Participants were interviewed individually, either in-person or by phone (see Appendix C). For each participant interviewed by phone, the consent form was sent via email prior to the interview. Those who met face-to-face met in a mutually agreed upon public location. Each interview session lasted about 30 minutes. The participants' responses were audio-recorded by the researcher. The interviews were focused on the individuals' own experiences with the acquisition and storage of properties.

The interviews allowed the researcher to build empathy with the stakeholders and gain a better understanding of their individual situations. The information gathered during these interviews was

integral in the development of the experience diagrams. The interviews were also used to communicate the current issues faced by these individuals and inform the discussion during the DT Workshop.

Experience Diagramming: Using the information acquired during the interview process, the researcher developed individual Experience Diagrams to show each participant's interactions with the acquisition and storage of properties (see Figure 12). These diagrams were in the form of a flow chart to illustrate individuals' typical interactions as they select and acquire a property for a theatrical production.

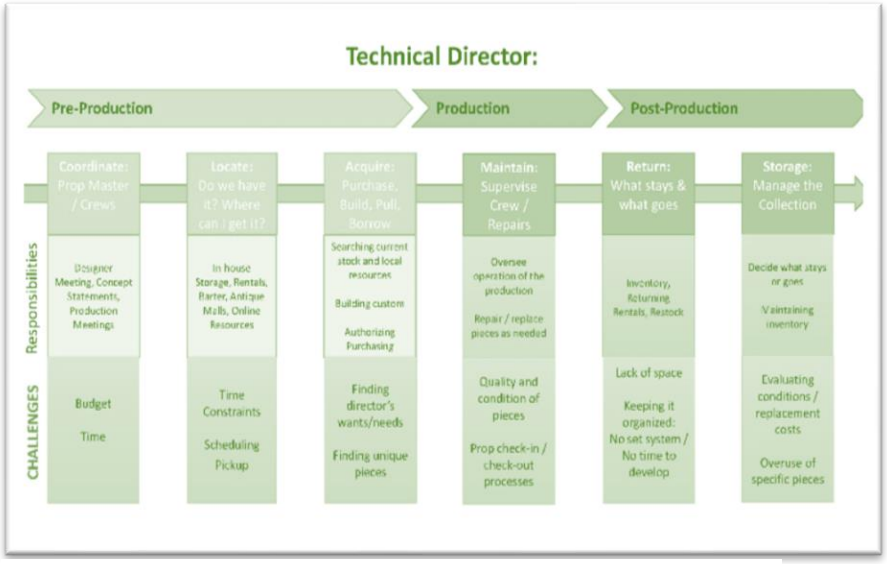

Figure 12: Experience Diagramming

The Experience Diagramming provided the DT Workshop participants with insight and facts into the current challenges associated with property acquisition and storage. Both of these tools were used to help build empathy with the stakeholders and give insight into the challenges. These tools were integral in laying out the facts and communicating the challenges at the beginning of the DT Workshop.

Stage Three
(Design-Thinking Workshop)

The team used for the Design Thinking (DT) Workshop was made up of 14 individuals representing various industries and fields of study including university logistics, warehouse automation, law enforcement, online training, pharmacy, library, post office, marketing, auto sales, and event production.

The DT Workshop took place in a classroom at Grace Baptist Church in Cedarville, Ohio over the course of one afternoon and included an introduction and three 20- to 30-minute sessions (i.e., the entire workshop lasted approximately two hours). Prior to the beginning of the workshop, the researcher explained the study, provided the participants with consent forms (see Appendix D), and allowed time for the participants to read and ask questions. After the consent forms were signed, the DT Workshop began with a 15- to 20-minute introduction presenting the information gained from the interviews and compiled in the experience diagrams. Each session of the DT Workshop was audio-recorded by the researcher.

The workshop allowed us to leverage the knowledge and experiences of individuals from different fields to gain a "fresh" approach to the challenges being addressed and propose innovative solutions.

Figure 13: Alternative Worlds

Alternative Worlds: The workshop began by using the Alternative Worlds strategy to explore how different fields would approach similar situations (see Figure 13). Each participant was given the opportunity to have 2 minutes to present how his or her industry or field approaches the concept of acquisition and storage. The researcher listed the different models presented and each participant was given three sticky notes and asked to vote on the models to explore further. The experts representing the selected fields then gave insight into how their industry typically operates and how their model may apply to the current issues.

The Alternative Worlds strategy gave a new perspective on the challenges identified during the earlier strategies. This strategy provided insight into ways other fields might solve a similar challenge in their industry. This knowledge provided inspiration and innovative answers to address the challenges as we began the Round Robin strategy.

Round Robin: The group was broken up into teams of three to four people and each given a worksheet (see Appendix E). The researcher asked each participant to write down the challenge statement in the first box on the worksheet, "to develop an efficient system to find and store quality set properties in order to save professionals at small theatres time and money." This statement was developed by the researcher after the completion of Stage Two and prior to the beginning of the DT Workshop. The challenge statement was worded in such a way to encourage creativity by eliminating restrictions. Along with the challenge statement, the participants were asked to write down a creative/unconventional solution using the second box on the worksheet. The person then passed his or her worksheet solution clockwise to another person in the team (see Figure 14). Using the third box on the worksheet, this person was asked to explain a reason why this idea would fail. Finally, the worksheets continued to be passed clockwise to another person who was asked to write down a way to solve the problem brought up in the first critique using the bottom space on the worksheet. Each round took 2 to 3 minutes. After the three rounds were complete, the group was given 5 minutes for the individuals to present their worksheet to their team for discussion, after which, the teams decided on a concept to present to the group as a whole.

Figure 14: Round Robin

The Round Robin session built off of the prior two strategies and allowed for greater ideation and promoted "outside the box" thinking. The concepts and solutions from this strategy were used to inform the development of potential innovations to address the identified challenges.

Visualize the Vote: The participants were given 5 minutes to finalize and post the determined strategies from the Round Robin session. For each strategy selected, the originator of the strategy presented its details. The researcher then gave each participant three sticky notes (one green and two yellow). Next, the participants were instructed to place the green sticky note on what they determined to be the best overall solution and the yellow sticky note on their two favorite elements from any of the strategies (see Figure 15). These votes all took place simultaneously. After the voting was finished, the votes were tallied, and the results were discussed for 10 to 15 minutes.

Figure 15: Visualize the Vote

Visualize the Vote allowed each participant to have an equal say in the final decisions. This strategy allowed the identification of trends and priorities within the system created. This information was instrumental in the development of the Schematic Diagramming during Stage Four.

Stage Four

Schematic Diagramming: Using the insight gained from the previous strategies, especially the DT Workshop, the researcher developed an innovative solution to the problem and created a schematic of

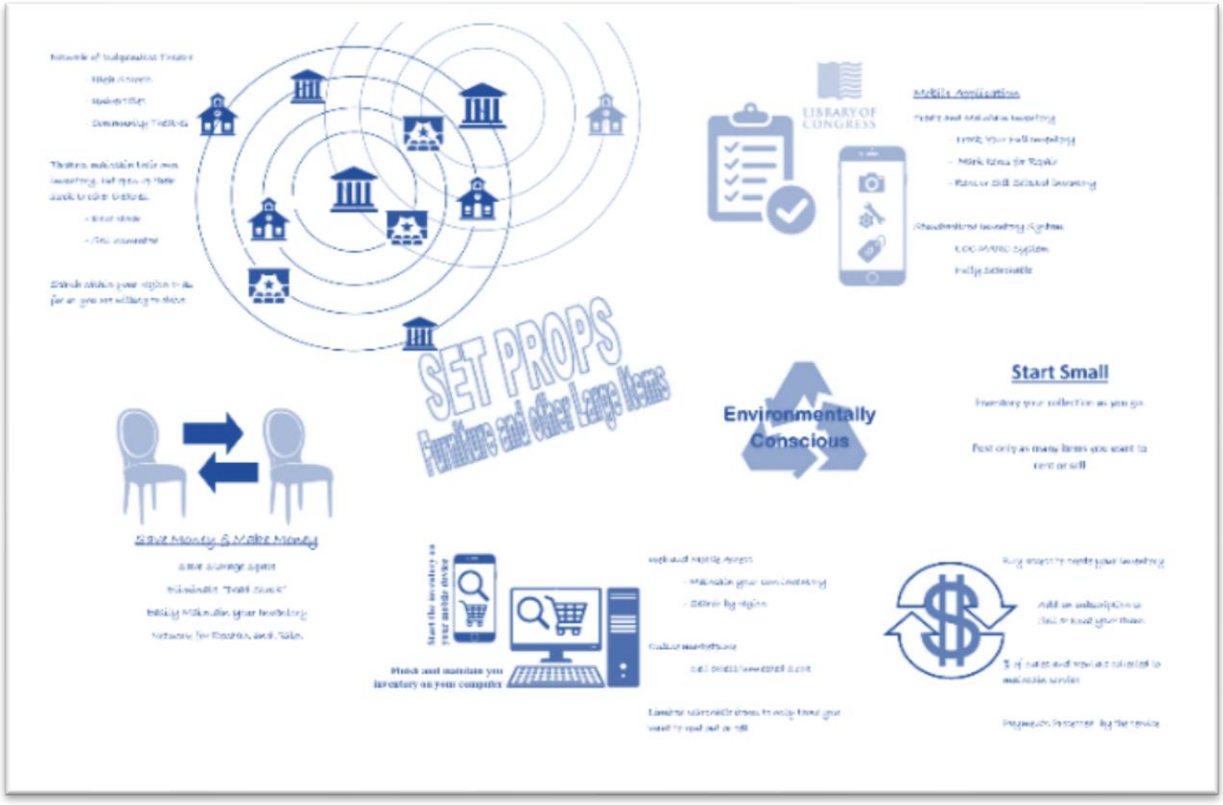

Figure 16: Schematic Diagramming

the solution using the various elements in order to communicate the potential solution to the stakeholders (see Figure 16). The schematic was created in a digital format and printed, so it could be easily presented to the participants of the Critique.

As the research and participants addressed the challenges of acquisition and storage, an alternative system of operation was developed. By using Schematic Diagramming, the researcher was able to visually explain the structure and operation of this new system. This strategy was also integral in the development of the Video Scenario during Stage Five.

Figure 17: Critique

Critique: After developing a solution and creating the Schematic Diagram to communicate it, the researcher presented the created concept for critique to two key stakeholders from Group Two. Before the Critique began, the researcher provided consent forms to the participants involved (see Appendix F). Time was provided for the participants to review and sign the consent forms. After the forms were signed and collected, the researcher presented the developed schematic to the individuals. The Critiques took place in person. To begin the Critique, the researcher gave a brief overview of the proceeding work and explained the concept presented in the Schematic Diagram. Next, the researcher allowed time for the participant to ask questions and the researcher provided clarification as needed. Once the participant was ready to move forward, the researcher asked the participant to provide any positive feedback on the proposal. Next, the researcher asked the participant for any negative feedback about the system (see Figure 17). Finally, the researcher invited the participant to provide any suggestions he or she may have to improve the system. After the Critique sessions were completed, the researcher used the collected responses and repeated the Schematic Diagramming strategy in order to revise the system. After revisions were completed, the Critique session was repeated. The Critique consisted of two cycles with the Schematic Diagramming so that an innovative solution could be finalized. Each Critique session was audio-recorded for reference and data analysis.

Using the Critique strategy created a feedback loop in order to fine-tune the solution and address any underlying issues that may not have been originally identified. This allowed for open discussion with the stakeholders in order to improve on the design.

Stage Five

Video Scenario: After a solution was finalized, the researcher created a media presentation to explain in detail the solution developed (see Figure 18). Using the finalized Schematic Diagram, a script was written and a short 5-minute video was created to communicate the basic elements of the determined solution.

Figure 18: Video Scenario

The Video Scenario ensured the solution was communicated clearly and succinctly. This strategy will help future stakeholders imagine how the solution can be implemented and help build support for the concept.

Results:

Over the course of 4 months, the various strategies from the five stages were implemented and reviewed. Each stage built on the previous stage allowing the researcher to understand the storage and acquisition challenges faced by small and medium theatre programs. Through the use of the DT Workshop (Stage Three) and Critique by theatre professionals (Stage Four), an opportunity was identified and a potential solution was designed.

Stage One

Stakeholder Mapping: Three theatre professionals with various experiences in the theatre industry met together to identify and discuss the key stakeholders. Participant one had experience as a performer and director. Participant two had worked as a performer, director, stage manager, and playwright. Participant three worked as both a costume and scenic designer with experience as a stage manager and other technical roles. The researcher currently works as a technical director and has experience as a scenic, lighting, and sound designer.

The stage began with the participants listing the various individuals and/or positions that interact with the storage and acquisition of properties over the course of a theatrical production. On a whiteboard, the stakeholders were listed, along with their priorities, and the links between the various stakeholders were drawn to show how the various roles interacted with each other. The participants determined the four most involved positions in storage and in acquisition. Afterward, the participants numbered the stakeholders, first in regards to storage and second in regards to acquisition, from most involved in the activity to least involved (see Table 2).

Table 2: Stakeholder Involvement

Involvement	Storage	Acquisition
1 highest	Technical Director	Properties Master
2	Facility Director	Designer
3	Producer/Manager	Producer/Manager
4 lowest	Director	Director

After the development of the stakeholder map (see Appendix G), the participants discussed the key positions they believed could provide the best insight into these challenges. This discussion was used to determine the stakeholder positions to be represented in Stage Two's interviews. The participants determined that the researcher should interview a technical director, director, properties master, producer, designer, and theatre program director. Even though the position of facilities director was ranked highly in the initial stakeholder map, the participants decided the chosen positions would be able to provide greater insight into the actual storage of theatrical props. Because of this, the position of facilities director was not targeted for an interview.

Stage Two

Interviews: Using the stakeholders identified for an interview by Stage One participants, the researcher contacted select individuals representing each of these positions. Six individuals agreed to participate in the interviews, many with experience in multiple of the selected areas of theatre.

The Designer: The participant representing the designer had more than 32 years of experience in the theatre profession and has served as a collegiate resident scenic designer and freelance scenic designer for the last 9 years. For this designer, the typical interaction with props included picking out all items being used in the production. Using a basic photo inventory, the designer would have students pull items from the stock collection for both final and stand-in properties for the productions. The items they did not have would be acquired through local auction houses, antique dealers, or through online sources such as Craigslist or eBay. Items that could not be found would typically need to be built.

The primary challenge that the designer faced with acquiring props came in the form of time, specifically, being able to find the piece and have the item in time for the production. With storage, the

designer cited many challenges, including a lack of storage space, access to the items in storage, and how to purge the collection. With limited space and new acquisitions, the designer would need to help determine what items would stay in the collection and what items would be eliminated. Condition, usefulness, and time in storage were a few of the determining factors involved in this decision.

The Technical Director: The participant representing the Technical Director (TD) had held this position for the last 9 years at the collegiate level. The TD also had more than 27 years as a theatre technician serving in a variety of positions. The TD was in charge of coordinating all properties within the department. The TD has had a student assistant at times, but the bulk of the responsibility fell on the TD. Along with supporting the theatre program, the TD also provided props to the university's film program. With acquisition, the TD oversaw the budgets and was the primary purchasing authority. The TD was also heavily involved in locating the needed props from the collection or outside sources. When possible, the TD would reach out to other local theatres to barter or rent needed items. Otherwise, the items would be found through thrift shops, Craigslist, or other online sources. With storage, the TD oversaw three different storage locations and was responsible for managing the collection.

