Masters Thesis

Enhancing Online Art Purchasing Decision using Virtual Try-On

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Abstract

This study aims to measure how Virtual Try-On (VTO) impacts customer satisfaction, attitudes, and purchasing decisions when buying art pieces in an online art gallery. VTO is the use of augmented reality utilizing virtual technology to superimpose objects on a person's body or in their space. While VTO has been extensively studied in the fashion, makeup, and even furniture industries, it has yet to branch into the online art gallery sphere. This study addresses this knowledge gap by employing a quantitative survey of 370 art-enthusiastic, tech-savvy U.S. residents including clients of the Benesch Collection and respondents from Survey Monkey Audience. Building on established frameworks such as Technology Acceptance Model by Davis (1989), this survey captured potential customer's satisfaction levels(SAT), attitudes (ATT), and overall purchasing decisions (PURD) using VTO during their shopping experience.

The key findings of this study show that ease of use, perceived usefulness, and satisfaction levels all positively and directly increase the likelihood of a purchase. Pearson Correlation analysis shows a relationship between all three variables, ATT, SAT, and PURD, with the most correlated variables being SAT and ATT with a correlation score of .835 and the least correlated being PURD and ATT with a correlation score of .743. The Factor analysis also showed promising results that inform one of the survey's overall validity. The results paint a picture showcasing how VTO can be used as a valuable tool in increasing customer satisfaction while encouraging positive attitudes towards the buying experience, thus limiting buyer apprehension and increasing purchasing decision likelihood.

This study concludes with potential research to further this knowledge as well as limitations experienced throughout the research process. Research, such as continued qualitative studies in addition to this quantitative study, could greatly benefit tech developers as well as art professionals. Limitations include the size of the sample used and the use of additional material in the survey.

Chapter 1: Contextualizing Virtual Try-On as a Helpful Tool in the Online Art Market

Introduction

Virtual Try-On is the future of online shopping. Virtual Try-On helps you try on clothes without having to visit a physical store, test drive trendy furniture looks right from home, and see the newest eyewear trends grace your face all from the security of your mobile screen. Virtual Try-On does just this as it utilizes nothing more than a camera and spatial awareness technology known as augmented reality (Zhang et al., 2019). Shopping has evolved since the idea of trade and barter systems emerged. From the Silk Road trade to brick-and-mortar stores, from catalog ordering to online ordering, shopping has taken steps toward the future and has reflected or, as some argue, preempted how society operates (Stobart, 2008). Technological advancements have been at the forefront of the current consumerism revolution as customer's ease of access to products has become increasingly important in a competitive ecosystem. Shopping has become a more digital yet more involved endeavor, and Virtual Try-On is a relatively new technology that can give the shopper a more enhanced "purchase decision process" and the producer a better purchasing model (Zhang et al., 2019, pp.4,26).

Shopping, whether we willingly admit it or not, affects everyone in its ways. Shopping is how we connect the producer of goods to the obtainer of goods, thus "tying people together by invisible threads, globally" (Stobart, 2008, p.13). The act of shopping is constantly evolving even though the main premise stays the same; someone produces a good for profit whether it be monetary or not, and the consumer purchases the product using value. Stobart (2008) highlights that shopping goes beyond the basic needs for exchanging goods stating that shopping is "central both to who we are and how we relate to others, and the character and built environment of our towns and cities." Shopping is the way in which society forms, the way in which people interact with one another, and the way we can support our own and others' livelihoods. At its core, shopping is consumerism but it is also a reflection of society and a precursor to how said society functions.

Shopping has since evolved from the trade and barter system to the more commonplace monetary system. As global trade routes became more established and heavily used, a revolution in shopping came about which opened up trade and the use of localized currency and trade laws. In the eighteenth century, a heightened consumption of novel and luxury items erupted, marking the “birth of consumer society” (Stobart, 2008, p.14). This boom in luxury consumption coupled with the rising wages of workers which encouraged even more consumption amongst the middle or working class of the nineteenth century, gave way to the “age of mass consumption” (Stobart, 2008, p.14). There have been several consumption revolutions such as these but the most recent and relevant revolution in current times has been the online shopping revolution, more commonly known as the digital consumerism revolution.

The shopping ecosystem has changed drastically from the old marketplace structure into a more digital experience, and for good reason. The ease of access to a product is now incredibly important to customers and companies along the supply chain have all had to adjust and enhance their offerings. Kucuk (2016) even touches on the fact that governments and large corporations have invested in online security to uphold the 1960s Consumerism Act which grants “the right to safety,” “the right to be informed,” “the right to choose,” and “the right to be heard” to all consumers. The check and balance of consumer empowerment and vulnerability needs to stay at an equilibrium for a market to survive. When it comes to online shopping, vendors are constantly adjusting and investing in their digital footprint to ensure customer satisfaction and safety which leads to more buying power for the consumer. (Kucuk, 2016, pp.516 -537)

Because of a consumer-oriented shift in power, enhancing the customer experience has been the focus of marketing research. Digital applications such as artificial intelligence, augmented reality, and virtual try-on have all surfaced as new and improving technology. From the need to travel to brick-and-mortar stores in order to physically try on products and see the material in person to, instead, agreeing to a product through a computer screen and with a simple click of a button, shopping has become a much more streamlined process.

