

Thesis Portfolio

Product Discovery in Artisanal Retail

(Technical Report)

Analysis of the Role of Technology in the Transformation of Artisanal Retail

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Deepak Goel
Spring, 2021

Department of Computer Science

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Deepak Goel
Fall, 2020

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On my honor as a University Student, I have neither given nor received
unauthorized aid on this assignment as defined by the Honor Guidelines
for Thesis-Related Assignments

Signature Deepak Goel Date December 4, 2020

Approved _____ Date _____
Advisor Name add another line if needed, Department of Computer Science

Technical Report

Introduction

Provide a synthetic introduction of your technical topic (the topic assigned by your home department) and the STS prospectus. For those whose STS prospectus does not connect to the technical topic assigned by your home department, you still need to talk briefly about the societal or ethical dimension of your assigned technical topic, then adding another sentence "The technical subject of the STS prospectus and the technical topic for the Dept. of XXX is not related".

For Capstone, my group proposed a new tool, Curate, to help small businesses which have been significantly impacted by the pandemic. The proposed tool is a software as a service provided to small businesses to connect these businesses with artisans as a source of product discovery. Artisans would be able to sign up for the service with their products. Curate would form personalized curated collections for small businesses to buy and sell. For my STS project, I am conducting a social study for this proposed tool, Curate. The project will analyze the current state of business operations for both small brick and mortar businesses and creators. Furthermore, I want to analyze the potential for technology to transform the small business industry based on innovations from larger retailers and other research.

Abstract

The COVID-19 pandemic has been detrimental for small businesses, especially those who already struggle with maintaining a competitive advantage and retaining customers in the retail industry. This proposal involves the design and build of a software-as-a-service tool that facilitates product discovery between creators and artisans, and small retailers, with the vision of bringing back the local, diversified shopping experience. Retail has gone through major changes in the past two decades, with a drastic shift from brick and mortar shopping to the online marketplace. Although many believe this transition is unidirectional, studies have shown that the physical and virtual marketplace are co-dependent. In the current retail landscape, physical stores have to operate in conjunction with an online platform to be scalable while providing the convenience and personalization of online shopping. The increasing use of the digital marketplace has created economic difficulties for creators and small retailers that do not have the resources or capital to compete with large corporations.

Certain companies have attempted to bridge this widening gap using online wholesale markets, digital artisanal platforms, and small-scale online shop builders. Although these sites incorporate many financial, design, and advertising tools, they primarily benefit consumers at the cost of artisans, creating unequal opportunity and high fees within the artisanal community. Platforms such as Etsy and Amazon Marketplace use a business to consumer model that creates an external marketplace, putting artisans at a disadvantage with high competition to reach successful sales. Similarly, online shop builders, such as Shopify, cater to a very targeted type of creator -- established artisans-- limiting new and or unestablished creators from creating an online presence. They also only provide services to establish and maintain an online shop, but do not offer affordable self-promotion tools. In parallel, brick and mortar stores are struggling to attract and retain customers and source unique inventory. With fast fashion and mass production in retail, small businesses cannot match the time and costs needed to maintain and

source inventory, while staying profitable. They also do not have unique factors to differentiate themselves, given how society has shifted to brand-oriented shopping. With both small businesses and artisans facing issues, there is no direct platform to facilitate product display and discovery, through all levels of retail.

The solution offers a service that caters to both the artisans, at varying levels of establishment, and small retail businesses. In both the physical and virtual marketplace, the service generates personalized curated collections of artisanal products for established retail businesses. Artisans will have the opportunity to submit their products to the tool, which will use algorithmic technology to curate products from various artisans into collections for retailers. Acting as the middleman for product sourcing, the tool removes the high competition created by external marketplaces with higher conversion rates at lower costs. For retailers, this tool eliminates time and costs of manual inventory sourcing, and helps small businesses collect better inventory to stay up to date with market trends. Through this proposed tool, artisans will acquire new avenues to sell their work, gain recognition, and minimize external competition, while small retailers receive personalized collections to increase customer traction for their stores and decrease inventory management costs. Locally curated inventories will also allow the service to create exclusivity and give retailers a competitive advantage in their local markets. Using a simple approach to connect these two groups, with a mixture of physical and virtual aspects, the tool ultimately benefits society by shifting away from mass production in retail and by offering improved shopping experiences and sustainable goods.