With acquisition, challenges included finding the items the directors and designers wanted, finding time to search for items that were not in the collection, strict budget constraints, and finding period-specific or unique items. The challenges faced by the TD in storage included a lack of space, tracking the items as they are used and returned, and keeping the collection organized. The TD stated that there was no current system of managing the collection due to lack of time and student turnover. The TD had attempted to create a photo inventory, but was never able to maintain it. When storage became full, items would need to be purged from the collection and were usually thrown away. The items to be discarded were determined by condition, quality, and if the items were overused.

The Director: The participant representing the director had 19 years of experience as a director and professor of theatre. Along with this experience, the director had previously held a technical director position for 10 years and had many years of experience as a designer and stage manager. This director had a more hands-on approach to properties due to the size of the theatre program. As the director, this individual would provide a list of all needed props and help pull the items when needed. The director provided much of the research for the pieces being selected as well. With the acquisition, the director helped locate items through thrift shops and antique shops, sometimes borrowing in exchange for advertising. In this case, the director also oversaw the cataloging and storage of the properties collection.

One of the challenges the director faced was finding and acquiring time specific or period items. This director attempted to overcome this challenge by networking with former students involved locally in other theatres. The challenge with storage was primarily with lack of space and the need to eliminate items from the stock collection. The director tried to keep anything that could be reused, give away or sell items they did not need, or find ways to repurpose items to new uses.

The Producer: The participant representing the producer stakeholder had more than 10 years of experience producing, designing, and directing with a variety of community theatres. As the producer, this individual's role with acquisition included setting budgets for the various aspects of the show, including properties, and helping arrange storage and transportation of set props.

The producer's challenges in acquisition included meeting budget, finding adequate transportation to move items from storage or pick up purchases, and building relationships and maintaining a strong reputation with other theatres. The primary challenge with storage was a lack of space and the cost of renting storage space.

The Theatre Program Director: The position of theatre program director was defined by the Stage One group as someone who oversees all aspects of a production. This role is seen especially in high school

theatres, where there is often one person in charge of most, if not all, aspects of the productions. The participant representing this stakeholder had more than 17 years holding this position and a total of 37 years of experience in theatre. In this individual's current role, the theatre program director directs the productions and oversees all technical aspects of the show, including properties. The theatre program director was instrumental in creating the list of props needed for the production, coordinating individuals to pull, build or purchase the needed props, directing how the items are used, and managing the stock collection before and after the production. This theatre program director would seek to acquire pieces the theatre does not have in its collections by purchasing at local thrift shops, asking parents for donations, and borrowing from other local theatres.

The acquisition challenges facing the theatre program director included finding items in time for the productions, finding authentic looking items, and finding show-specific or unique items. The program director stated that a lack of organized storage and having no record of items as the primary challenges related to storage. This individual also needed to decide what to keep and what to discard after each production. Due to space limitations, usually, only items that have multiple uses or are generic enough to be reused in multiple shows are retained in the collection.

The Properties (Prop) Master: The properties master is responsible for acquiring, maintaining, and overseeing properties for a theatrical production. Some theatres have dedicated individuals to fill this role, while many other theatres delegate these responsibilities to other positions within the program, such as the technical director or designer. The participant representing this stakeholder has worked 6 years as a prop master with small professional theatres. This prop master also had multiple years of experience as a prop builder and stage manager. The prop master would meet with the designer and director in order to build the list of needed and wanted properties. This individual would then make a plan to acquire these pieces either from the theatre's collection or from outside vendors. The prop master would often try and network with other local theatres when possible for missing pieces. When those

relationships were exhausted, the prop master would begin searching flea markets and antique malls, or would research, design, and build the remaining items. Many times, this prop master would pull and return items from other theatres' collections. Because of this, when it came to the storage, the prop master had to rely on photo inventories and technicians to locate and pull the needed items. The prop master would then arrange transportation to pick up and return the items. After the production, the prop master would also help determine which newly acquired or built items would be retained and which would be discarded.

The prop master's challenges in acquisition were primarily cost and time. Budget constraints made it difficult to always find and get the items needed. The time needed to locate, pull, and transport the items was also a large concern. With storage, lack of available space forced the prop master to limit the theatre's own stock collection, making use of more outside sources for acquisition. The prop master also found that most theatres this individual networked with had incomplete and outdated paper inventories, usually just consisting of a notebook of pictures. Many of the collections were unorganized and required technicians familiar with the collection to locate items within it. The final challenge faced by the prop

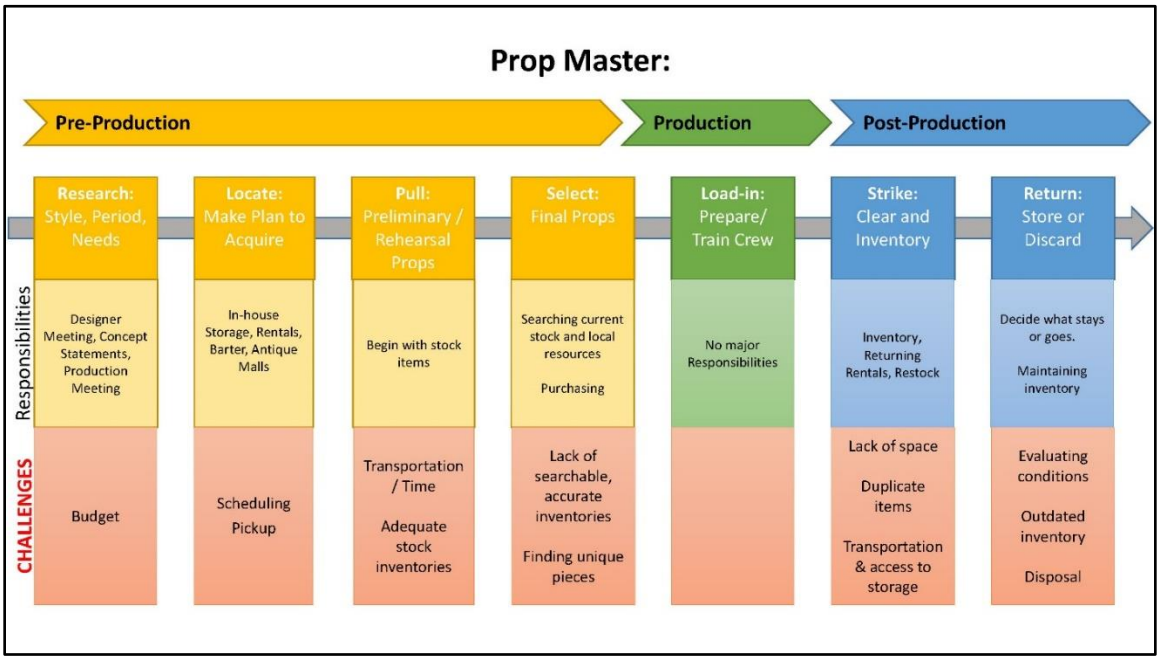

Figure 19: Experience Diagram, Prop Master

master was deciding which items to discard at the end of the production. This decision was primarily based on condition, usefulness for future productions, and cost to replace the item.

Experience Diagramming: After the interviews were completed, the researcher developed experience diagrams (see Figure 19) to represent each stakeholder. The diagrams were based on the positions themselves instead of the individuals interviewed (see Appendix H). This decision was made since each participant came from a very specific situation and the experience diagrams needed to more fully represent the industry. The experience diagrams were based on the aggregate interviews as many of the participants had served in multiple stakeholder positions and could speak to their respective experiences.

The experience diagrams were divided into three sections, representing the pre-production phase, the production phase, and the post-production phase. Within each phase, the stakeholder's primary responsibilities and the challenges faced were listed. After all the diagrams were completed, the information was analyzed and common challenges were listed (see Figure 20). The primary needs were determined for each phase of the production and used to develop the challenge statement used in Stage

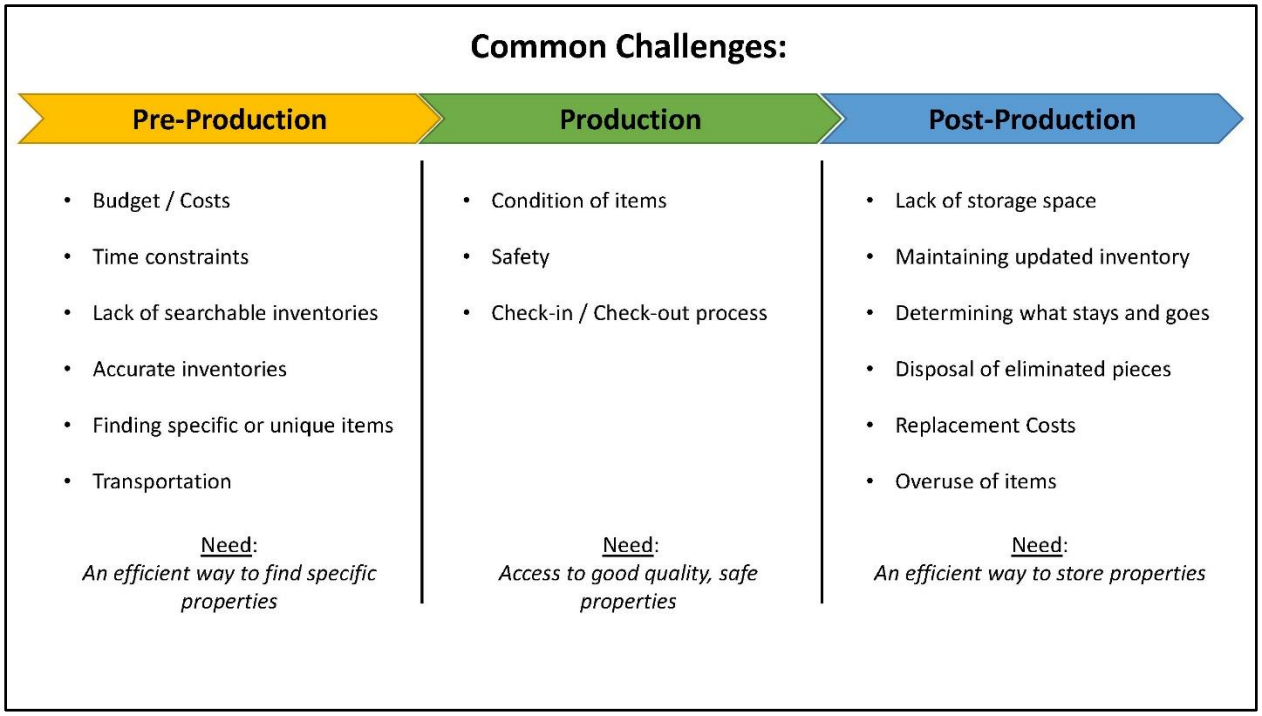

Figure 20: Common Challenges

Three's Round Robin strategy. Based on the common needs, the challenge statement was determined to be: *to develop an efficient system to find and store quality set properties in order to save professionals at small theatres time and money.*

Stage Three
(Design-Thinking Workshop)

Alternative Worlds: The DT Workshop consisted of 14 participants (see Table 3). The session began with an introduction to the project and a discussion of the stakeholder map and experience diagrams. Following the introduction, the workshop started with a strategy called Alternative Worlds, in which each participant was given 2 minutes to briefly represent his or her industry and how it approaches acquisitions and storage. The industries were then written on a whiteboard (see Appendix I) and the participants, using sticky notes, were given the opportunity to vote for the three industries they felt needed to be explored more. The industries selected to discuss further were Multi-site Church Production (12 votes), Warehouse Automation Systems (8 votes), and the Library Systems (7 votes). The representative from each of these industries then answered questions the group had about how their industries operated.

Table 3: DT Workshop Participants and Alternative Worlds Voting Results

Design Thinking Workshop Participants (votes)
• Auto Salesman, Multi-site Used Car Sales • Creative Director, Director of Marketing Department (1) • Event Production Manager, Venue and Tour Productions (6) • Law Enforcement Employee, City Police Purchasing and Inventory • Librarian, County Library System (7) • Librarian, School District Library System • Manager of Facilities Services, University Logistics (5) • Pharmacist, Long Term Care • Pharmacist, Retail (2) • Post Office Worker, US Postal System (1) • Regional Manager, Warehouse Automation Systems (8) • Retail Manager, University Bookstore • Technical Director/Lighting Designer, Multi-site Church Production (12) • Trainer/Developer, Educational Design

Round Robin: After the participants were placed in teams of three to four, they completed the Round Robin strategy (see Appendix J). The team's concepts were presented to the entire group for considerations and the key elements were placed on the whiteboard. Similar systems emerged from the four groups as well as many similar themes, including maintaining individual inventories, regional connections, and opportunities to sell or rent items.

Visualize the Vote: The participants completed the Visualize the Vote strategy (see Appendix K) by placing sticky notes on the whiteboard, voting for one overall concept and two key elements. The voting showed a desire to pursue a marketplace type model allowing for the sale and rentals of inventory. Another key element was finding ways to keep the system regional (see Table 4).

Table 4: Round Robin Concept and Visualize the Vote Results

Team 1 Concept (6 votes)	Team 2 Concept (3 votes)	Team 3 Concept (5 votes)	Team 4 Concept (0 votes)
Independent Organization Individual Inventories Membership/Fee-Based Centralized Storage Location Inventory Tracking System (3)	Individual Inventories Goodwill or Tool Rental Model Shared Rental Space (2) Manage Rental Agreements/Contracts (3)	Marketplace: Sales/ Rentals (1) Maintained by Grants K12 – College Show Packages: Items Grouped for Specific Shows (4) Subscription Based (2) Regional/Local Inventory Website for Stock Inventory (2)	Regional (4) Social Media Connections Online Marketplace: Sales and Rentals (6) Individual Arrangements Thrift Shop

Following the completion of the three strategies, the results of the workshop were discussed (see Appendix L). As the participants discussed, a few key concepts emerged. The primary discussion revolved around the interlibrary loan system. The participants felt that this system may be the best overall model on which to base the solution. The interlibrary loan system allows users to borrow items from other libraries within their public library system and between a nationwide network of public and private libraries. As the discussion continued, the lack of a standardized inventory system seemed to be the greatest challenge to overcome. For the proposed system to work, the participants put inventorying as a top priority. From this discussion came the idea to create an inventory system with the ability to network with other theatres to sell or rent items.

Stage Four

Schematic Diagramming: Using the information gathered in the previous strategies, the researcher created a visual representation of the solution (see Figure 21). The schematic diagram included visual elements and text to communicate the overall concept with potential stakeholders. The proposed solution included a mobile application for interaction with the inventory and marketplace sections of the solution. The researcher developed mobile mockups to include inventorying, check-in/check-out procedures, stock catalogs, and the marketplace system. Key features within the schematic diagram included networking, standardized inventories, environmental concerns, web/mobile access, and costs. The mobile mockups were used to show how the proposed system would operate.