The adoption and advancement of e-commerce, p.e. online shopping, has not only supported an entirely new mode of connection to consumers but also a platform for

which great advancement in technology can happen. One such advancement is the use of artificial intelligence on e-commerce sites. E-commerce is “the use of electronic means and technologies to conduct commerce, including within-business, business-to-business, and business-to-consumer interactions” (Whinston et al., 1997, p.14). Using the internet for marketing a product, advertising, and ultimately the selling of a product could fall under the umbrella of “e-commerce’.

E-business sites, or the platforms on which e-commerce is conducted, no longer “focus solely on public opinion, (but) try to personalize them through artificial intelligence and data processing methods” which lends a more comprehensive, personalized experience for the user (George, 2019, p.29). E-businesses have become a necessary part of operations for businesses as a majority of customers default to online search engines due to their ease of access and ability to create a competitive advantage so that they themselves can then find and source the best services that fit their needs (Gielens & Steenkamp, 2019, p.368). With a concentration of users turning to the internet for assistance, artificial intelligence has become a new investment opportunity for e-businesses and marketing agencies.

Artificial intelligence has and continues to change e-commerce. Artificial intelligence (AI) has brought great profit to e-businesses with its ability to “correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation” (Kaplan & Haenlein, 2019, p.15). AI has the capability to carry out human activities such as creating text to sound like an example excerpt, creating visuals from scratch, decision-making in data comprehension, and even translating languages on a website. AI is constantly learning in its environment, enhancing logistic lines, helping companies operate in a lean manner, analyzing data efficiently, and creating a more personalized sales approach for customer retention. AI hasn’t only streamlined online actions but has also led to the adoption and implementation of other advancements in e-commerce such as augmented reality and, its antecedent, virtual try-on. (Pallathadka et al., 2023, p.2610-2613)

Just like in the advancement of AI, e-commerce sites are also benefiting from using augmented reality to showcase and sell their products online. Augmented reality

(AR) is a technology that superimposes a computer-generated image on a user's view of the real world on their device's screen, thus providing a composite view. Recent applications of AR in e-commerce range from uses in the fashion, automobile, home goods, eyewear, and cosmetic industries (Gabriel et al., 2023; Duarte Guimarães, 2020, Alves & Reis, 2021). By opening the AR application and allowing access to camera functionality, users can experience a superimposed image or 3D product on their device's screen and interact with it. Users can see a company's product in great detail, having the ability to turn it 360 degrees and see its size, shape, and color in real-time. This allows the customer to get a more natural, 'in-person' experience without having to leave their home (Kim & Forsythe, 2008). AR has expanded e-commerce's capability by giving more power to the consumer, letting them virtually try something on before they purchase, and interact with the product before they commit, leading to more involvement in the buying process and lessened purchase hesitation (Nikhashemi et al., 2021). This specific experience of virtually trying a product using AR, commonly known as Virtual Try-On (VTO), has many business applications that run a portion or majority of their services online.

As an extension of AR, VTO is a real-life application seen on a handful of successful websites and applications promoted by large companies. VTO is "technology that allows shoppers to create their virtual models based on their measurements, facial characteristics, hair color, body shape (or surroundings) and also allows shoppers to zoom in on product features, rotate and view the product from different angles, and view the product in a variety of colors on a virtual model created to imitate their appearance" (Kim and Forsythe, 2008, p.46). VTO is used in many ways such as, but not limited to, placing furniture in customer's homes to see if it will fit, putting makeup on customer's faces to see if it matches their complexion, and even placing virtual glasses on a customer, all without having to worry about leaving the comfort of one's home (Alves & Reis, 2021; Gabriel et al., 2023; Zhang, 2018). While these are all examples of profitable usages of VTO, more research is sought especially for smaller businesses on how implementation will help their customer retention and sales volumes.

This study explores the relationship between VTO and the attitudes and satisfaction levels that consumers have toward the implementation of VTO on an online

site. Understanding the ecosystem in which VTO plays a part and how customers react to new technology in their purchasing decision journey could help businesses better market, design, and adapt to their clientele. The following research questions outline the overall goals of this research which is also addressed in the literature review and methodology section.

Statement Problem

Understanding the 'attitudes and satisfaction levels of customers while using Virtual Try-On in the online art gallery sector during their buying journey is necessary to eventually improve its marketing and sales.

Art evolves constantly in all aspects. Trends, tastes, mediums, and even platforms in which art is shared are changing as technology and a deeper understanding of art expands. Adapting to these trends takes time, which brick-and-mortar art galleries struggle with, and understanding how customers react to new technology implemented into art is a great challenge. While physical art galleries prompt up-and-coming artists to share their art, it's sometimes to the detriment of smaller yet equally talented artists who can't afford the gallery commission. Online art galleries are the solution to this problem but sales of online art galleries are still supported through personal relationships.