To define a proof of concept, we plan on defining the product workflow, and simulating the system on a smaller scale by connecting one small business to about five creators. Despite the small sample group, this experiment would be an accurate representation of how a business would use and benefit from our technology. This would allow us to iteratively scale in the future with more businesses

and creators and widen our regional reach. We have conducted a multitude of survey responses from the targeted audiences, researched market sizing and modeled data to understand the user stories involved. We will also generate technical designs, to model the tool's capabilities in offering a unique way of connecting the average artisan, retail business, and shopper. Initial surveying has shown insights into both the creator and shopper market. For shoppers, out of 350 surveyed shoppers, 40% preferred shopping in local boutiques over large malls, and 73% are more likely to purchase a unique item. For creators, out of the 150 surveyed, 85% showed interest in partnerships with retailers.

Introduction

Tons of individuals around the world have creative talents that they pursue, as hobbyists, side careers, and or full time jobs. Whether it be customized or handsewn apparel, handmade accessories, or other pieces of art such as books and candles, a lot of people do not have the platforms to market themselves and sell their products to a wide array of people. Artisans have a slim chance of selling their homemade products at retail or boutique stores. Most of their sales occur online, however, having the chance to sell at a brick and mortar store would give them more exposure. Furthermore, they are limited by their social presence, constrained by people they know or communities they are a part of, which hinders a lot of these aspiring creators.

From a shopper's perspective, in-person shopping is at an all-time low as most consumers prefer the convenience of shopping online and getting their items delivered to their homes. There is not much incentive to shop in person. In addition, there is an increasing trend of wanting to find exclusive, unique products so that they can stand out and claim a distinct style. Many department stores and chains sell non differentiable products at every location all over the country. Some of these chains also participate in production that uses unsustainable resources as well as unjust labor. Larger businesses also struggle to

attract new shoppers on a daily basis. They maintain very trend following product lines and aren't able to incorporate uniqueness into their designs with mass production contracts and processes.

To solve this problem, the proposed tool aims to create a platform to facilitate connections between individual creators and local, small retailers. The platform would allow these individuals to pitch their products and portfolios with pictures, quantities, and prices, and create a marketplace sourcing to local businesses. Specific to connecting local businesses to local creators, both sides would benefit. On one side, the individual creators will gain access to large audiences to sell their products to and create brand recognition. Small businesses will benefit by initiating social responsibility in retail and attract new audiences that they would not have had otherwise. The general public will also benefit, as an indirect beneficiary, by being able to buy unique items from common stores. This way, shoppers will have a chance to purchase products that are not mass produced and are more distinct. Lastly, since these items would be created locally by individuals and not large corporations, they would be more sustainable and help local family-owned businesses.

Background

More than four billion people, approximately 56% of the world's population, are connected to the Internet. 85 percent of this figure spend nearly seven hours each day online (Clement 2020). As it currently stands, there are nearly two billion digital buyers across the globe, and this number is only expected to increase. Though e-commerce is the primary driving factor behind overall retail growth, in-store sales are up and thriving. According to the State of Retail survey report shared by Time Trade, 75% of buyers prefer shopping in-store, the top reason being, it allows them to physically examine what they are going to buy (TimeTrade 2017).

Different generations have differing preferences for how they wish to shop, whether it be through virtual or in-person avenues. A study conducted by Shopper-First Retailing reveals that Baby

Boomers would prefer shopping in-store, while Millennials and Gen Z are open to shopping in-store and online (Sapient 2018). By strengthening both their online and physical presence, retailers can establish marketing strategies that specifically address such generational consumer shopping behavior. Such small businesses can engage each relative generation on multiple channels, such as an online website, brick & mortar store, mobile application, and even social media. This multi-faceted approach is likely to be the most successful in today's world to increase and retain customer traction.