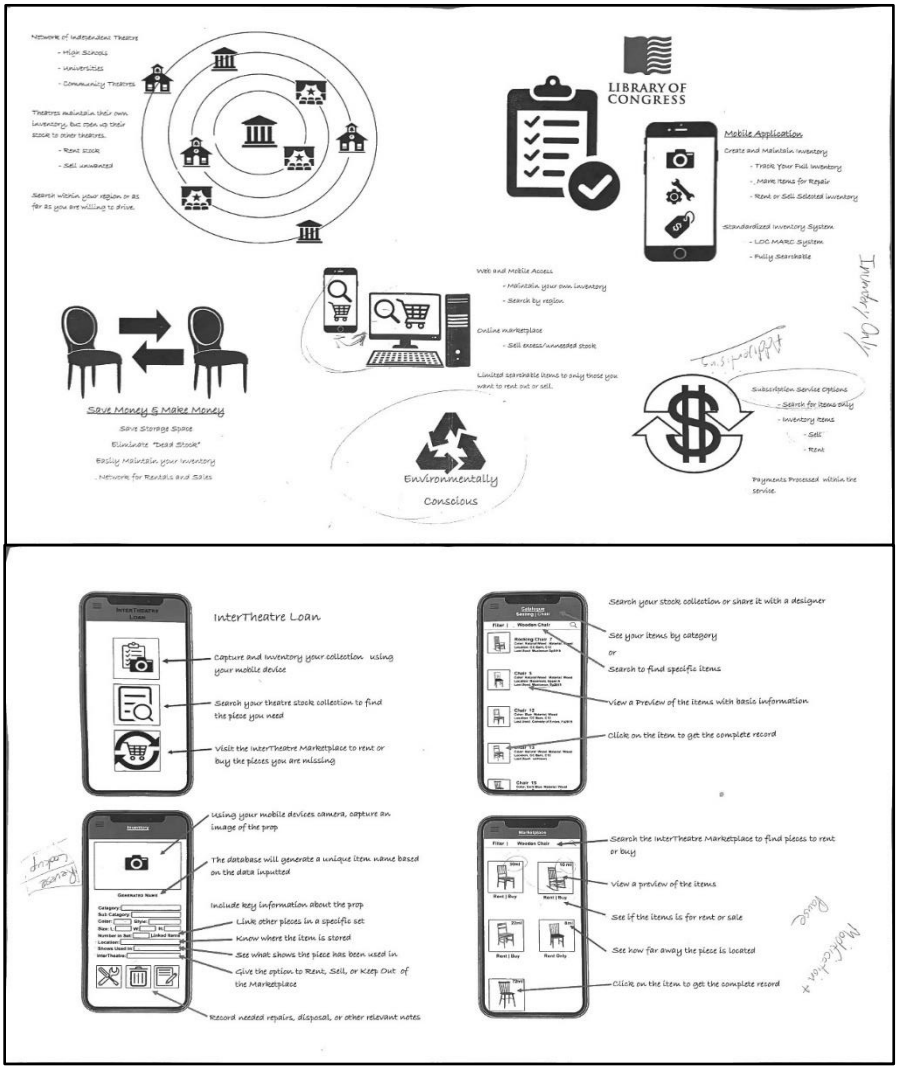

Figure 21: Schematic Diagram, Original (Appendix M)

Critique:

Round 1: The schematic diagrams were presented individually for review and critique to two of the stakeholder representatives from Stage Two (see Table 5). The two critics were supportive of the proposed system and felt like it would be very helpful in their respective organizations.

Table 5: Critique Results

Strengths/Opportunities	Weaknesses/Challenges
Round One:	
Participant 1 • Maintaining individual inventories • Networking • Mobile application • Standardized inventory • Eliminating unused items • Knowing item distance Participant 2 • Maintaining individual inventories • Networking • Environmental consciousness • Eliminating unused items • Potential advertising opportunities • Web-based access	Participant 1 • Subscription options may be unfair • Keeping inventory up-to-date • Lack of item tracking • Time to manage sales/rentals • May eliminate bartering • Saving items for review • Initial setup time Participant 2 • Keeping inventory up-to-date • Managing rentals • Liabilities for lost or damaged items • Modifications to rentals • Too many props to inventory
Round Two:	
Participant 1 • Tracking labels • Check-in/Check-out system • Availability Calendars • Ability to use the system just for inventory and searching Participant 2 • Tracking labels • Check-in/Check-out system • Contracts • Ability to mark items in the catalog • Focus on set props	Participant 1 • May eliminate bartering Participant 2 • No major concerns

Both critics wanted to have the ability to maintain their current collection and liked the ability to network with other theatres. The critics agreed that the current lack of a standardized inventory system has impeded their efforts in the past. The primary concerns came in the initial setup time as many theatres do not have the staff to complete a full inventory in a timely manner. There was also a concern that a strict subscription model may prevent smaller organizations from being able to afford access. The concerns were considered and the solution was revised to help address these challenges. Revisions were made to the schematic, including a new payment/subscription approach, clarification on inventory workflow, emphasis on the ability to start small, and some additional features in the mobile mockups.

Round Two: The schematic diagram was revised (see Figure 22) to reflect the revisions to the solution and was presented for a second critique. Both stakeholders approved of the revisions and additions with no major revisions. The only concern raised was a potential elimination of informal bartering between local theatres a system like this may cause. However, the concern was not strong enough to prevent the stakeholder from approving the proposed solution.

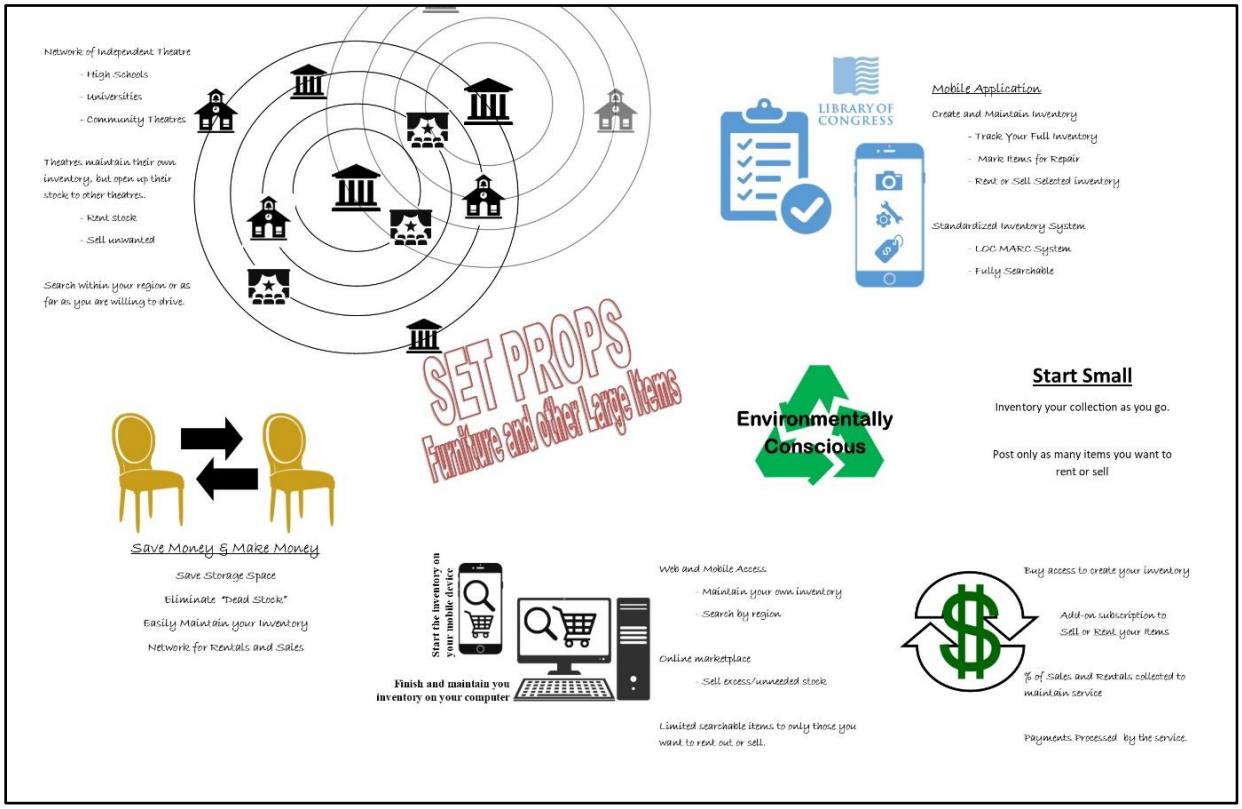

Figure 22: Schematic Diagram, Revised (Appendix N)

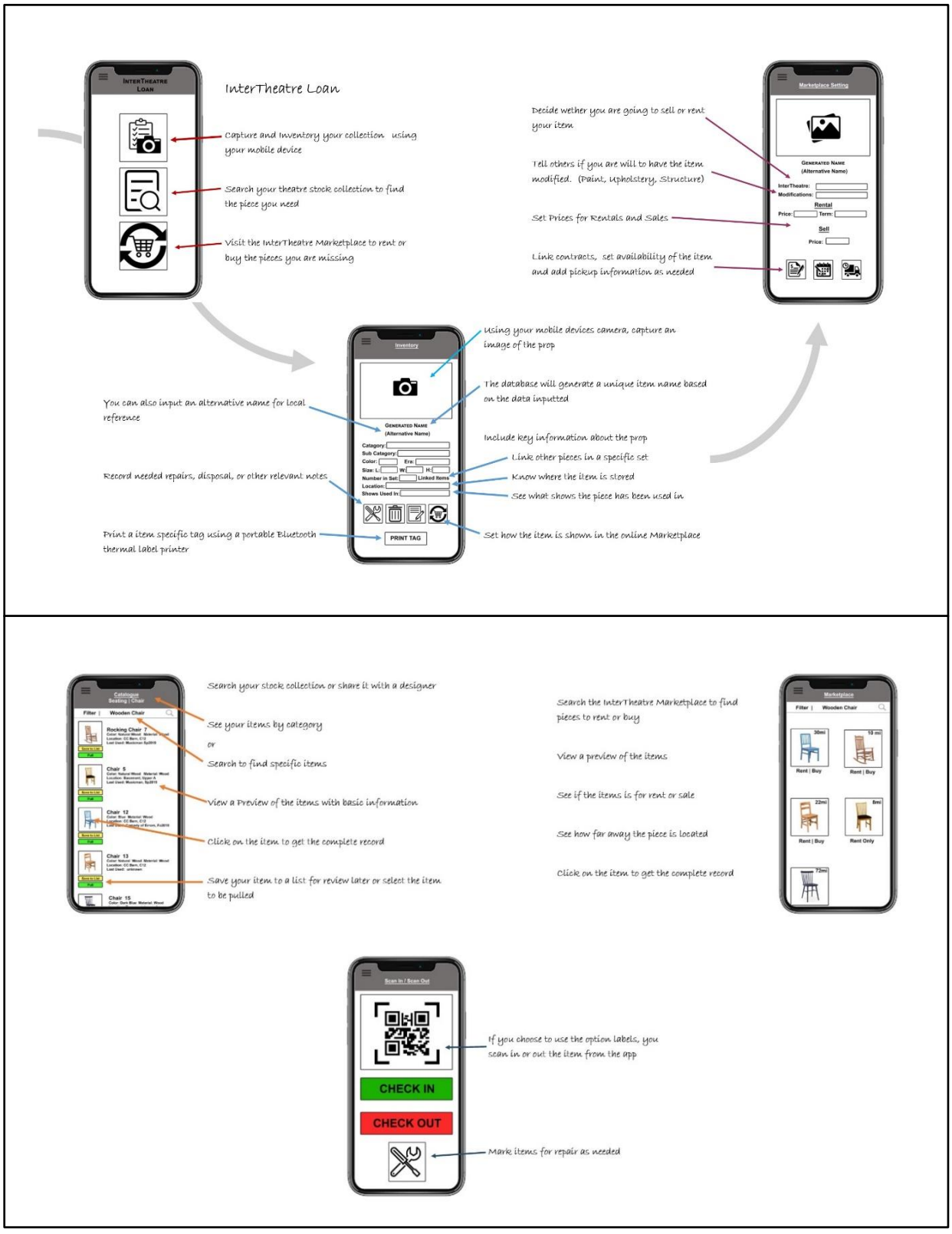

Figure 22: Schematic Diagram, Revised (Appendix N)

Stage Five

Video Scenario: Following the second round of critiques, the researcher completed the Video Scenario strategy to create a short video presentation that can be used to communicate the proposed solution to other stakeholders (see Appendix O). The video was posted online for the future consideration of potential stakeholders. In order to make the solution easily communicated, the proposed system was given the prototype name, PropTracker.

Discussion:

Theatre is a field of doing; at all times, the directors, designers, performers, and technicians are constantly running, tearing down, or preparing for the next production. Because of this continual cycle, there tends to be limited scholarly research in many of the technical areas of theatre. This study sought to bring the design-thinking methodology into the field of theatre to address a common problem among many theatre organizations, especially, high school, collegiate, and community theatres. Addressed primarily in textbooks, most theatres face challenges with the storage and acquisition of their props (Campbell, 2016; Cohen, 2014; Parker et al., 2003; Rogers et al., 1995). This is especially true with the larger set props. The primary challenges come down to time and cost considerations with both the initial acquisition of these props and the subsequent storage of the props.

The first two stages of the research helped identify the key individuals who could provide the most insight into these problems from their firsthand experiences. The stakeholder mapping strategy allowed the researcher, using three theatre professionals, to sort through the many different positions within the theatre industry that are most closely connected with the problems related to storage and acquisition. As

was found in the research and from experience with the theatre industry, depending on the size and type of an organization, different positions may be responsible for different jobs. This trend was echoed through the Stage Two interview process. Each participating stakeholder held a different title/position, but there were many overlapping responsibilities. In one theatre, there may be an official properties master doing most of the planning, acquiring, and maintaining of the props as laid out in many of the theatre texts (Strawn, 2013), while in another theatre, these roles are filled by the technical director or scenic designer. The stakeholder list created in Stage One led to a broad range of experts with many years of experience trying to overcome the challenges posed by the need for set props. There were many common challenges (see Table 6) that reflected those from the literature review, many of which were directly related to time, cost, and storage.

Table 6: Common Stakeholder Themes

Time	Cost	Storage
• Finding items within the collections • Connecting with or searching other organizations collections • Transporting items • Searching for an item from various vendors • Having the item in time for the production	• Budget limitations • Replacement costs • Maintaining Storage	• Lack of adequate storage • Inadequate or nonexistent inventory records/system • Making room for new items • Disposal of eliminated items

As was seen in the literature review, the four primary ways props are acquired are building, buying, renting/borrowing, and pulling (Gillette, 2013). In order to deal with the challenge of time constraints, the stakeholder's first approach was pulling from the organization's collection, renting/borrowing tended to be the second option, with buying third, and building last. Unfortunately, one of the common challenges faced by the stakeholders was the lack of adequate inventories. Many of the organizations relied on personal knowledge of their collection and did not have complete, or in some cases any, inventory lists.

If there was an inventory, it was usually in the form of a notebook of printed photos. Even though using items from the organization's stock may be the cheapest and most timely option, the lack of organized and searchable inventories made the process inefficient. The primary challenge with looking outside the organization, whether through rentals, borrowing, or purchasing, was the time needed to locate and transport the items. The lack of sufficient inventories among theatres usually meant the stakeholder would need to rely on the knowledge and expertise of another organization's collection manager to know what items they had, or spend time searching the collection themselves. Most purchasing was spent exploring antique malls, thrift shops, and online sources for the items, some time to no avail. Building items was the final option due to the amount of time and money many items take to build. The concern of having the time to spend searching for items, especially props specific to a show and having enough time to have the item ready for the production, was a common theme among the stakeholders. There was a desire among the stakeholders to make the acquisition process more efficient.