The sale of the piece is also at the mercy of the gallery owner, who might need more in-person traffic to sell and could fail to bring in buyers. Art galleries are a recent advancement in the art scene, with "nearly half of all galleries (being) founded after 2000 and only 7% of all galleries (having) been established for more than 35 years" (Resch, 2016) . This shows that longevity for art galleries is rare, especially with only "30% of all galleries operate in the red, and only 18% make a healthy profit margin of over 20%" (Resch, 2016). This means that, at the higher end of the spectrum, a handful of galleries have figured out how to make a lucrative profit off of art, whereas many galleries on the lower end are struggling to stay afloat. Bringing art galleries, especially small and privately owned ones, into the digital landscape is imperative if they are going to survive the declining market.

Aim of Study:

This study aims to measure buyers' attitudes and satisfaction using the Virtual Try-On extension and understand how it would affect their purchasing decisions.

While purchasing using VTO, many factors come in to play such as satisfaction with the new technology and ease of use or perceived usefulness. Several large companies have used VTO to enhance their customer's buying experience. Chanel, the fashion icon, has integrated Virtual Try On (VTO from now on) into their online purchasing journey and has seen great success within their clientele as their interface is easy to use. Loreal has made new adaptive filters for customers to try on their makeup. Warby Parker[1], the famous eyewear brand, was the first to popularize trying on glasses virtually with the user's image in real-time before a customer's purchase decision. This saves the customer time in choosing which product will go best with skin tone, face shape, and unique structure, and also saves the company operating and logistics costs as "try on" shipping and return packaging are reduced.

VTO also helps the company gather more data for future sales and marketing research, making integrating augmented reality into one's website an excellent investment that will likely pay for itself. Although virtual and augmented reality has been used extensively in museums and educational institutions for appreciating art, there is a lack of literature and application of VTO and augmented reality in selling pieces.

Research Questions

RQ1: What are potential customers' attitudes towards VTO in regard to their online art purchasing decision?

RQ2: Will potential customers report high levels of satisfaction when using Virtual Try-On as a helpful tool in their online art purchasing decision?

[1] Warby Parker is the "#1 online eyeglass retailer in the United States". They offer in person eye exams at flagship stores and an app allowing customers to virtually try-on sunglass and eyeglass frames.

Literature Review:

This study aims to see if Virtual Try-On (VTO) is a viable approach to increasing overall satisfaction in the buying experience. This literature review covers necessary subjects such as an overview of the online art gallery industry with the advantages and disadvantages of adopting e-commerce, VTO with its uses and current trends, and the significant theories that are present through the implementation of research moving forward. This section also covers important past models and methodologies that have shaped this study's purpose and aim.

E-commerce in Online Art Galleries

The surge in e-commerce in the last 20 years has undeniably reshaped the retail landscape and with it, the online art gallery industry (Habelsberger & Bhansing, 2021). Traditionally a socially and physically bound industry, art galleries have since adapted to the 21st century's push for digitization by allowing more transactions of art, auctions, and showcases to live online instead of solely in brick-and-mortar auction houses and galleries (Arora & Vermeylen, 2013). The art market has also experienced a noteworthy increase in online sales, steadily climbing from the adoption of social media and other online platforms (*The Rise of Online Art Sales: An New Era for Art Collecting*, 2023). The increased use in technology and ecommerce has resulted in a boom in online art sales.

The importance of e-commerce and the current ease of access to artwork is global sales numbers. In 2022, global online art sales reached approximately 10.8 billion U.S. dollars, a steady climb from the previous year's figure of around 10.2 billion U.S. dollars (Kohl, 2022). Due to this increase in sales, some traditional brick-and-mortar art galleries are adapting and becoming either hybrid online and in-person stores or have shifted to completely online places of business, where the visibility of the art market and its participants have been spotlighted and made more attainable (Habelsberger & Bhansing, 2021). As consumers actively continue to purchase pieces of art online, it’s influence on the market seems relatively important for

art galleries. This study sheds some light on the art industry adapting to the market by using ecommerce technologies such as VTO.

A current topic in the art industry is the growing significance of e-commerce and its capabilities to bring ingenuity and prosperity to galleries of all sizes and in all parts of the world. The art industry is a part of the creative industry yet is limited to physical pieces of art that can be sold, bought, physically shipped, handled, and appreciated by a consumer in whatever space they choose. With an increasing number of art enthusiasts and art collectors opting for online platforms to explore and acquire artwork, online access to art has increased. An easier, faster and more secure way of selling and purchasing art for artists, galleries, and buyers is constantly being developed in the art world as art collectors and enthusiasts both seek a more seemless exhange of art. Art collectors are “those who put substantial resources and receive substantial compensation from the purchase and then sale at appreciated price” of a piece of art and could benefit greatly from increased e-commerce innovation (ETChster, 2019). Alternatively, an art enthusiast is someone that appreciates art but does not necessarily buy art to create an investment portfolio, but instead to enjoy in their space.