Furthermore, a dual approach would accelerate a customer's decision-making process, and increase their loyalty to the retailer. According to McKinsey, the buying process is a circular journey, for which the first two stages - initial consideration and active evaluation- consume most of the time (Court 2018). Consumers heavily prefer researching a product online to get an idea, then going into the store to examine and purchase it in-person. This further explains why having both an online and physical presence is crucial for customer acquisition and retention, which led us to our model for the product.

Related Research

There are businesses that exist and have proven success in the same industry as the proposed product. Etsy, an online marketplace where people can buy, sell, and create unique products, is the primary competitor in this space. The e-commerce company is focused on handmade, vintage items, and craft supplies in a wide range of categories, including jewelry, bags, clothing, home décor and furniture, toys, art, as well as craft supplies and tools. The primary difference between the two is that Etsy itself is a virtual marketplace where creators can sell their own individual products, whereas the proposed product is a platform that directly connects creators to small businesses. Similar to how Amazon has defined their online marketplace, Etsy has additionally limited all customer relations to occur online, with no in-person aspect at all. The sellers on Etsy do not interact with other stores and corporations. Creators, or "shop owners" on Etsy, simply sell with their own marketing and exposure and ship out

their products. They have options to increase their market presence through additional advertising and promotional fees and are charged through per transaction cuts. They are similar in the sense that they will both attract individual creators that can have limited products and sales and form a similar customer-base (on the creator side).

There are other businesses and platforms that enable creators to open up their own shop, such as Shopify, an ecommerce platform that allows users to set up an online store and sell their products. While not directly competing in the same space, the customer base for creators is also similar, since they would enable creators to set up their own shops and operate independently. For example, once a creator uses the proposed product to gain some notoriety and traction as they establish their brand, they might look to expand and become independent through a service such as Shopify. This same theme is applicable to platforms like Instagram and Amazon as well.

The reason that companies like Etsy seem incomplete is due to the fact that the company does not prioritize the creator, and rather themselves as a business. Firstly, manufactured items are allowed, it is hard to distinguish between a handmade and manufactured item. Many sellers are selling mass market items at very low prices and advertising them as high quality, handmade goods. This in turn undercuts other creators that actually use high quality materials, as their cost is much higher than the sale prices of other products. Etsy is also pushing away small creators as they gain traction and establish their own brand. One such example is how they “encourage” sellers to offer free shipping on orders over \$35, otherwise their products are de-prioritized in the search algorithm. Furthermore, they make Etsy ads a required subscription for businesses with more than 10k in annual sales. The highly saturated selling space with low conversion ratios, in addition to extensive fees and cuts, limits creators from being successful. Similarly, Shopify and Amazon Marketplace have established a level of production requirements, which marginally decreases the applicable members of the creator community. With a

complex set of variables, the proposed product has been designed to competitively promote creators, while still acquiring profitable margins.

System Design

Catering to both creators and small retailers, the product technology is expected to have dual functionality and manage data through various channels and profiles. After conducting initial research on existing systems such as Etsy, Shopify and Amazon Marketplace, and business opportunities and limitations within retail today, the system design process was broken into three different stages - user case definition, technology specifications, and product workflow.

1 User Case Definition

1.1 User Personas

As our team worked through understanding the survey data collected from creators, retailers, and general shoppers, certain user stories were constructed and used to strategize how an end to end flow of the proposed tool should function. This process included developing various personas for each target audience, understanding the types of situations that either party could face, and identifying any safeguards needed to combat against potential service failures.