Budget constraints were also a common theme among the stakeholders. The challenge with costs appears in both the need for the props and the need to store the props. While maintaining their own internal collection is considered the most cost-effective, long-term solution (Strawn, 2013), there are many other costs involved in maintaining these collections. Some of these costs include the potential need to rent storage space, general upkeep on owned spaces, and transporting pieces between storage and stage. Another budget consideration was the actual cost to buy or rent items; this was especially true with items considered to be unique or hard to find. The challenge of balancing storage needs and replacement costs was another theme. As theatres ran out of storage space and had a need to purge their stock, there was a need to determine whether the item was worth storing long term or if it could be cheaply and easily replaced.

Storage was the last common stakeholder theme. Ideally, theatres would have large climate-controlled warehouses in which to store their properties (Mussman, 2008). However, for most theatres,

this is not the case. All six of the stakeholders interviewed faced the challenge of adequate storage space. As was found in the literature review, there is a constant need to evaluate the collection and remove unwanted pieces in order to make room for new acquisitions (Strawn, 2013). While the stakeholders wanted to increase conservation efforts, the need to purge items from the collection poses a problem. All of the stakeholders sought to find ways to reuse or sell the unwanted items; however, most of the time the items would just be thrown away. Finally, many of the stakeholders stated that they have tried to create comprehensive inventories, but were not able to maintain the inventories, so they quickly became obsolete.

With each interview, the various stakeholders tried different ways to overcome their challenges on their own. Through the interviews and experience diagrams, there was evidence of a need to increase efficiency in each of these areas. Some tried, but most had failed or given up. Using the information gleaned from analyzing the interviews and experience maps, the researcher sought to find an innovative approach to these challenges. This was the purpose of Stage Three, the DT Workshop. Drawing from other industries for insight, the workshop allowed for an outside look at the challenges. Over the course of the workshop, the need for a standardized inventory system became evident. One industry that has done this well is the library system. Currently, libraries use the MARC system to catalog books and other resources ("What is a Marc Record," 2009). This system creates a standardized system allowing libraries to track and network their collection with other libraries. Finding a way to standardize the inventory records among theatres would open up more opportunities to network among theatres. The participants concluded that by opening these connections between theatres, this network could help alleviate many of the challenges faced with time, cost, and storage. Regarding time, the creation of a searchable database of theatre storage would expedite the acquisition process. In overcoming cost, the network would increase opportunities to rent, buy, or sell items, ideally saving acquisition costs and potentially providing a new income stream. Finally, the network could alleviate some storage needs by limiting the need for

new acquisitions and potentially give a new home to unwanted or unused items. This also increases the potential for conservation as purged items could be reused by another theatre instead of simply being discarded.

Coming out of the DT Workshop, a potential solution became evident. Using the information from the first three stages, and previous research, the researcher designed a proposed system of inventorying and networking to meet the challenges. The key elements (see Table 7) that emerged from the DT Workshop were used to create a schematic, which was reviewed by two of the Stage Two stakeholders.

Table 7: Proposed Solution's Key Elements

Key Elements

Inventory:
• Standardizing inventory system through standardized input
• Using mobile technology to capture inventory
• Online databases to refine and maintain inventory
• Including standardized fields to increase the ability to search
  ○ Standard categories/sub-categories
  ○ Color, style, era, size
  ○ Productions used in
• Ability to tag and track items
• Note and track conditions or repairs
• Allow designers/directors the ability to remotely view stock
• Create slowly over time
 	
Networking:
• Maintain current collection
• Create a marketplace for sales and rentals
• Allow items to be hidden from marketplace
• Ability to search by region
• Eliminate “dead stock”/unneeded or unwanted items
• Fair, non-prohibitive cost to participate
• Integrated payment portal

The critique allowed for feedback with those who would interact with a system like this. The feedback was very positive and encouraging. Two main concerns were identified: whether or not the system was

accessible and affordable for organizations of all sizes, and whether a system like this would eliminate bartering between organizations. With the cost consideration, ideas were discussed. The current decision was to have options for inventory and searching only, and another option to rent and sell. The concept would include a onetime buy-in for some of the basic features with a subscription for rentals and sales, probably including some form of a service fee. The participants determined that the concern regarding the elimination of bartering was insufficient to require a change, especially since those relationships would still exist. This system would instead provide expanded opportunities for rentals and sales. With the critiques completed and revisions made, the researcher developed a video scenario to showcase the concept and some of its key features.

By looking closely at the challenges faced by theatre programs in order to understand it better, the research led to the development of a proposed solution. Since this solution includes a product type component, more time will be needed to create a working solution. Using the various design-thinking methods, the researcher was able to see the opportunity to create an efficient system for acquisition and storage by helping theatres solve the underlying challenge of inventory. By providing a way to help theatres quickly and easily establish and maintain an inventory of their set prop collections, this research can open up opportunities to alleviate some of the challenges involved with time, cost, and storage of props.

In the end, the developed solution is a network of independent high school, collegiate, and small professional theatres maintaining their own inventory while networking with other theatres for rental and sales opportunities. The proposal is to create a simple to use, mobile-based, inventory tool to capture key information about the items and create a fully searchable database of properties. The database can be maintained on any computer with internet access using cloud-based technologies. As the theatre creates its inventory, it will have the opportunity to place items in an online market for rental or sale to other theatres. The marketplace will allow users to view items available in their search radius that may meet

their needs for an upcoming production. With many other features, including tracking labels, show-related searching, condition tracking, and scheduling, the solution will allow theatres to work together and support each other's productions by providing access to a nationwide network of set props. This solution will help organizations save time in acquisition by providing a fully searchable inventory of their private collection and other available pieces that can be locally sourced. This will address the challenge of cost by opening up new access to rentals and potentially create new sources of revenue. Additionally, this project can address the challenge of storage by allowing organizations to sell off unneeded or unwanted items while providing access to other large items within the network of theatres. Finally, this network can help theatres operate greener by helping eliminate the number of pieces that are discarded when storage becomes limited. Now the items can find a new home at another theatre through the online marketplace. Through the use of these design-thinking methods, a potential solution emerged to address the longtime challenges, which were also echoed by the stakeholders, of time, cost, storage, and conservation.

Internal Validity/Limitations:

Reliability: As this research study is fully qualitative, the researcher planned to ensure the reliability of the research through the use of the purposive samples. By selecting the participants for the various groups, the researcher made certain the participants were qualified to provide the insight specific to their fields and experiences. As the researcher sought to learn more about the industry from the stakeholders during Stage Two, the use of multiple participants allowed the researcher to triangulate the data and identify emerging themes. The researcher also limited mortality during the study by using different participants during each stage. This was especially true during the Stage Three workshop, as all three strategies were completed in a single 2-hour block of time. Throughout the study, the researcher audio-recorded and documented each stage in order to maintain accuracy in the data analysis. Finally, the

feedback loop built into Stage Four allowed the researcher to provide member checking since the findings were presented to a selection of the stakeholders from Group Two for review and comments.

Limitations: The primary limitation of the research was the sizes of the groups. For Group One, bringing in more theatre professionals would have helped provide a greater range of stakeholders. However, due to availability and limited time allotted for the study, expanding this group would have been challenging. Within Group Two, expanding the number of stakeholders for interviews would have provided more data to analyze and may have revealed additional trends. Finally, expanding Group Three would have provided more insights into more industries and may have provided more opportunities for other innovative solutions. Additionally, the time and scope of the research also provided limitations. Expanding the data collection and analysis from Stage Two into a multi-year, nationwide study would provide more insight into the acquisition and storage problems faced by theatre programs industry-wide. Finally, since the proposed solution involves a product and service, more development and additional research will be needed for it to become a viable solution, and someone or a group will need to initiate the inventory system.

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Appendix A: Consent Form: Stakeholder Mapping

RADFORD UNIVERSITY
Department of Design
239 McGuffey Hall
Box 6967
Radford, VA 24142
Phone: 540-831-5386

Adult Informed Consent – Stakeholder Mapping Session

Title of Research: **Creative Storage Solutions for Theatre Programs: The Time and Cost of All Those Props**

Researcher(s): Tim Phipps and Joan Dickinson

We ask you to be in a research study designed to: understand how small theatre programs store props for shows and propose potential solutions to the various challenges associated with the acquisition and storage of props. If you decide to be in the study, you will be asked to participate in a Design Thinking strategy consisting of one exercise. The exercise, *Stakeholder Mapping*, will have you brainstorming, listing, and diagraming the various individuals/positions involved with the storage and acquisition of properties for a theatrical production. The entire session will require 30 minutes of your time.

For the purpose of data analysis, the audio will be recorded during the session. Please indicate below if you agree:

__ I agree to be recorded.
__ I do not agree.

This study has no more risk than you may find in daily life.

There are no direct benefits to you for being in the study.

You can choose not to be in this study. If you decide to be in this study, you may choose not to answer certain questions or not to be in certain parts of this study.

There are no costs you will incur for being in this study. There is no compensation for you to be in this research.

If you decide to be in this study, what you tell us will be kept private unless required by law to tell. If we present or publish the results of this study, your name will not be linked in any way to what we present.

If at any time you want to stop being in this study, you may stop being in the study without penalty or loss of benefits by contacting: Tim Phipps, tphipps1@radford.edu or Joan Dickinson, jidickins@radford.edu.

If you have questions now about this study, ask before you sign this form.

If you have any questions later, you may contact: Tim Phipps, tphipps1@radford.edu or Joan Dickinson, jidickins@radford.edu.

This study was approved by the Radford University Committee for the Review of Human Subjects Research. If you have questions or concerns about your rights as a research subject or have complaints about this study, you

Appendix A: Consent Form: Stakeholder Mapping, pg.2

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should contact Dr. Orion Rogers, Interim Dean, College of Graduate Studies and Research, Radford University, jorogers@radford.edu, 1-540-831-5958.

It is your choice whether or not to be in this study. What you choose will not affect any current or future relationship with Radford University.

If all of your questions have been answered and you would like to take part in this study, then please sign below.

_____	_____	_____
Signature	Printed Name(s)	Date

I/We have explained the study to the person signing above, have allowed an opportunity for questions, and have answered all of his/her questions. I/We believe that the subject understands this information.

_____	_____	_____
Signature of Researcher(s)	Printed Name(s)	Date

Note: A signed copy of this form will be provided for your records.

Appendix B: Consent Form: Interview

RADFORD UNIVERSITY
Department of Design
239 McGuffey Hall
Box 6967
Radford, VA 24142
Phone: 540-831-5386

Adult Informed Consent – Interview

Title of Research: **Creative Storage Solutions for Theatre Programs: The Time and Cost of All Those Props**

Researcher(s): Tim Phipps and Joan Dickinson

We ask you to be in a research study designed to: understand how small theatre programs store props for shows and propose potential solutions to the various challenges associated with the acquisition and storage of props. If you decide to be in the study, you will be asked to participate in an interview. The interview will focus on your position in the theatre industry, especially in relation to the acquisition and storage of properties. The interview will require 30 minutes of your time.

For the purpose of data analysis, the audio may be recorded during the interview session. Please indicate below if you agree:

__ I agree to be recorded.
__ I do not agree.

This study has no more risk than you may find in daily life.

There are no direct benefits to you for being in the study.

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Appendix B: Consent Form: Interview, pg. 2

RADFORD UNIVERSITY
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I/We have explained the study to the person signing above, have allowed an opportunity for questions, and have answered all of his/her questions. I/We believe that the subject understands this information.

_____	_____	_____
Signature of Researcher(s)	Printed Name(s)	Date

Note: A signed copy of this form will be provided for your records.

Appendix C: Interview Questions

Interview Questions

Demographics:

What is your current job title?

- How long have you held this position?

How long have you worked in the theatre industry?

- What other positions have you held in the theatre industry?

How many theatre productions does your program do in a year?

- What are the types/sizes of these productions?

Experience and Roll with Props:

Can you walk me through how you interact with the props before, during, and after a production?

Acquisition:

What roll do you play in the acquisition of properties for a production?

- How does your program acquire its props for the productions?
- What are the challenges in acquiring props for the productions?
  - How do you/your program attempt to overcome these challenges?

Storage:

What role do you play in the storage of properties for your theatre?

- What does your program do with the props after the production closes?
- What are the challenges your program faces in storing props?
  - How do you manage the collection?
    - Where/how are your props stored?
    - How does your program decide what stays or goes?
  - How do you/your program attempt to overcome these challenges?

Appendix D: Consent Form: Design Thinking Workshop

RADFORD UNIVERSITY
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Radford, VA 24142
Phone: 540-831-5386

Adult Informed Consent – Design Thinking Workshop

Title of Research: **Creative Storage Solutions for Theatre Programs: The Time and Cost of All Those Props**

Researcher(s): Tim Phipps and Joan Dickinson

We ask you to be in a research study designed to: understand how small theatre programs store props for shows and propose potential solutions to the various challenges associated with the acquisition and storage of props. If you decide to be in the study, you will be asked to participate in a Design Thinking Workshop consisting of three exercises. The first exercise, *Alternative Worlds*, will have you consider and communicate to the group how your field/industry approaches acquisitions and storage. The second exercise, *Round Robin*, will have you propose and critique potential solutions to a challenge question. The third exercise, *Visualize the Vote*, will have you voting on proposed solutions and discussing the results. The entire session will require two hours of your time.

For the purpose of data analysis, the audio will be recorded during the session. Please indicate below if you agree:

__ I agree to be recorded.
__ I do not agree.

This study has no more risk than you may find in daily life.

There are no direct benefits to you for being in the study.

You can choose not to be in this study. If you decide to be in this study, you may choose not to answer certain questions or not to be in certain parts of this study.

There are no costs you will incur for being in this study. There is no compensation for you to be in this research.

If you decide to be in this study, what you tell us will be kept private unless required by law to tell. If we present or publish the results of this study, your name will not be linked in any way to what we present.

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If you have questions now about this study, ask before you sign this form.

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Appendix D: Consent Form: Design Thinking Workshop, pg. 2

RADFORD UNIVERSITY
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Signature of Researcher(s)	Printed Name(s)	Date

Note: A signed copy of this form will be provided for your records.

Appendix E: Round Robin Worksheet

Innovating for People | *Activity Templates* | **Round Robin**

CHALLENGE STATEMENT

FOLD TO DOTTED LINE

PROPOSED SOLUTION

Come up with an unconventional way to address the challenge.

FOLD TO DOTTED LINE

WHY THE SOLUTION WILL FAIL

Review the proposed solution, and find a reason that it will fail.

This is your chance to be the armchair critic!

FOLD TO DOTTED LINE

FINAL CONCEPT

Review the critique. Then, quickly generate an idea that resolves the issues raised.

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Appendix F: Consent Form: Critique

RADFORD UNIVERSITY
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239 McGuffey Hall
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Adult Informed Consent – Critique

Title of Research: **Creative Storage Solutions for Theatre Programs: The Time and Cost of All Those Props**

Researcher(s): Tim Phipps and Joan Dickinson

We ask you to be in a research study designed to: understand how small theatre programs store props for shows and propose potential solutions to the various challenges associated with the acquisition and storage of props. If you decide to be in the study, you will be asked to participate in a design critique. The critique, will ask you to give feedback on a proposed system design considering with the storage and acquisition of properties for a theatrical production. The critique will occur on 1-2 occasions during the development of the proposed design. The critique will require up to 20 minutes of your time for each occasion.