Although different in their motivations, both art collectors and art enthusiasts have the purchasing of and appreciation of art as a common thread that online galleries could use to their advantage. Research indicates that even high-luxury art can be sold online and smaller galleries with a lower price range can adapt readily to online sales operations, which is good news for art galleries trying to attract both art collectors and enthusiasts (Habelsberger & Bhansing, 2020). The increase in online traffic, however, is a double-edged sword where the success and failure of art galleries depend on their carefully and meticulously curated, marketed presence. The marketing of an online art gallery is done either through social media, gallery websites, or third-party online auction provider websites (Garyfala, 2022, p.19).

While e-commerce is rising for large art galleries, smaller art galleries face different challenges and opportunities in the digital world. The traditionalist art community is apprehensive toward online marketplaces that clearly outline the exclusive approach most art moguls and institutes tend to perpetuate. The easy-to-access, free market that the internet embodies goes against the grain of the art community, where

value is placed on uniqueness and exclusivity. Buyer apprehension also discourages customers from making their final purchases online. With shipping concerns and some galleries' return policies, an online sale can be rare if the gallery does not already have an established reputation or, in addition, great return policy. These challenges highlight the nature that the art industry upholds, which is quite opposite of the liberating and consumer-empowering form the internet was created upon. (Lind & Velthuis, 2012, p.23-36)

The inclusive nature of the internet is juxtaposed with the exclusive nature of the art industry which creates a hurdle that larger, more established luxury art galleries seem to overcome based on reputation alone. According to Tiziana Sprenger (2022), smaller, less-known galleries leapt over this hurdle with ease by creating the right environment. By bringing in unique pieces at a competitive price, smaller galleries tend to stay relevant and marketable to their specific buyer profile (Tiziana Sprenger, 2022). The gatekeepers, or in this case, art dealers, who are the middlemen between art and admirers are in charge of driving the market by manipulating a sense of exclusivity and connecting galleries with artists and art with buyers (Lind & Velthuis, 2012). By creating unrestricted access to common buyers (a.k.a art enthusiasts, collectors), such sense of intrigue is lost in acquiring seemingly exclusive art, and the need for an art broker is diminished. This dynamic creates opportunities for smaller galleries but challenges larger galleries and their art brokers to stay relevant. (Tiziana Sprenger, 2021, p.49-73)

Although leveling the playing field for small and large art galleries via equal-access online connection comes with great benefits for equality and the consumer, there is a risk of launching an e-commerce art gallery. Getting lost in the online sea of thousands of galleries, depending on the algorithms current that pulls in clients that will potentially buy an art piece is a major one of these risks (Tremayne, 2023). Using e-commerce as a tool in addition to an already existing traditional structure, instead of abandoning the physical gallery and moving online all at once, has proved to be the path of least resistance for most galleries. In addition to its already existing traditional structure, physical art galleries use e-commerce as a tool to attract and keep customers (Tremayne, 2023).

The most notable artwork dealers have come into the industry through two avenues; (1) by expanding on an already established online presence and (2) by adopting online sales as a part of their physical sales room. Even though they are not a traditional art gallery, the on-line retailer Amazon, in partnership with the e-commerce marketplace eBay, has an extensive online art sales portfolio with over 180 different artists (Adam & Humphries, 2014). Their online art platform, called Amazon Art, sells original pieces and uses its already-established presence to promote itself. On the other spectrum,Sotheby's, the globally known auction house, launched an online auction extension in 2014 that was complete with live bidding and sales (McAndrew, 2015). Both Amazon and Sotheby's are increasing their online art sales primarily because they hold the largest market share in their respective sectors. The online movement of these two huge corporations shows are an indicator that the art industry and overall market are begining to move towards a more online presence. Small and medium-sized galleries, however, are adapting in different ways to stay competitive and fight buyer apprehension in the growing online art market through adaptive pricing and creative marketing. (Adam & Humphries; McAndrew)

Art buyer apprehension is one struggle that online art galleries of all sizes face when adapting to an e-commerce market in the art scene. Buyer apprehension "represents the unpredictability of the transaction's consequence" effects on the said buyer (Al-Adwan & Yaseen, 2023, p.3). Physical art, such as paintings and sculptures, is not easily conveyed over a screen making it difficult to sell above average items online (Habelsberger and Bhansing, 2021). Consequently, many buyers either turn away from buying art online or towards readily available art at major commercial stores that they can physically touch, see, try on at home, and ultimately return if it does not suit their needs.

While the challenges of e-commerce in art may discourage some galleries from going digital, there are significant opportunities that newer online art galleries are benefiting from. Because of the digital nature of online commerce, smaller galleries can operate purely online forgoing overhead costs such as physical gallery spaces, art liaisons and dealers, and advertising (Grant, 2015). Art galleries can also implement new technology as they evolve and develop inventive art styles and vessels of

consumption such as augmented reality and virtual reality. Because of these implementations of technology, art itself has evolved. New mediums and styles have come forward to match the online ecosystem and adapt to buyer habits by using technology such as Virtual Try-On, powered by augmented reality (AR). The opportunities that online galleries face create an interesting dynamic in this new age of art.