First, our team established the user personas in detail. The surveys showed that many of these creators were discontent with the high fees of selling online, the highly saturated selling spaces that made it difficult to compete, and the low conversion rates that followed. Many complained about existing platforms, such as Etsy and Shopify, and wished they had more flexible features to promote higher selling rates. Using all these variables, the creator was defined as an individual who sells handcrafted products at varying costs, in limited quantities, and primarily in local areas, through known, established online platforms. This persona could maintain any level of production, whether it be a hobby, side job, or full-time career. The persona could sell at personalized prices and have the ability to

establish themselves through both physical and virtual avenues. In design principle, the creator should be able to submit their products to the tool with data such as the price, quantity, graphics, and materials used, among other variables. From this point forward, the creator's products would be added into the database of products to be sorted into a "curated collection", and give the creator an equal opportunity to sell their items without external competition and fees for advertising.

The second user persona, required for successful execution of the tool, is the small retailer persona. After surveying a couple businesses, the primary complaint was not being able to source inventory easily, as unique inventory sourcing requires searching through a multitude of wholesale markets, social media profiles, and other obscure platforms to get exclusive items. These store owners have low customer traction and retention rates. This user case defines the local, small retailers that either do not have the capital and resources to stay up to date with market trends, scale in competition with large department stores and online markets, and or especially struggle to source inventory in timely, cost effective and differentiable ways. In design principle, a retailer will describe their store's brand and theme, and with this information, the database should be able to classify creator products into collections for each individual retailer.

1.2 Potential User Scenarios and Safeguards

After persona definition, the team worked to acknowledge the various user scenarios that could arise throughout the process. From the creator side of the process, many issues come from an operational standpoint. These issues include quality assurance guarantees, product inventory management, and delivery and shipping guidelines. For example, when the tool is used to allocate products into collections, it is presumed that the creators will be submitting monetizable, valuable products and have accurate quantities available at the time of allocation. If these variables are inaccurate, the algorithm could misallocate the products, causing time-to-retail delivery lags, in the best case, and loss of a client,

in the worst case. To combat these concerns, the team incorporated logistic terms and conditions for product quality assurance approvals, shipping and transactions methods, and retailer sale guarantees.

2 Technology Specifications

Based on the above personas, the initial development of the tool will be done using a database in combination with a knowledge graph algorithm for product curation. The database design consists of three main entities: the creator profile, the retailer profile, and a product profile. Each of these profiles will contain specific attributes and be linked by an ordered ID for identification. Attributes can include

- Creator Profile
 - Name
 - Email
 - Date of Birth
 - User ID
 - Category(s) of Product Production
- Retailer Profile
 - Name
 - Point of Contact
 - User ID
 - Category(s) of Inventory
 - Brand/Theme
 - Collections(s) (numerical)
- Product Profile
 - Name
 - Quantity Available
 - Price
 - Category of Product
 - Creator User ID
 - Retailer User ID with Collection #

Using product and retailer profile data points, the team will construct a knowledge graph to interlink and correlate the possible product-to-collection matches. For example, let's assume the system has 15 painters selling various types of art, including historical oil paintings, nature watercolor paintings, and abstract pop-culture spray paint canvas. Let's also assume there are two art gallery

retailers in the system, one with modern art inventory, and another one centered in the historic downtown mall in Charlottesville. Using these data points, the graph will find all possible product collections, matched to the retailers with the closest theme and brand, and ensure both the creator and retailer will have the most success in sales. In this case, the algorithm may find that historical oil painting artists will be more successful in a downtown Charlottesville gallery, while pop-culture spray paint canvas will attract more customers at the modern art inventory. It will then allocate those artists to one traditional collection, and allocate the others to the second modern collection, while still maintaining different artist products within the same genre. This removes the trend of mass production, but still allows the retailer to scale and maintain inventory. This simplistic example represents how the graph will provide the most accurate and personalized inventory possible by leveraging all details available.