For the purpose of data analysis, the audio will be recorded during the interview session. Please indicate below if you agree:

__ I agree to be recorded.
__ I do not agree.

This study has no more risk than you may find in daily life.

There are no direct benefits to you for being in the study.

You can choose not to be in this study. If you decide to be in this study, you may choose not to answer certain questions or not to be in certain parts of this study.

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Appendix F: Consent Form: Critique, pg. 2

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If all of your questions have been answered and you would like to take part in this study, then please sign below.

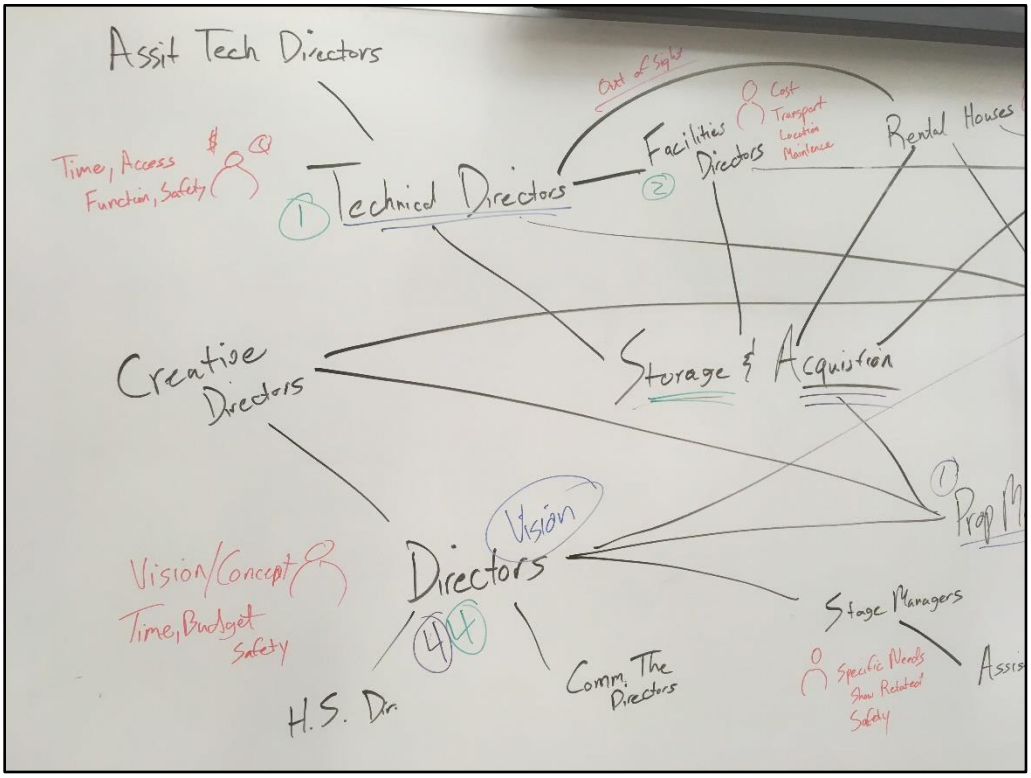
_____	_____	_____
Signature	Printed Name(s)	Date

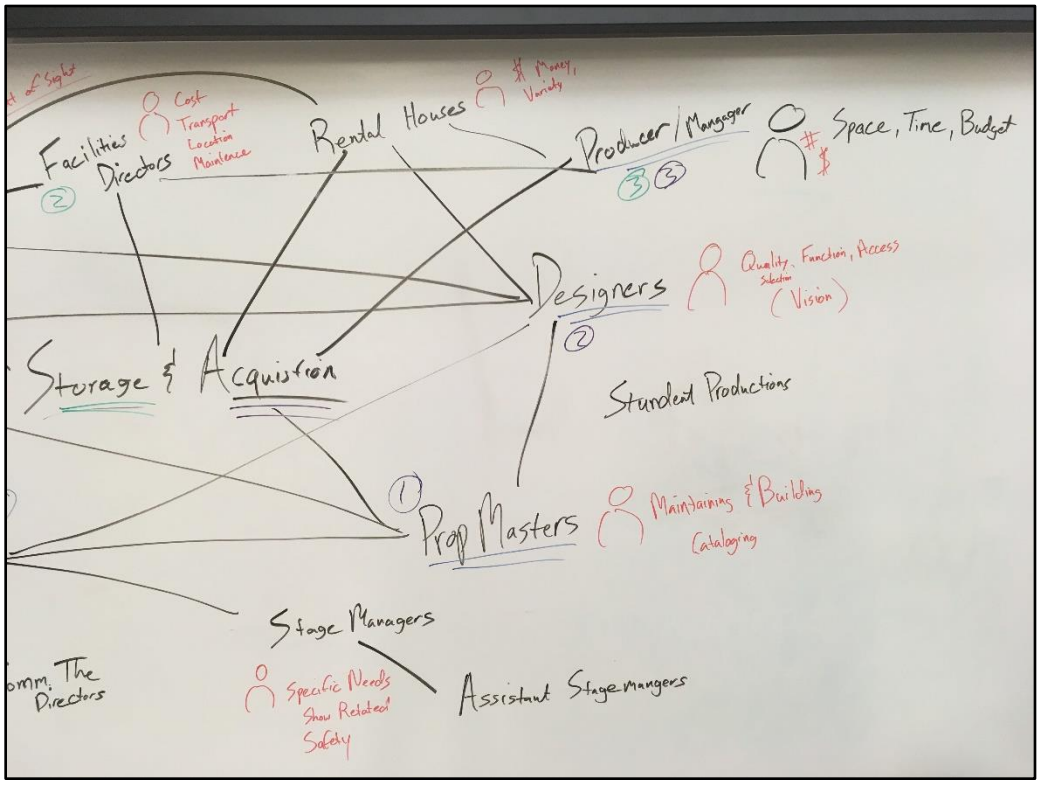
I/We have explained the study to the person signing above, have allowed an opportunity for questions, and have answered all of his/her questions. I/We believe that the subject understands this information.

_____	_____	_____
Signature of Researcher(s)	Printed Name(s)	Date

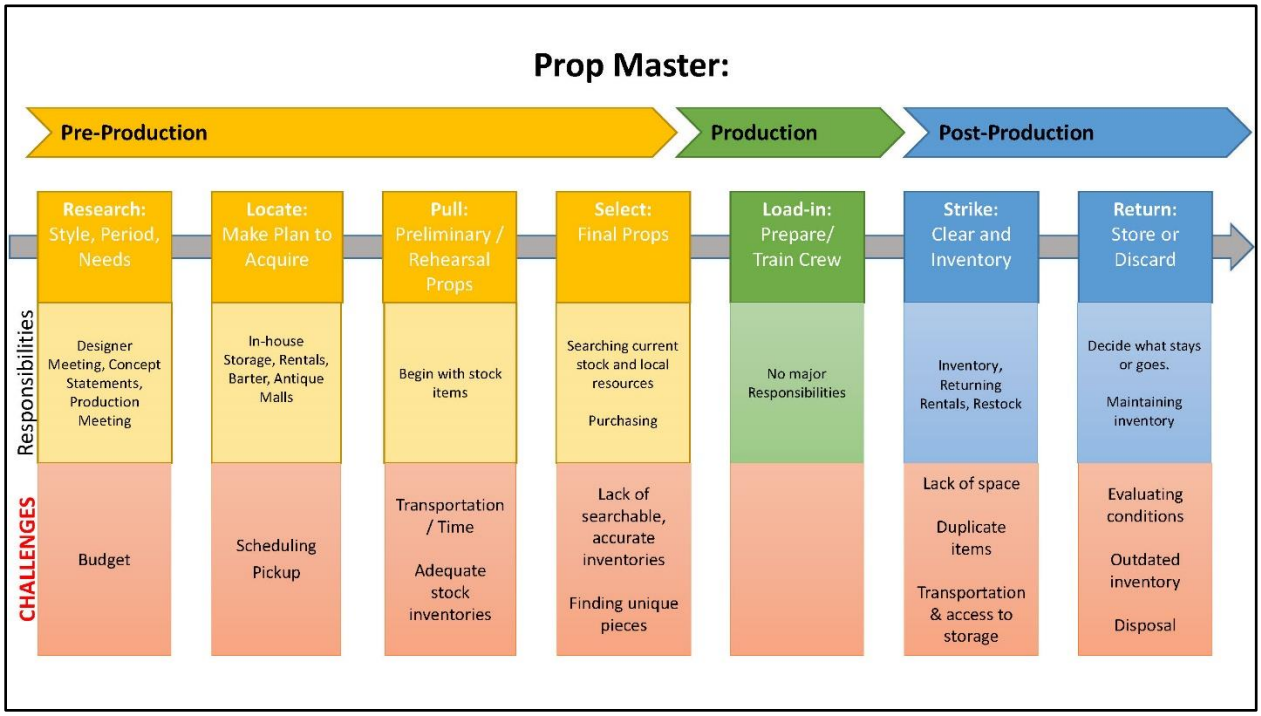
Note: A signed copy of this form will be provided for your records.