As art naturally evolves, the mediums in which it is sold and shared also adapt to an ever changing reality, even if there is some resistance from traditionalists. One advantage of moving to the online art world is the ability to cut down on or eliminate the overhead costs of holding pieces in a physical building. For example, “online marketplaces, such as websites, were the highest-growth source of artwork sales for 45 percent of galleries, followed by Instagram at 32 percent” which outlines the push for the online presence of art galleries (Tremayne-Pengelly, 2023, p.2). Art gallery owners also lament that the spaces they own are costing more than ever at about 33% of their total budget. The cost to run a physical gallery is quite large when the alternative is to move fully online where advertising and showcasing art is minimum to free. While the challenge of running a gallery online is still great due to buyer apprehension, the implementation of high-definition photos, videos, and augmented reality makes the marketing of art potentially lucrative.

With more galleries turning online, creators who work in the arts, especially digital art, developed a new ecosystem where art and tech converge into virtual installments. According to Marisa Enhuber (2015, p. 9) “digital technology in art has a democratizing, educational and socializing effect on the consumption of art” which allows access for all while promoting interest and commerce as a byproduct. The idea of implementing technology into art has naturally evolved as the world has become more technologically advanced and has turned online presence into a part of everyday life. The intertwining of art and tech has, thus, led to increased advancements in the buying process of art as well.

Technology has brought us many things but the ability to see art in high-definition with hyper-detailed photos, to walk around a virtual gallery without leaving home, and to use Virtual Try-On (VTO) to test how a piece will look in any space is arguably some of

the most impressive advancements to date. VTO is the usage of augmented reality to try on a product on a user's body or in a user's space (Kim & Forsythe, 2008). VTO comes from augmented reality, a technology that utilizes a camera and spatial awareness technology to superimpose graphics on a user's screen (Zhang et al., 2019). VTO not only has potential in the e-commerce sphere, but also has been proven to be successful when implemented in education and has gained increasing popularity in public art installments.

As VTO and more technological advancements increase, implementation of the virtual trying on of products can be seen more readily in everyday life. One of many prime examples of using VTO in art and education is the La Pedrera Museum based in Barcelona. La Pedrera was designed and remodeled by Antoni Gaudi in 1912 but has gotten an upgrade through new implementation of VTO. The updated museum now uses technology to its advantage by allowing their younger visitors an iPad to virtually explore the ocean-like architecture of the three-story home turned art museum. As the children hold up their iPads to the surrounding rooms and walls, ocean life swims into view on their screens, weaving in and out of the pillars and breaching through windows all while interactive buttons pop up and music softly plays along the narration of their surroundings. This is all possible by the use of the built-in camera of the iPad and augmented reality which is created by hired graphic art designers and implemented on the device. This is just one example of using technology in education and a public, physical and digital art space. (La Pedrera, 2022)

Another implementation of augmented reality (AR), and subsequently VTO, in everday life is the remote museum visits. Much like the La Perdera example of using augmented reality in addition to an in-person museum visit, exploring a museum can be done remotely from any corner of the world using AR technology. AR is the "virtual technology that incorporates digital components into a real-world context to incur alternate perceptions of reality" and is done so by superimposing a computer-generated image on a user's view of the real world (Hong & Hongxiu, 2022, p.346). This provides a composite view much like La Pedrera does in their exhibits. This advancement is used in museums and is, in some cases, developed for both physical and completely online galleries. Some physical art galleries, such as The Getty Gallery in Los Angeles

California, use companies like Emperia VR to create a virtual world or gallery where their art can live with great attention to detail (Migdol, 2021). Visitors can visit their physical gallery, use the virtual reality headsets offered to them, see the art in a 3D space, decide if this is something they'd be interested in buying, and immediately purchase their favorite piece. As more galleries move to a fully online experience, technologies such as AR and VTO will be the launching point that successful galleries need in order to increase their profit and sales volumes while decreasing buyer apprehension.

New technologies are emerging from e-commerce in the art scene and have changed the way we purchase, view, and enjoy art. There have been advancements made in online purchasing that ensure the viewing of a piece of art is secure, fraud is detected, and the buyer is given their piece quickly. Online galleries have pushed for virtual reality on their sites. While online art sales are increasing at a slower rate (9% per year) in comparison to most other industries, the outlook for e-commerce in the art sector is bright as "new technologies improve the online perception of the artworks and establish some interactive experiences"(Grand View Research, 2021, p.2). Adapting to newer technologies and embracing current trends will promote newer, less exclusive art galleries that believe art is for everyone to enjoy and experience. It is the investment and research in AR and VTO that will help more galleries adopt new technology and decrease their consumer's fear of buying online.