3 Product Workflow

With all factors defined, the product workflow, depicted in Figure 1, describes how the technology would function as the middleman between both target audiences, incorporating business agents and data analytics as well. In understanding the product workflow, there are a number of assumptions that should be addressed. It can be assumed that the tool already has an established set of creators and retailers in the system database. It can also be assumed that the tool works in combination with human agents in order to maintain client relationships and customer support, when necessary. Lastly, this workflow describes the high-level process of how products will be added, filtered, and allocated into collections, addressing the primary needs of the target audiences. It does not particularly include the advanced technologies that are anticipated for future development.

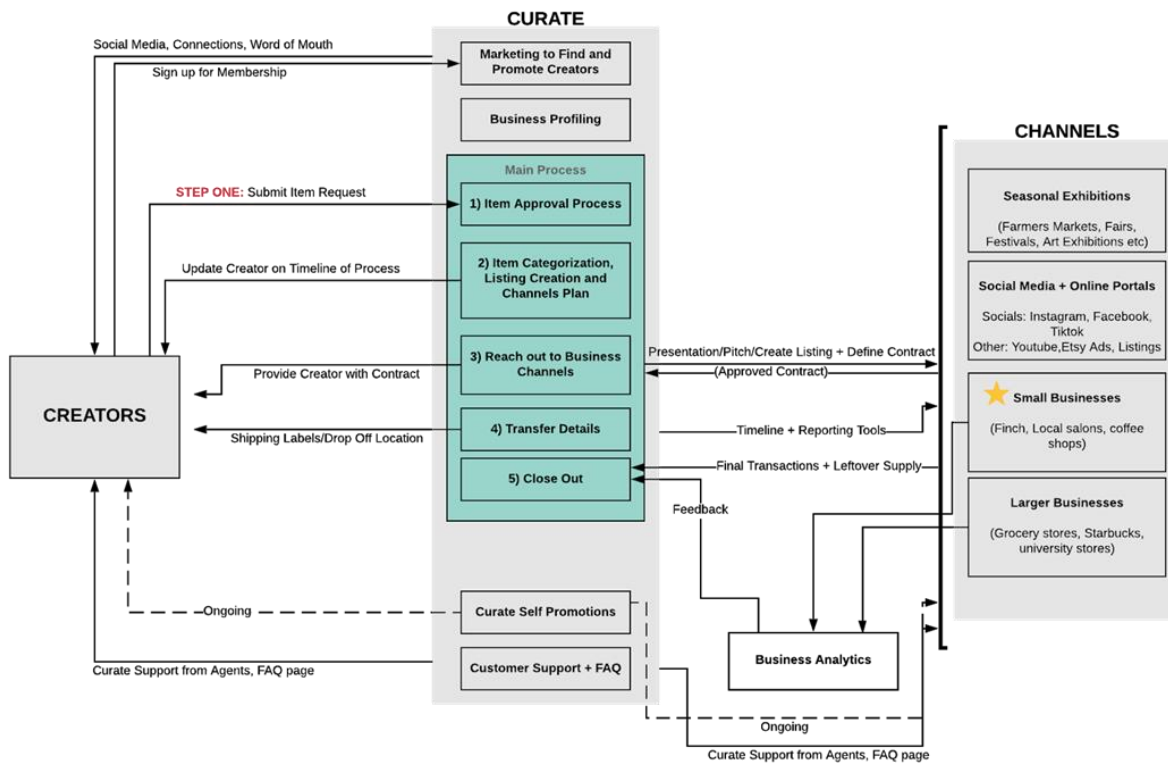


Figure 1: Product Workflow (Appendix A)

Step one begins with the creator submitting their product(s) into the system for initial approval. The tool will screen and validate the creator’s profile and approve the product for curation, to ensure quality assurance for the retailers. After product validation, the products will be filtered into the database and categorized according to the values provided by the creator. This will include, but not be limited to, category of product (art, apparel, shoes, accessories, home and living, toys, etc), materials used, price range, quantity available, colors, themes, and other product properties. In parallel, retailers, with predefined profiles and brands, will have posted requests for new inventory. Using the requests, the algorithm will distribute products from the database into carefully curated collections, by drawing matches between the product qualities and the retailer’s profile. This will be an event driven process, with the technology tending to both creators and retailers. This stage of the process is the most crucial

and highlights the concerns and difficulties of inventory sale and sourcing that occurs for both parties. Following the curation, the involved parties will be contacted regarding the collection match, creators will be notified to ship their products to locations designated by the retailer, and the transaction will be completed. The product will ultimately be a web application, with a responsive iOS interface as well.