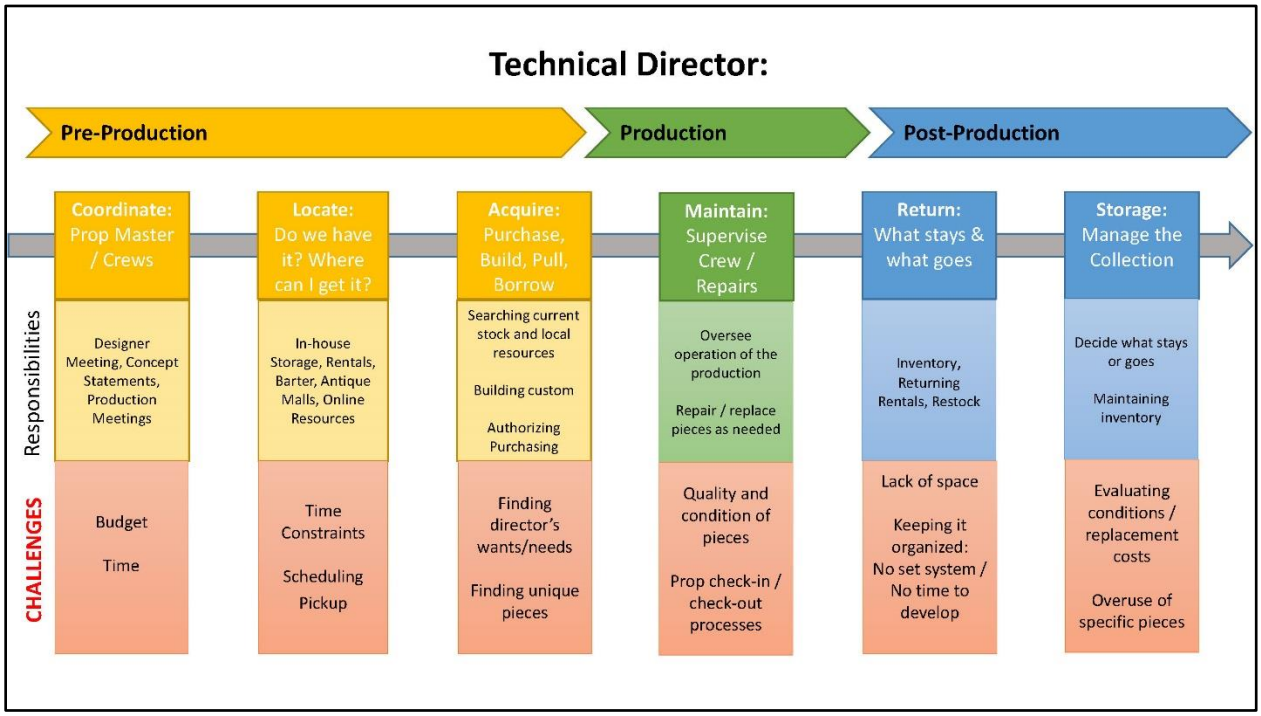
Appendix G: Stakeholder Mapping



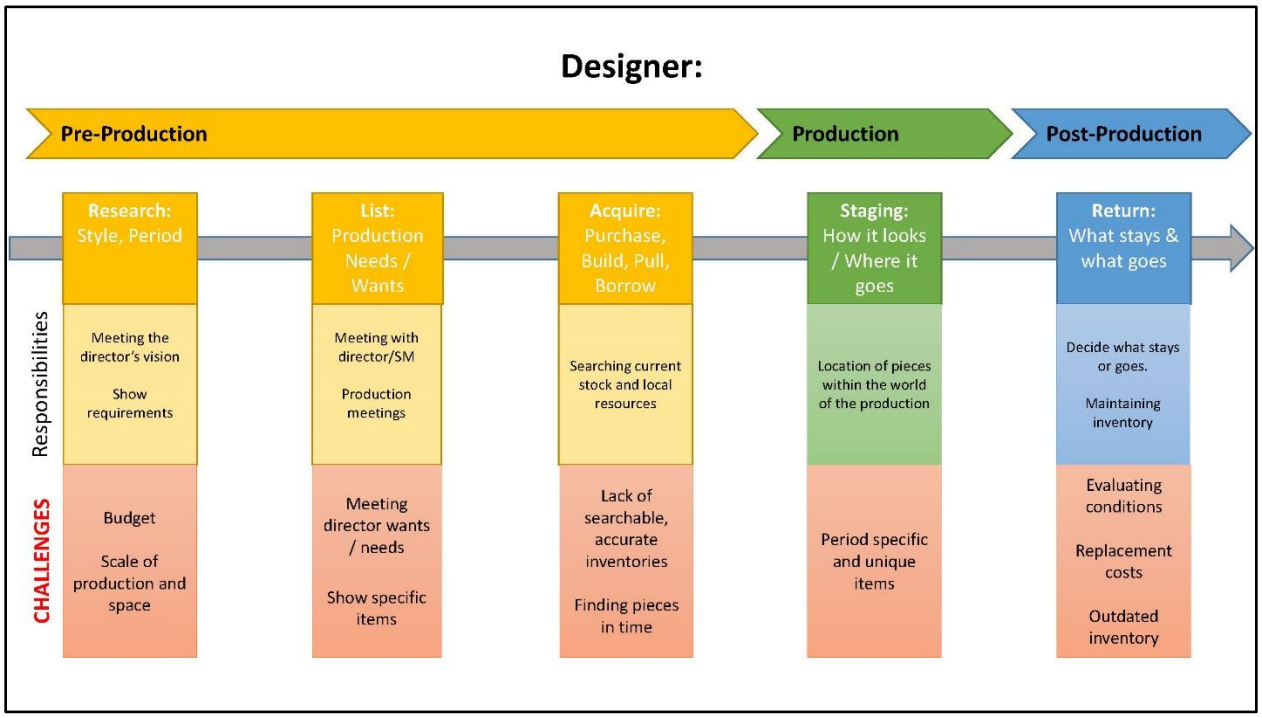


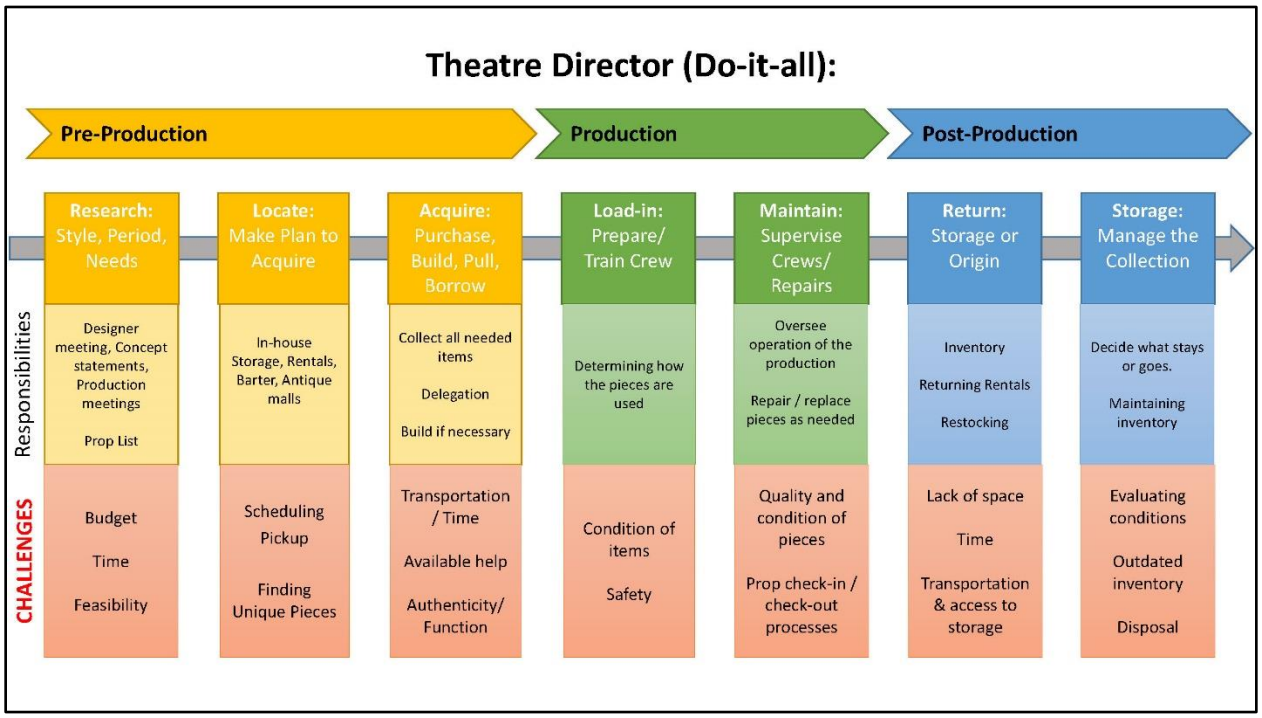
Appendix H: Experience Diagrams



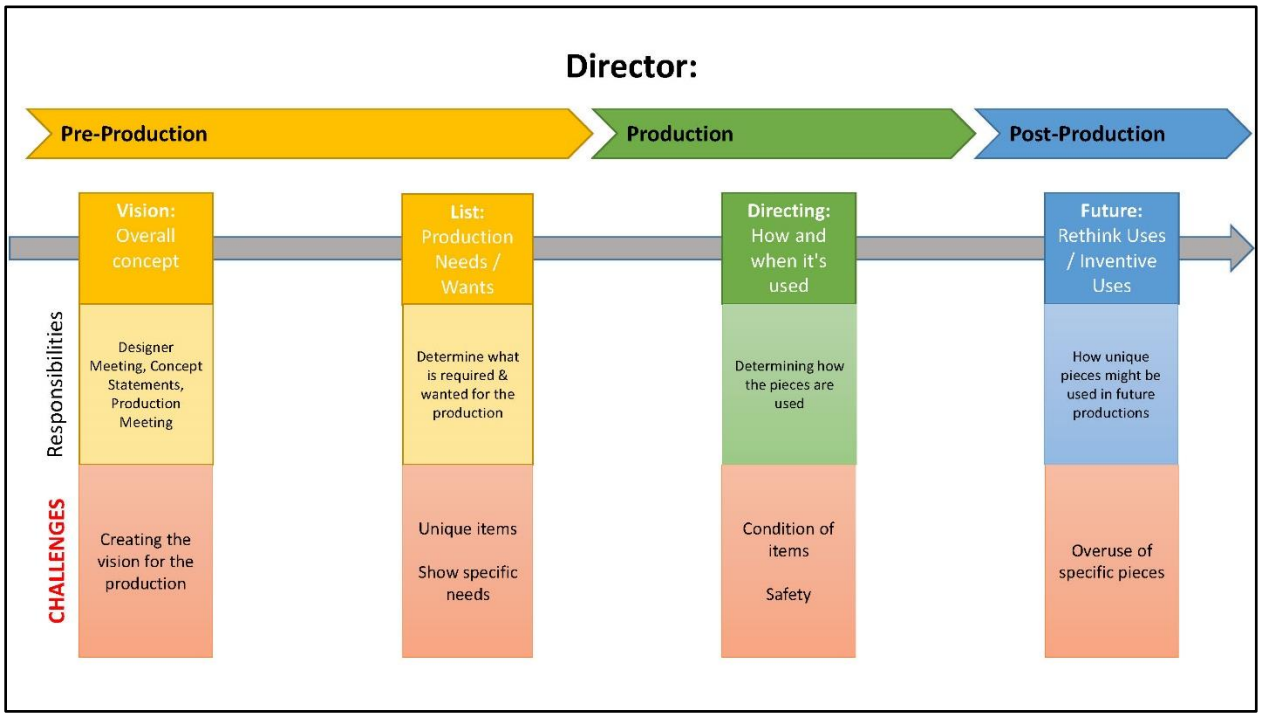


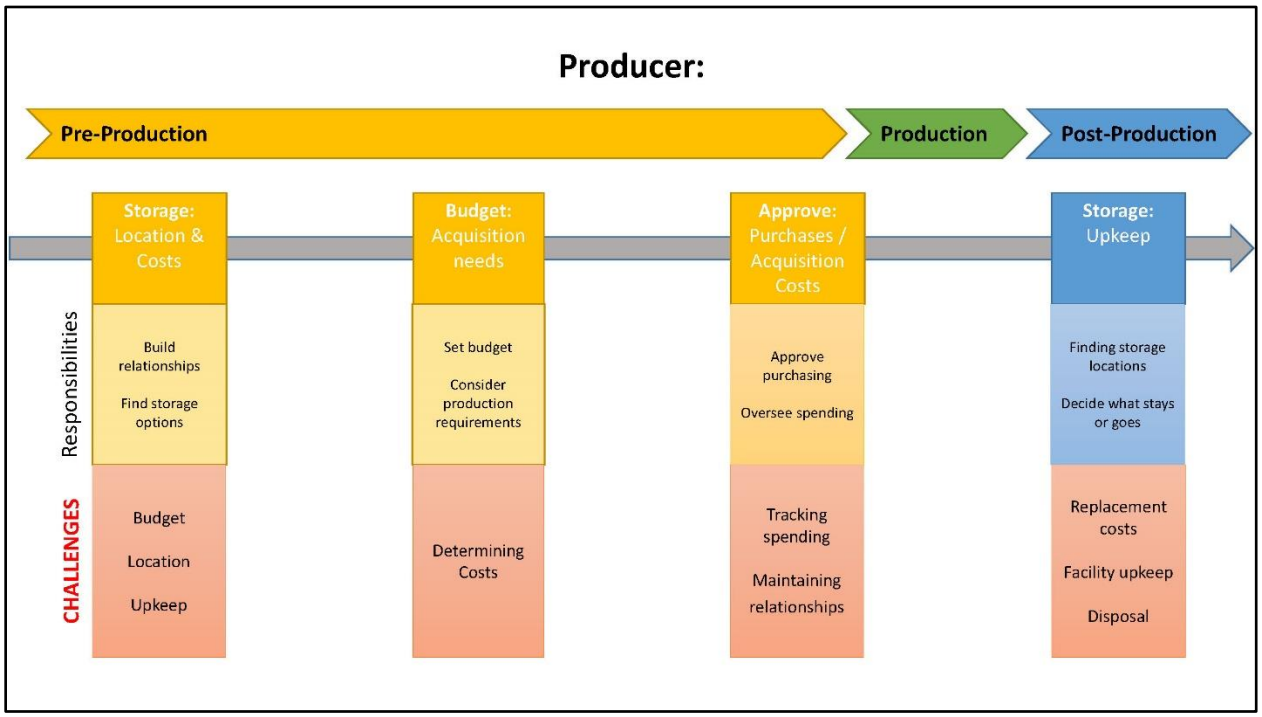
Appendix H: Experience Diagrams, cont.





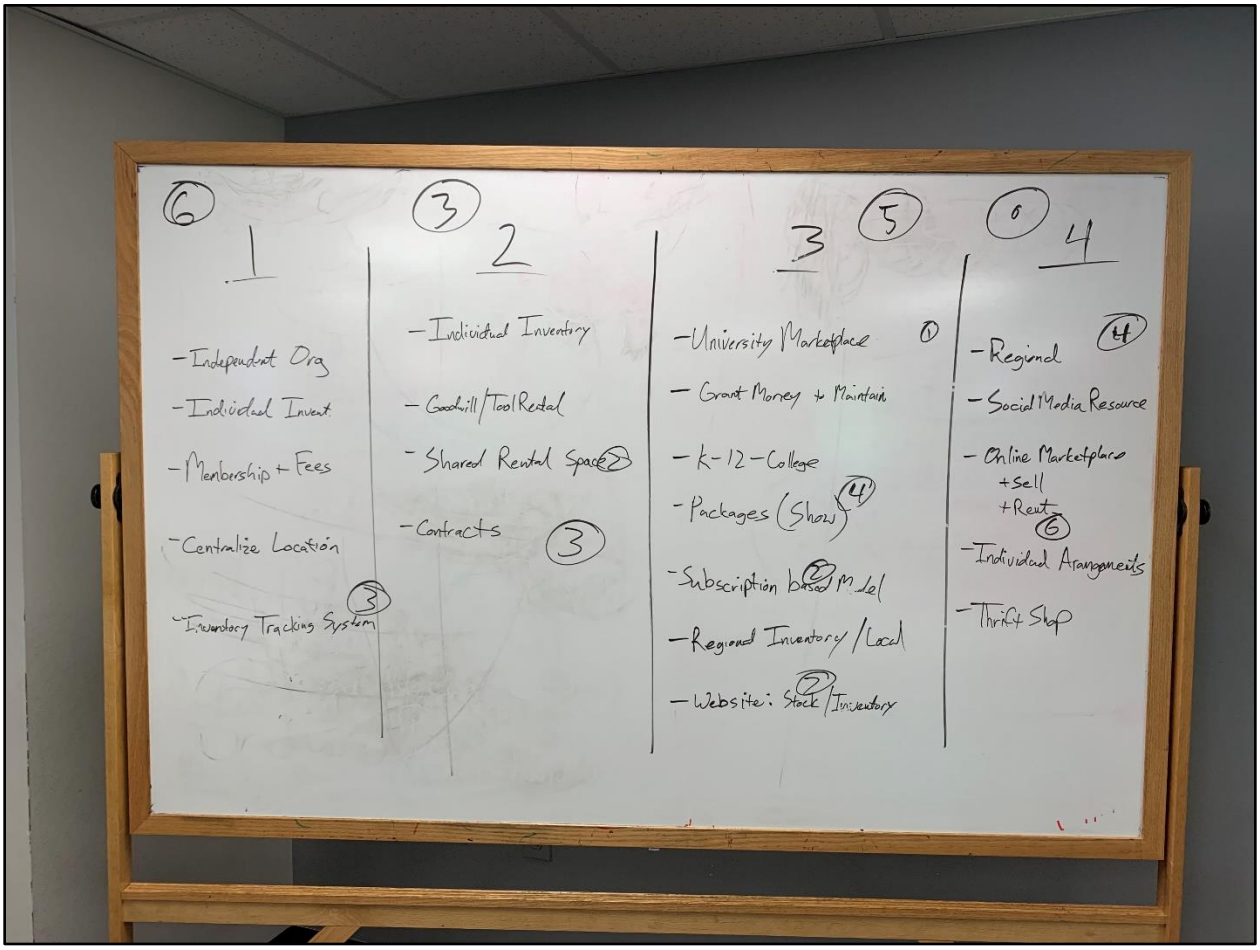
Appendix H: Experience Diagrams, cont.