Introduction to VTO: How It Is Being Used and Why

Virtual Try-On (VTO), although new the art industry, has become more common in global online retailers. According to Kim and Forsythe (2008):

> VTO is technology that allows shoppers to create their virtual models based on their measurements, facial characteristics, hair color, body shape (or surroundings) and allows shoppers to zoom in on product features, rotate and view the product from different angles, and view the product in a variety of colors on a virtual model created to imitate their appearance. (p.46)

In the case of augmented reality, VTO uses modern technology to scan an area and place an object into that person's surroundings, basing measurements on their

surroundings. Because VTO supports camera functionality and uses mobile devices to place products in the user's surroundings, it is possible to try different products on the user's body or surroundings in real-time. This real-time, try-on of products helps a consumer immediately see if the product is the right fit for them.

The current e-commerce trends in VTO are centered primarily on makeup, clothes, and glassware such as sunglasses and prescription eyeglasses. However, there is a "lack of holistic understanding of the application of VR/AR in e-commerce based on the literature" provided (Hong & Hongxiu, 2022, p.346). This includes how consumers react to art offered online. On-line vendors, such as Amazon and Ikea, have VTO for furniture and decorations but there has yet to be a study that focuses specifically on the attitude and satisfaction rate of customers who are buying using VTO as a helpful tool concerning their purchase decision in the art sector (Raska & Richter, 2017). A study conducted by Hwangbo, Kim, Lee, and Jang (2020) in China showed that "the average sales per customer increased by 13 USD"(p.18) when using VTO and the return rate of clothes decreased by nearly 30%. Although they reported that the purchase decision, in this case, is directly influenced by VTO technology, the level of satisfaction and attitude the customers had can be explored more in the context of purchasing art pieces.

Regarding augmented reality and VTO, more social media applications such as Instagram and Snapchat regularly use augmented reality to superimpose filters with objects, characters, clothing items, makeup, and more onto a person's body or surrounding environment (Dodoo & Youn, 2020). The effects of augmented reality on a user's perceptions of certain advertisements show there is a positive correlation between user's emotions and advertisement viewing inside the filters embedded on Snapchat (Ewis N, 2023). Although Ewis, Youn and Dodoo's research lends insight to user satisfaction, it does not connect those variables to purchasing intentions or how VTO can either alleviate buyer apprehension or altogether counteract it.

While commercial uses for augmented reality and VTO can be seen in large corporations, non-commercial uses of AR are also being used on smaller scales. Non-commercial uses of AR, meaning not used for the sale of a product for a company, are commonly found in museums, public art installations, and classrooms around the

world. The example given in the introduction of La Pedrera House in Barcelona is just one museum that uses AR to educate the general public. At the Manchester Jewish Museum, it was found that “integrating AR could further enhance knowledge acquisition, schoolchildren were able to identify their preferred learning style, and schoolchildren were motivated to continue learning with AR in museums” which lends a hopeful outlook for integrating technology in everyday life (Moorhouse et. al, 2019, pg. 3). International schools such as Colegio Santo Domingo de Alegete in Madrid, Spain have implemented AR regularly into their curriculum, combining art history into interactive gallery walks where students can learn about famous artists and even create their final projects in Reality Composer (Moorhouse et. al, 2019). The opportunities are limitless with augmented reality applications as technology becomes more accessible to schools and students, prepping the next generation who will soon be consumers themselves for a VTO-filled world.

The adoption of VTO at schools is hopeful for on-line retailers, as their next consumer is being exposed to the next advancement in e-commerce. On-line shopping became increasingly popular in the past decade and technology began to support what consumers wanted to see in their online experiences. Ease of access, decreased shipping times, and immediate information all became commonplace. It is projected that VTO will be the next step consumers take in their buying experience. An increase in virtual reality and augmented reality usage is projected to “grow at a compound annual growth rate (CAGR) value of 25.5% from 2021 to 2026” as more people report positive experiences with such implemented tech (Global Market Estimates, 2024). As VTO and augmented reality are refined and invested in, virtual fitting rooms, or online sites to try on products much like a physical fitting room, could become more commonplace. Further research into what attitudes and satisfaction levels consumers have with VTO is called for in the advancement of augmented reality and VTO, especially in regards to how it affects sales (Hwangbo et al., 2020, p.79).

Significant Theories with Virtual Try-On

Theories have yet to emerge to understand implementations of VTO in general and specific usages, such as in the art industry. However, some theories exist such as

the Technology Acceptance Model created by Davis (1989) that help explain how VTO works with buyer and consumer behavior and how people perceive its implementation. The Technology Acceptance Model is based on the Theory of Planned Behavior, which explains how users use and accept new technology (Cheng, 2018). In this case, the new technology is VTO. It uses measurements of perceived usefulness and perceived ease of use which then lend insight to the attitudes a consumer has using a certain piece of technology. Perceived usefulness (PU) is “the degree to which an individual believes that using a particular information system or information technology would enhance his or her job or life performance” (Davis, 1989, p.320). Perceived ease of use (PEU) is “the degree to which a person believes that using a particular information system or information technology would be free of effort” (Davis, 1989, p.320). These elements combined lead to Attitude Toward Using (ATU) which lends insight to the intention to use new technology. Together, these parameters are used to measure how likely a consumer would be to adopt a new form of technology in their everyday life. These terms and their forms of measurement are used moving forward in the methodology section. (Davis, 1989)