Procedure and Experiment

To evaluate the feasibility and need for this certain product, the team conducted a two part experiment: user surveying and workflow simulation.

1 Part One: Surveying

Each of the three primary stakeholders were surveyed to validate design decisions. Three separate surveys were created for each of the groups that asked a variety of questions pertinent to the respective groups. For the creators/artisan survey, questions asked information about general pricing, time for production, and categorical statistics, as well as free response questions regarding experiences with current competition and existing tools. This survey was sent through Facebook channels, personal connections, and directly messaged through Instagram for established profiles. The team consulted this survey's content with real creators to draft the best set of insightful questions possible. Second, the shopper survey was created to gauge general shopping trends and behaviors in the retail industry. This survey was sent to the general public, through all common social media channels. Both the creator and shopper surveys were distributed through a virtual Google Form. Lastly, the retailers survey was created in a different way. This survey was conducted in interview format with a generic set of questions, open to interpretation according to the industry and responses of the interviewee. Each team member conducted these interviews with individual shop owners through phone interviews, reaching out to a variety of different artisanal stores. The surveys were revised numerous times before distribution to ensure there was no question bias and or undue influence from the question framework. The team set

quantitative goals for each survey, with an expected 100+ creator responses, 200+ shopper responses, and 25+ retailer responses for significant data analysis. The survey cycle lasted for approximately one month.

2 Part Two: Simulation

For the simulation, the tool was probed on individuals that were unfamiliar with the product concept and functionality. The trial consisted of five individuals, four of whom were designated creators and one designated a small business retailer. Given the limited accessibility to real workers and COVID-19 restrictions, the participants were chosen from the UVA student body. Two were actual, established creators, and the other two were normal students with interests in content creation. The retailer was represented by an economics student at the university as well. These individuals were specifically chosen to most accurately represent the parties that would use the system in real time.

The team played the role of the middleman algorithm, in human form, accompanied by a clickthrough prototype. Each participant was given access to the clickthrough, and was allowed to ask clarifying questions throughout the process, as expected when using the “application”.

To begin the simulation, the team first collected information from the four creators. Each of the creators was given a unique persona. They were told to use this persona while generating questions, and using the clickthrough to submit information to the tool. Similarly, the retailer was given a unique persona as well, and told to follow a similar process as the creators. Quantitative data values and qualitative feedback was collected throughout the simulation and used in the analysis to pinpoint missing areas in the design.

Results

1 Part One: Surveying

After one month of surveying, the team was able to collect 150 creator survey responses, 342 shopper responses and 4 retailer survey interviews. There was a limited number of retailer interviews, as it was difficult to get a hold of store owners through virtual communication. In person interviews were not as easily accessible due to Covid-19 limitations.

After data collection and analysis, a couple major trends were identified for each respective user group. Creators, on average, produce 43 items per month with approximately five hours for production per item. The average sale conversion time is 11 days, in which, 45% use Etsy, 50% use Shopify or a personal website, and 85% use social media in varying combinations. Out of the 150 creator responses, 70% were unhappy with the low conversion rates in existing platforms due to highly saturated seller spaces and inaccurate audience targeting, while the other 30% were discontent due to high fees for self promotion and sales. In positive news, 85% of creators showed interest in partnerships with retailers, if given the opportunity. The creators also had varying levels of commitment to their work and produced in over six different product categories. Shopper data showed that most shoppers bought most goods in clothing and shoes, home living, and art, when buying artisanal products. 40% preferred buying from local boutiques over large malls, and 38% preferred newer/less established brands. Lastly, 73% were more interested in buying exclusive items rather than commonly found products. Retailers interviews showed that most retailers struggle with inventory sourcing due to the time it takes to test and sample products, extensively look through wholesale platforms, and put together themed collections with little resources. They showed interest in having platforms to help them with product discovery, and said that theme and product integrity were key to their success. See Appendix B, slide 5 for more information.