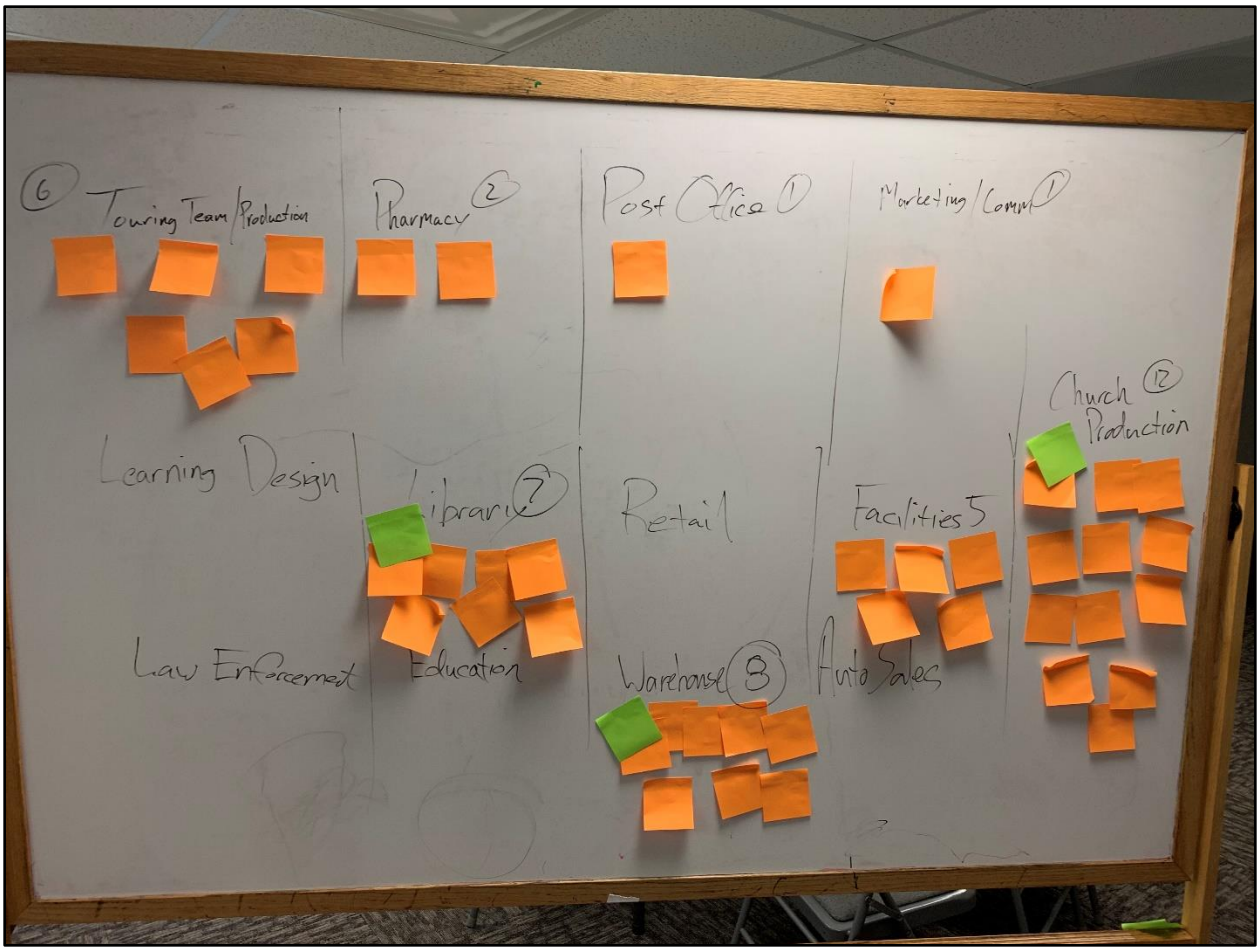


Appendix I: Alternative Worlds

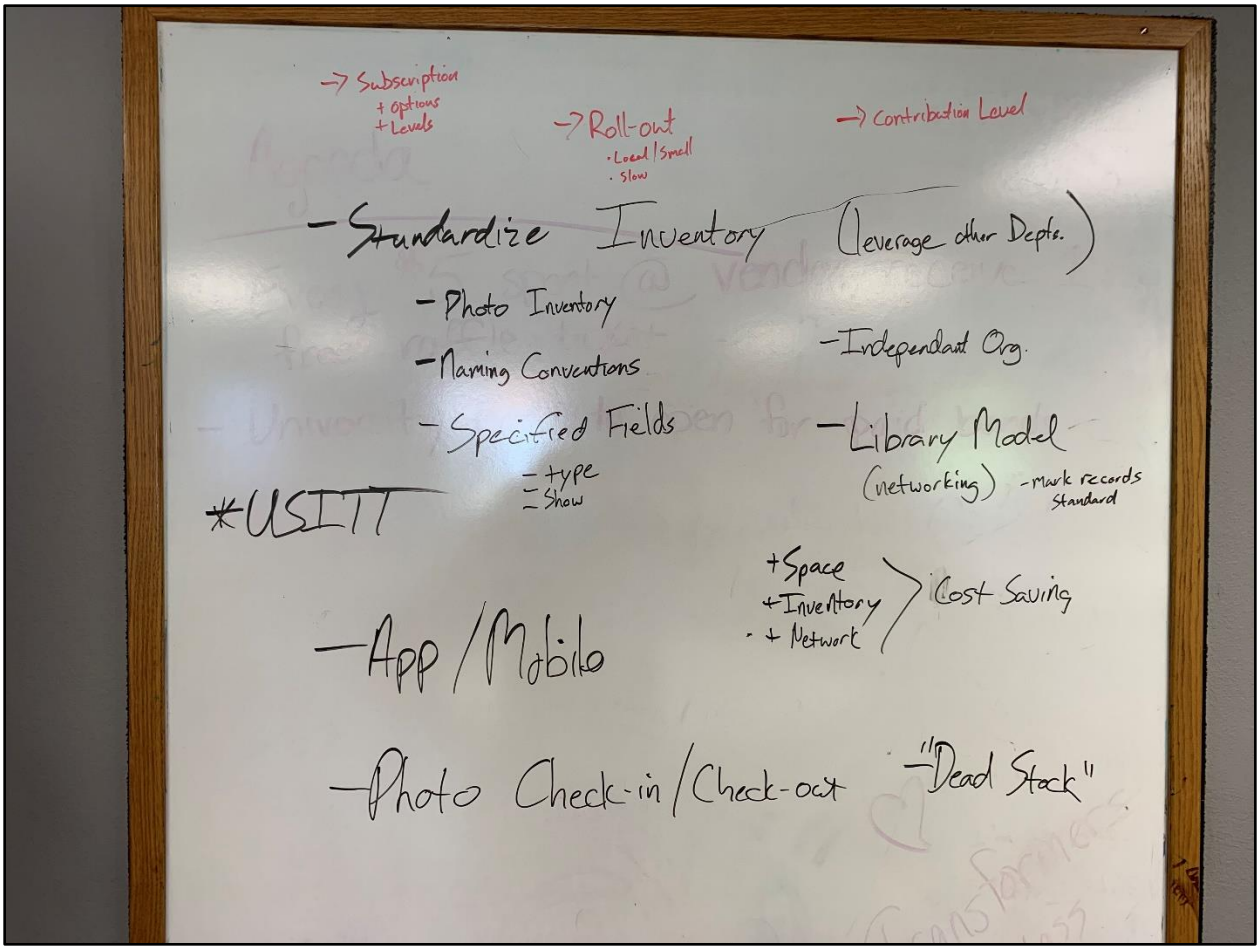
Appendix J: Round Robin



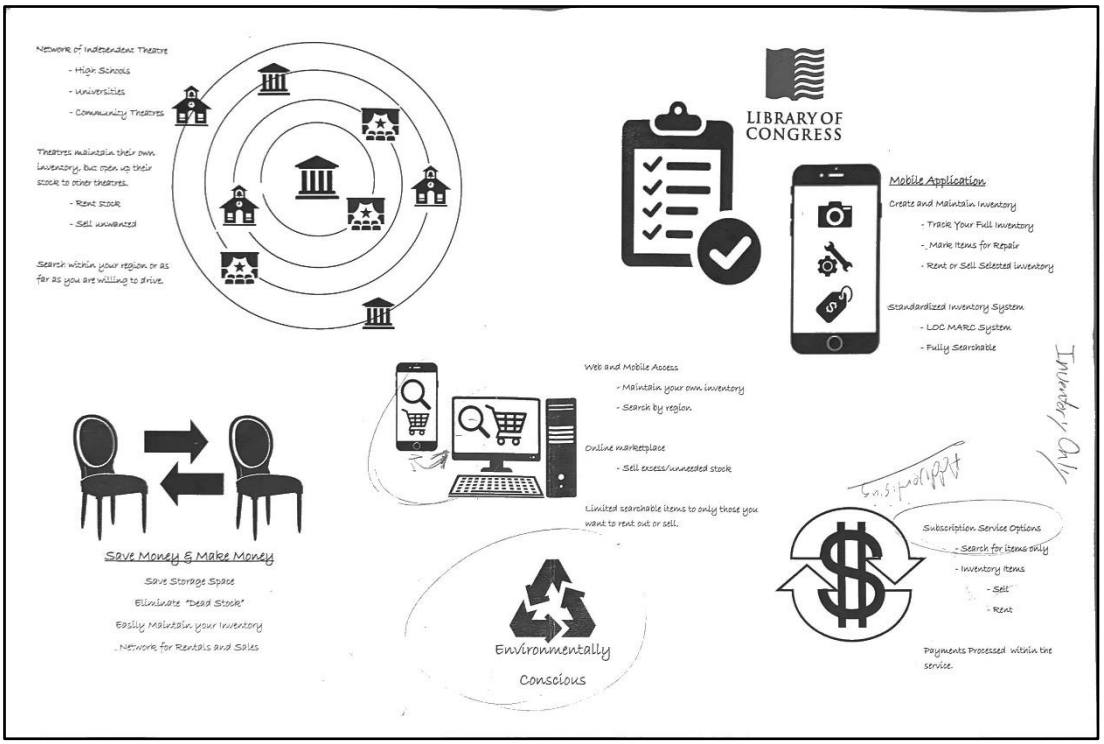
Appendix K: Visualize the Vote

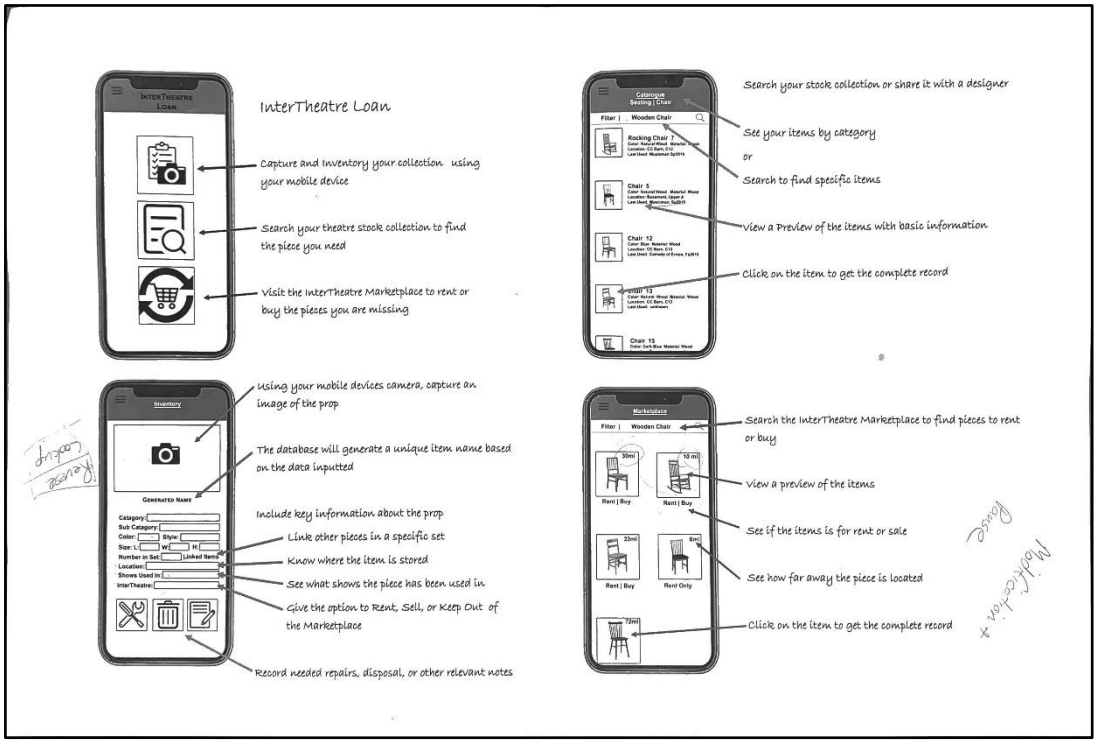


Appendix L: DT Workshop Discussion

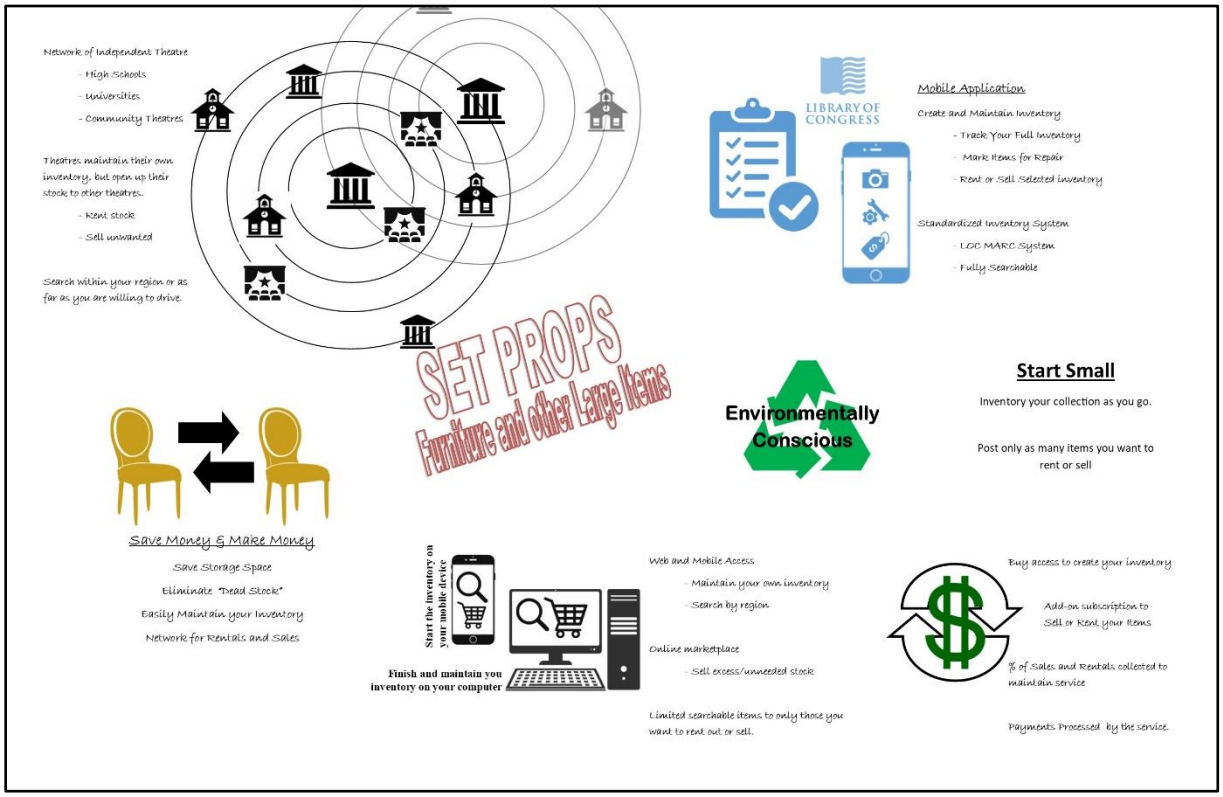


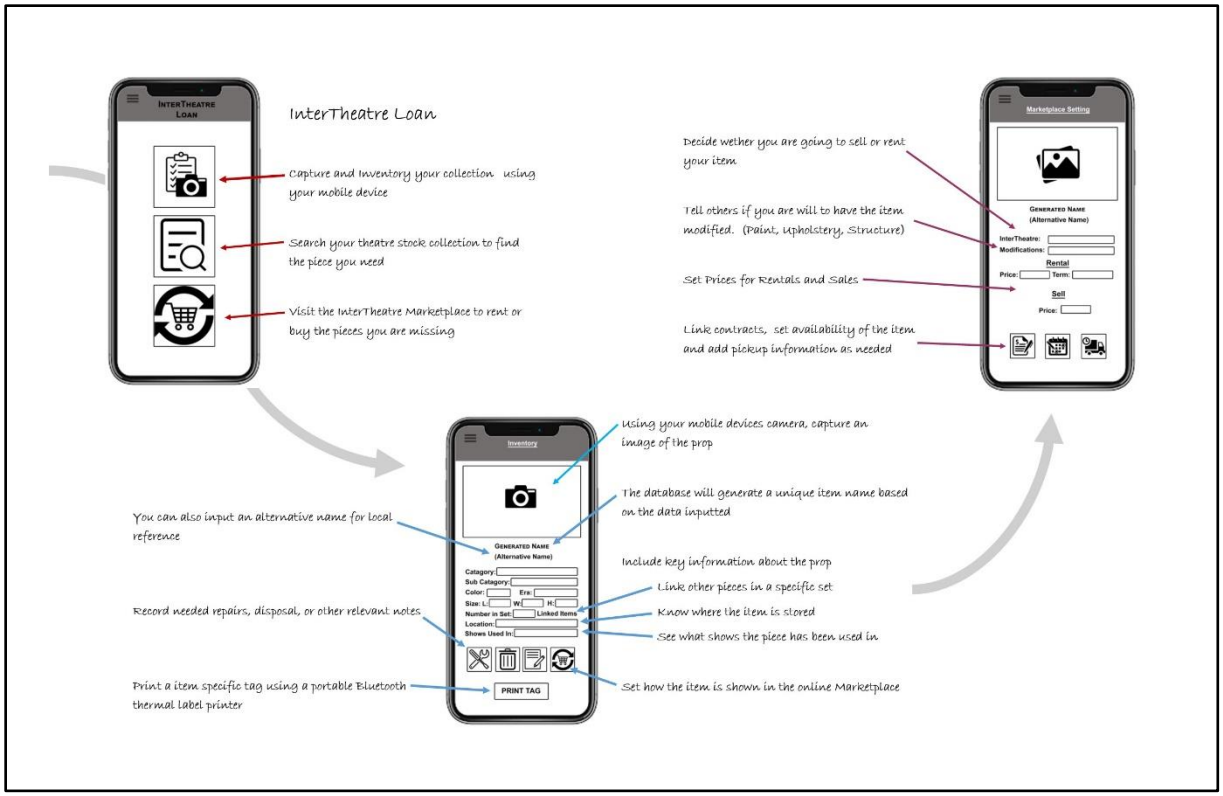
Appendix M: Schematic Diagramming, Original