The Technology Acceptance Model (TAM) partially inspired this thesis. Adapting the first stages of Davis’ (1989) research, this thesis aims to measure the satisfaction and attitudes that consumer’s have while using VTO. Theory of Planned Behavior and Theory of Reasoned Action were also evaluated for this study, but TAM encapsulates the desired variables of measurement that might lend the likelihood of increased accuracy and insight when studying VTO (Cheng, 2018). This thesis aims to measure both “Satisfaction of VTO as a helpful tool” (SAT) and “Attitude of VTO as a helpful tool” (ATT) which are theorized to directly affect the “Purchasing Decision of Art” (PURD). Both SAT and ATT have a relationship to the purchasing decision explored by Hyunwoo et al. (2020). This thesis re-imagines and re-structures that relationship in the context of Virtual Try-On. (Hwangbo et al., 2020, p.88)

Art galleries decisions would be better supported when incorporating VTO in their e-commerce. As a helpful tool, VTO seems to have a relationship between both SAT and ATT in the art sector. Koivumäki (2001, p.186) concludes, “there [SIC] is a statistically significant positive relationship between the level of customer satisfaction

and the likelihood of a repeat purchase" in the realm of e-commerce. While repeat purchase and purchase decision are different, the connection between customer satisfaction and overall willingness to buy a product is apparent in Koivumäki's study which lends insight into how the thesis research questions presented could be supported. Al Halbusi et al. (2022, p.1) also adds, "customer satisfaction with subsequent online purchases is also positively associated with website continuance intention" which could mean good news for VTO moving forward. The previous research shows a potential link between customer satisfaction and purchase intention but a more attentive lens should be taken with VTO. Incorporating VTO as an extra tool for customers can affect the results of art galleries in their e-commerce results.

This thesis expands on the understanding of the relationship between ATT and PURD. This understanding can lend insight into customers' usage of VTO in e-commerce. In the context of VTO as a helpful tool in online purchase decisions, the following sections explore it in detail in the context of art galleries. This study measures both Attitudes towards VTO as a helpful tool (ATT) and Satisfaction of VTO as a helpful tool (SAT) as independent predictors of the Purchasing Decision of Art (PURD) in the online shopping context.

Statement of Project's Significance

In marketing, measuring buyers' attitudes that use Virtual Try-On has primarily been tracked through quantitative measures such as sales, click rates, and focus groups. Large companies have implemented VTO as a chance to diversify and keep up with advancements because they can afford to, but smaller companies struggle to compete. Chanel, the fashion icon, has integrated VTO into their online purchasing journey, or customer journey, and has seen incredible added benefits including but not limited to increased online sales (Javornik et al., 2021). Rolex has made new, adaptive filters for customers to try on their watches and a new jewelry line (Javornik et al., 2021). Warby Parker, the famous eyewear brand, was the first to popularize trying on glasses virtually with the user's image in real-time before a customer's purchase

decision (Williams, 2019). These companies save the customer time in choosing which product would go best with their skin tone, face shape, and unique structure. They also save the company's operating and logistics costs as “try-on” shipping and return packaging are reduced.

VTO also helps the company gather more data for future sales and marketing research, making integrating augmented reality into one’s website an excellent investment that will likely pay for itself. Although virtual and augmented reality has been used extensively in museums and educational institutions for appreciating art, there is a lack of literature and application of VTO and augmented reality in selling pieces.

Chapter 2: Methodological Approach to Analyzing Customer Satisfaction and Attitudes when Purchasing Art Online Using Virtual Try-On

This chapter provides a comprehensive overview of the research hypotheses, methods, design, population and sample, materials and instrumentation, study procedures, data analysis, assumptions, limitations, and ethical assurances for this thesis regarding VTO used in online art galleries. The independent variables are attitudes (ATT) and satisfaction (SAT) of VTO as a helpful tool. The dependent variable is the purchasing decision (PURD).

Hypotheses:

Positive attitudes towards Virtual Try-On (ATT)

Researchers examine the use of VTO technology in various industries, primarily in the fashion and retail sectors. According to Kim and Forsythe (2008), VTO enables shoppers to see things on virtual models, improving their buying experience by viewing products from multiple perspectives and in various combinations of model, color, and size. This technology successfully increases customer engagement and reduces return shipment rates in online clothing stores (Hwangbo et al., 2020). Although these studies establish a solid base for comprehending the influence VTO has on consumer behavior in retail, there is still a notable gap in the existing literature about its implementation in the online art gallery industry.

The literature review reveals the slow rate of adoption of digital innovations in the art industry compared to other industries (Aurora & Vermeylen, 2013). Although online art sales become more popular and used, researchers have not extensively investigated the use of VTO technology. Studies suggest that the online art gallery sphere faces significant obstacles from customer uncertainty due to the difficulty of effectively expressing the true essence of physical art through a flat, single-planed screen (Habelsberger & Bhansing, 2021). This concern highlights the importance of technology such as VTO in connecting physical, third-dimensional pieces to consumers in a digital art environment.