All these data points helped depict what kind of features would be most beneficial during development, as well as helped substantiate the need for this system given such a large market size opportunity.

2 Part Two: Simulation

After conducting the representative simulation, there were a few key takeaways from the feedback. On a high level, all five participants were pleased with the design, approach, and possibilities for advancement and found the tool very useful for their respective positions. From an operational perspective, the creators found the tool useful in the fact that they did not have to be fully established to use the platform. They believed the algorithm had very powerful potential, but were skeptical that creators would still not have solid guarantees on the sales of their products. Although the internal marketplace design with a middleman curator was appealing, if creators are not in control of their own product sales, how would they be given 100% guarantee for successful conversion? They questioned how the algorithm would differentiate between similar products of the same ratings, materials, and pricing, and what kind of conditions would be set to make these decisions. Creators were also concerned with timeline to sales, as if, at a given point in time, there were no inventory requests being processed, how long would they have to keep their products available. From a design perspective, the creators found the clickthrough very learnable and simplistic, with little to no confusion in feature functions. They found the tool to ask all the necessary questions, and did not find the process to be demanding or confusing. All the questions that were asked through the process simulation were answered in a straightforward and understandable manner, giving creators a very clear picture of the end-to-end flow.

On the contrary, the retailer had differing views on the operational and design aspects of the system. Throughout the process, there were many unconnected features that made the overall process unclear. After initial profile set up, the retailer was unsure about how to change their theme/branding, update any inventory requests, and how to contact the creators in their collection. The operational capabilities for the retailer were ambiguous, as he expected very different functionality from the platform than what had been designed. The team had designed the retailer not as active entities but

rather as avenues to distribute collections into. The primary role of the retailer was to subscribe to the platform, provide a detailed profile, and then wait for collections to be sourced and delivered. They were not meant to be involved in the selection process as the algorithm is meant to remove that manual work. The simulation was very beneficial in understanding where the proposed tool was lacking and could be improved upon. As the system architects, the team did not recognize issues in the product framework as many of the novel business ideas did not translate as clearly in the technology design.

Conclusion and Future Work

With the experimental simulation, our team was able to define a proof of concept for the product and gained insight into features that could enhance the functionality of the system, in terms of both business and technical aspects. The team analyzed numerous literature and research to understand the baseline for the industry and technology involved, conducted surveys with all major target audiences, and ultimately put together a business model and design document for further development. Through multiple design iterations, in collaboration with real users, the product has much potential going forward and can slowly be expanded across various regional groups and individuals.

There are several different routes that our team could take as the product expands into the future. Assuming the web application development and functionality connecting creators to small businesses is established, one next step would be to incorporate business-request features. This would be a feature that allows businesses to ask for what they wish to see in the next shipment of “curated” collections, how they might want to customize shipments, and which creators they would like to see more of. For example, a local boutique might be able to request for certain tags on items for their next shipment, by color, product type, certain quantities, etc. all through our tech platform. Another tech feature that could potentially be integrated could be using reinforcement learning models for vision recognition to work towards a primarily techbased curation. This would involve our platform identifying tags and filtering

automatically by product images, so that no human “curators” need to be involved in the curation process. The tech would entirely take care of assigning products to particular collections for individual shops purely off of the uploaded images.