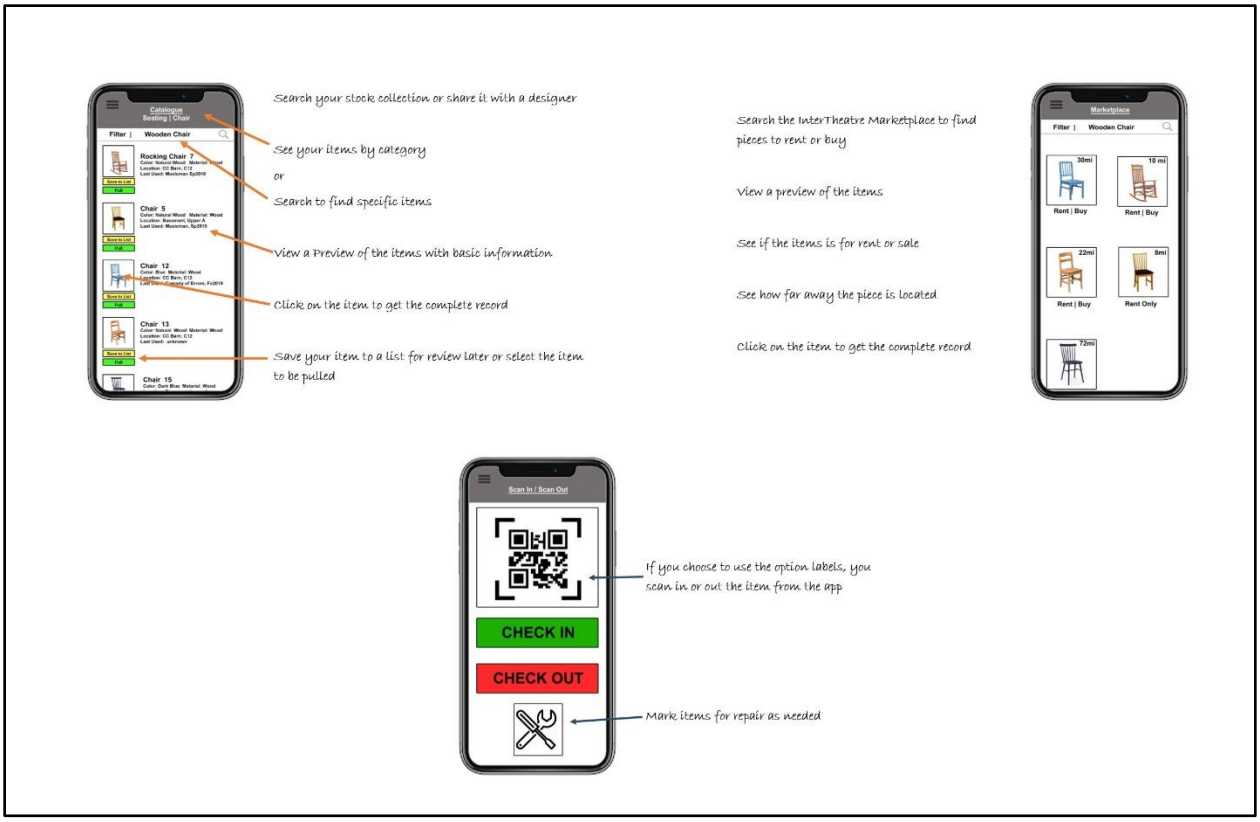


Appendix N: Schematic Diagramming, Revised

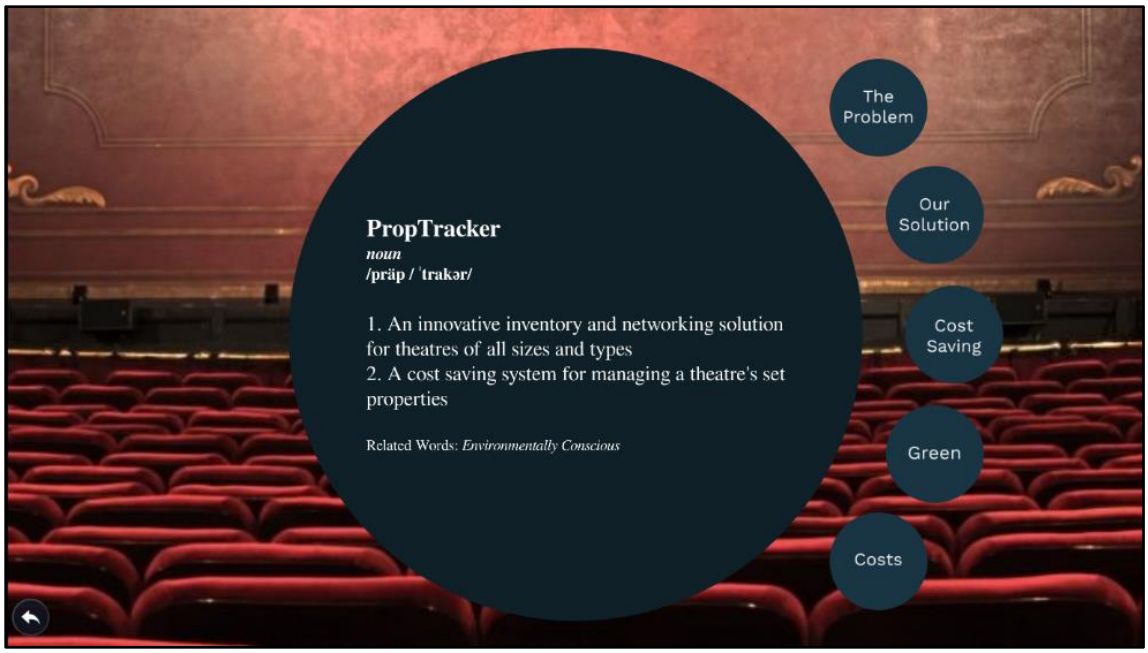


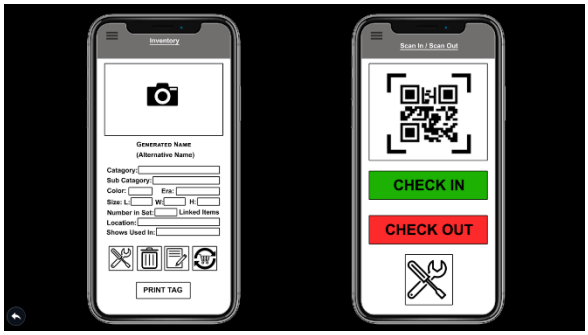


Appendix N: Schematic Diagramming, Revised, cont.



Appendix O: Video Scenario





Video Scenario Link: https://vimeo.com/341246963

Appendix P: Magazine Glossy

Creative Storage Solutions for Theatre Programs:

The Time and Cost of All Those Props

Timothy J. Phipps, M.F.A.
Department of Design Thinking, 2019
Radford University

Joan Dickinson, Ph.D. | Thesis Advisor
Holly Cline, Ph.D. | Committee Member
Kathleen Sullivan, M.S.| Committee Member

One of the primary problems faced by small theatre groups is the acquisition and storage of props. Props are acquired in various ways including purchasing, renting, building, or pulling from an internal collection. With limited resources, these process can be time consuming and expensive. Because of this, many theatres maintain an internal collection of pieces acquired over time. These collections of properties can help in addressing some of the financial and time related issues posed by the other methods, but create additional logistical problems, primarily related to storage space requirements and costs. In addition to these challenges, there is a heightened sense of environmental consciousness, calling for increased conservation efforts within the theatre community.

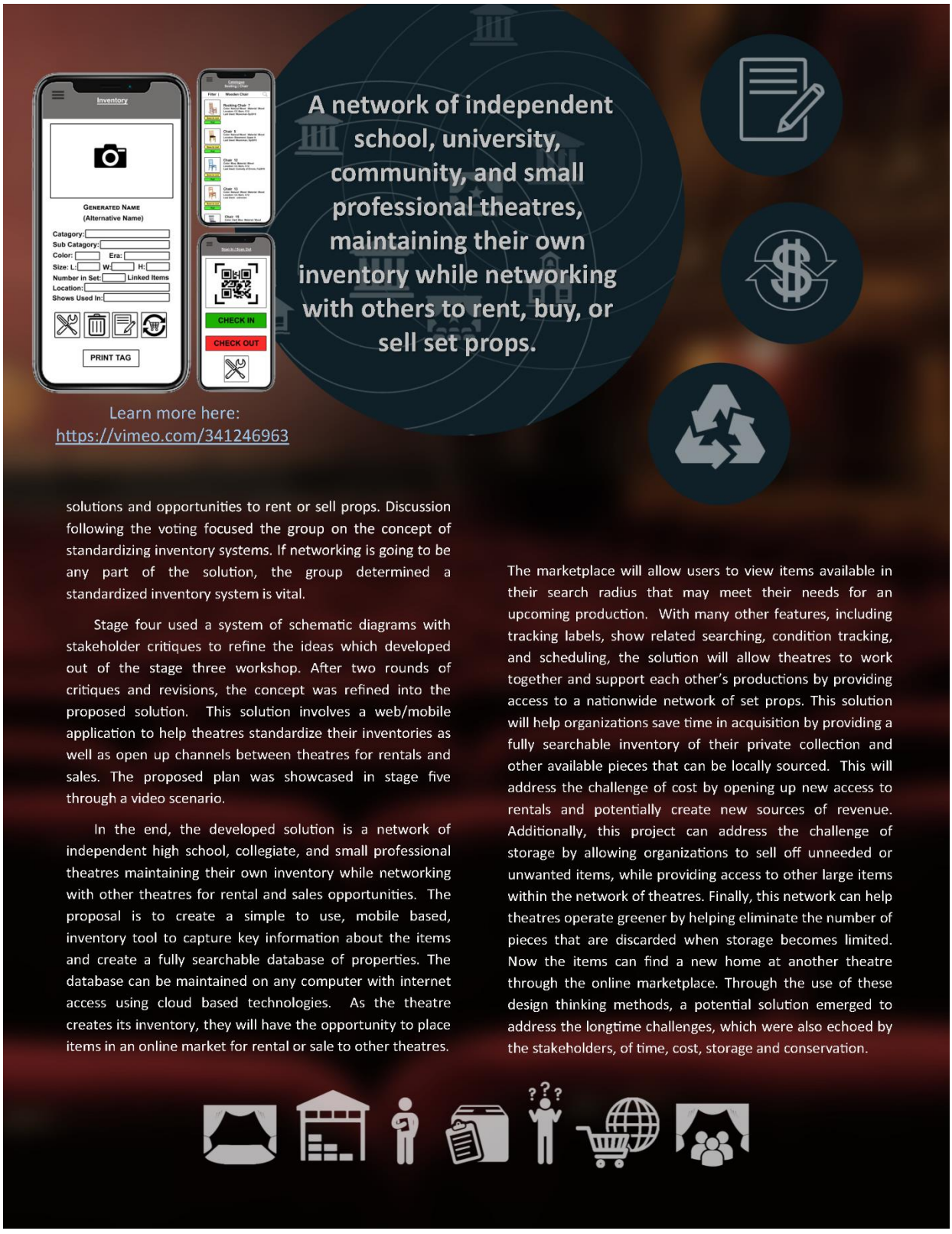
This study sought to use design-thinking methods to understand how small theatre programs acquire and store props for productions and to propose innovative solutions to help alleviate these challenges. The research project was broken down into five stages, each implementing a different design thinking methods.

Stage one began as three theatre professionals completed a stakeholder map in order to determine those positions most involved in the storage and acquisition of theatre set props. This would help ensure that those most closely connected to the challenges could provide greater insight into the issues. The theatre professionals identified six key stakeholders: director, designer, technical director, producer, properties master, and theatre program director.

In stage two, six Individuals representing each of the key stakeholders were interviewed and their typical experiences were diagrammed. The individuals echoed the challenges from the initial research. There was a desire to develop a more efficient system to find and store their properties. However, none of those interviewed had a fully working system. It was found that these organizations were on their own to develop their own solutions. The interviews consistently echoed the issues of time, cost, storage, and conservation that where raised in the previous research.

Using 14 participants from a variety of industries outside of theatre, stage three worked to see how others areas have dealt with similar challenges. These professionals helped to present innovative concepts dealing with acquisition and storage solutions by participating in a design-thinking workshop. This two hour workshop included three strategies: alternative worlds, round robin, and visualize the vote. The alternative worlds strategy led the group to explore libraries, warehouse automation systems, and multi-site churches further to understand how these industries approach the issues being investigated. The participants then completed a round robin session, where they developed potential solutions. Using this strategy, improved inventory and networking options emerged. Finally, visualize the vote led the group to focus in supporting the individuals programs and developing a system to provide inventory creation

Appendix P: Magazine Glossy, pg. 2



solutions and opportunities to rent or sell props. Discussion following the voting focused the group on the concept of standardizing inventory systems. If networking is going to be any part of the solution, the group determined a standardized inventory system is vital.

Stage four used a system of schematic diagrams with stakeholder critiques to refine the ideas which developed out of the stage three workshop. After two rounds of critiques and revisions, the concept was refined into the proposed solution. This solution involves a web/mobile application to help theatres standardize their inventories as well as open up channels between theatres for rentals and sales. The proposed plan was showcased in stage five through a video scenario.

In the end, the developed solution is a network of independent high school, collegiate, and small professional theatres maintaining their own inventory while networking with other theatres for rental and sales opportunities. The proposal is to create a simple to use, mobile based, inventory tool to capture key information about the items and create a fully searchable database of properties. The database can be maintained on any computer with internet access using cloud based technologies. As the theatre creates its inventory, they will have the opportunity to place items in an online market for rental or sale to other theatres.

The marketplace will allow users to view items available in their search radius that may meet their needs for an upcoming production. With many other features, including tracking labels, show related searching, condition tracking, and scheduling, the solution will allow theatres to work together and support each other's productions by providing access to a nationwide network of set props. This solution will help organizations save time in acquisition by providing a fully searchable inventory of their private collection and other available pieces that can be locally sourced. This will address the challenge of cost by opening up new access to rentals and potentially create new sources of revenue. Additionally, this project can address the challenge of storage by allowing organizations to sell off unneeded or unwanted items, while providing access to other large items within the network of theatres. Finally, this network can help theatres operate greener by helping eliminate the number of pieces that are discarded when storage becomes limited. Now the items can find a new home at another theatre through the online marketplace. Through the use of these design thinking methods, a potential solution emerged to address the longtime challenges, which were also echoed by the stakeholders, of time, cost, storage and conservation.