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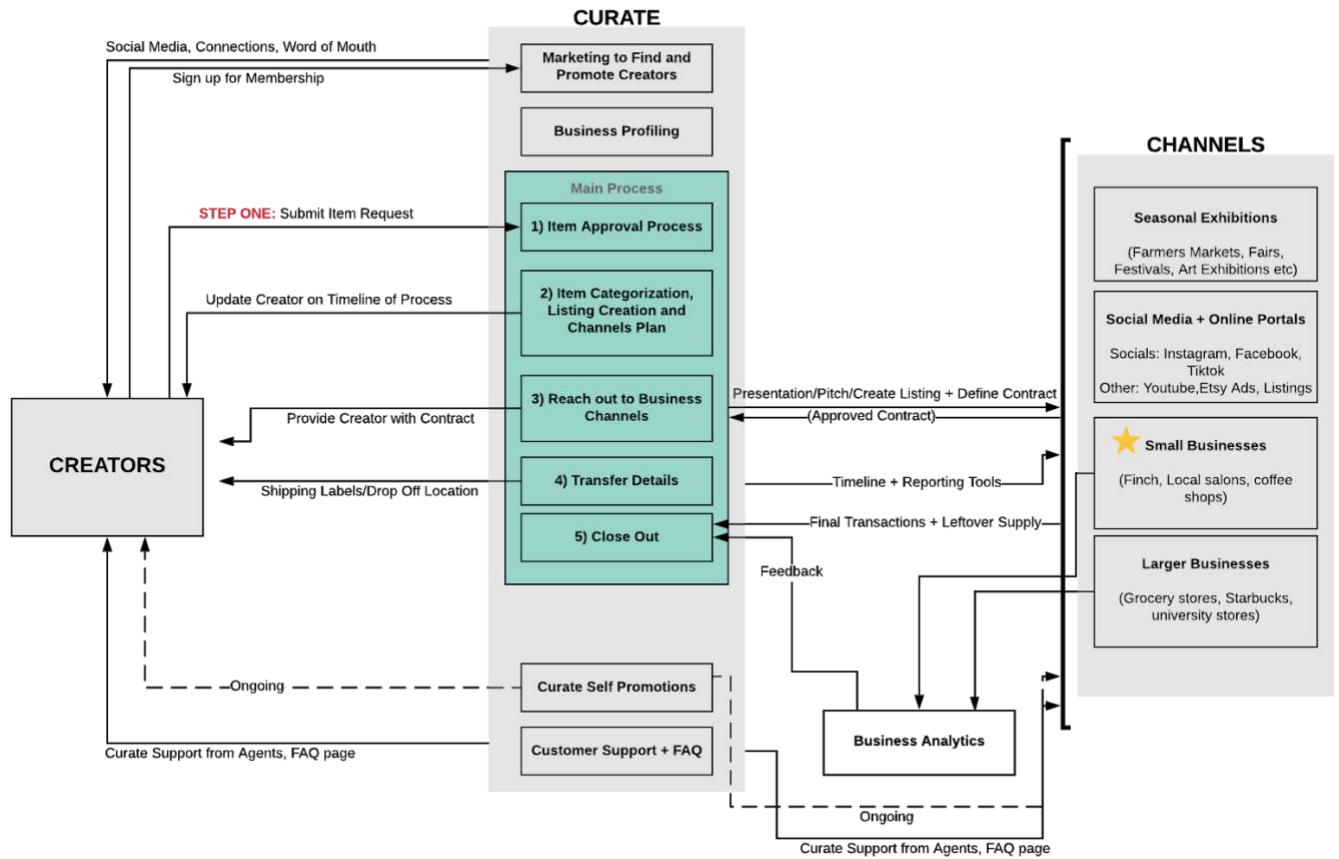
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Appendix

Appendix A

The following depicts the product workflow, with “Curate” as the middle-man product.



Appendix B

Company Pitch Deck; submitted to the Posicovidity Innovation Challenge August 2020
 Link: <https://drive.google.com/file/d/1cq-jrT7bM1nGibaNKgxrKlAW5ovhgEkS/view?usp=sharing>