Considering the advantages recorded by other industries, it is reasonable to speculate that VTO could have a favorable impact on attitudes toward online art purchases. Positive attitudes (ATT) are essential for mitigating buyer fear and improving the shopping experience. VTO can also alleviate concerns over the placement and integration of art into the consumers' space by providing them with the ability to see art objects in their settings. This capability could significantly influence consumer views, leading to increased confidence in their purchasing decisions (PURD).

H1: ATT is highly and positively related to PURD in the context of VTO

This hypothesis explores whether the successful application of VTO, as was shown in other industries, could be replicated in the art market. This could potentially transform that online art buying experience and reduce buyer apprehension. This research aims to gain insights into the feasibility of using VTO as a tool to improve the online art gallery experience by analyzing the attitudes of art enthusiasts who are knowledgeable about or comfortable with technology.

Virtual Try-On Positively Associated with Customer Satisfaction (SAT)

Previous studies show that VTO technology can significantly enhance customer satisfaction (SAT) in online shopping. The research conducted by Kim and Forsythe (2008) and Davis (1989) establishes a robust theoretical basis, explaining that the perception of ease of use and usefulness of a new technology are crucial factors in determining customer satisfaction. Research demonstrates that, in the realm of online retail, VTO enhances customer satisfaction by offering a more dynamic and captivating purchasing experience (Kim & Forsythe, 2008).

Despite these findings, there is a significant lack of information in the existing literature about the use of VTO in the online art market. Traditional art galleries mainly depend on the physical presence of art to engage and attract customers. However, the shift to online platforms presents distinct obstacles. Buyer reluctance, especially

regarding the genuineness and quality of the visual appeal of art pieces, continues to be a major obstacle to online art sales (Lind & Velthuis, 2012).

This study aims to fill this need by examining if VTO can augment client satisfaction in the online art industry. Through the implementation of VTO technology, buyers can position artworks in their environments virtually. This has the potential to remove worries or uncertainties regarding the appearance of the art before purchasing, ultimately resulting in a higher level of satisfaction (SAT) with the purchasing decision (PURD).

H2: SAT is highly and positively related to PURD in the context of VTO

This hypothesis seeks to investigate the degree to which VTO technology can improve customer satisfaction in the online art market. By measuring the satisfaction levels of art-enthusiastic, tech-savvy buyers, this research provides valuable insights into the potential of VTO in improving the online art-buying experience. The findings of this study will aid in the development of a more robust understanding of VTO and how it might be utilized to overcome buyer apprehension and enhance customer satisfaction.

Refer to Fig 1 in Annex

<u>Research Methodology and Design:</u>

This thesis employs a quantitative research design to systematically measure attitudes (ATT) and satisfaction (SAT) toward Virtual Try-On being implemented by an online art gallery. The focus is to gather numerical data to analyze and draw statistical inferences regarding users' perspectives and experiences. The following methodology

aligns with the thesis' study problem, purpose, and research questions. Carefully selected and validated instruments from previously conducted studies serve as an accurate tool in data collection. Building on base knowledge accepted and expanded upon by other researchers helps shape this thesis.

Using quantitative methods allows for objective measurement and the creation of new data, which expands upon previous findings. This thesis is based on academically validated and peer-reviewed evidence, which guarantees the advancement of knowledge rather than its repetition. The methodology has been significantly influenced by the research undertaken by Kim & Forsythe (2009), Davis (1989), and Abdullah & Kassim (2008). These papers, in total, have received more than 90,215 citations in scholarly literature.

For example, this thesis uses the mentioned researcher's foundational work and expands upon it for increased data analysis. Kim and Forsythe (2009) previously tested VTO's effectiveness in an online purchasing study. The survey utilized in this thesis is modified to assess purchasers' opinions towards VTO technology, aligning with the perspective of the art market rather than online fashion purchases. Understanding the foundation of research conducted specifically in VTO is vital in understanding the gap in research and how to expand upon already established knowledge.

Unlike Kim & Forsythe's (2009) newer reports on VTO, the Technology Acceptance Model, developed by Davis (1989), is used in many fields but its model and structure guide many studies. The Technology Acceptance Model is still utilized today to comprehend the process by which people adopt new technology. It assesses the perceived ease of use and perceived usefulness of new technology. These same terms and overall method constructs were used in creating the VTO acceptance model and giving this study's survey a direction in regards to measuring users' perceptions of VTO. The Davis (1989) model offers this study an overall design, giving clarity and direction for the survey writing, model graphic creation, and understanding of respondent's technological relationships.

Although not as popularly used across all fields as Davis' (1989) work, Abdullah & Kassim's (2008) study lends specific insight into measuring the satisfaction and loyalty of customers in online commerce. Abdullah & Kassim create an understanding of

how to measure satisfaction in the customer purchasing journey which is used throughout this study to measure satisfaction through the lens of VTO in the art market. This core study yields valuable insights into quantifying customer happiness and attitudes during the process of making a purchasing decision.

The three studies chosen above are used to create a basis upon which this thesis expands its research. However, many other methods and studies are evaluated in this knowledge-seeking process. Alternative methods and designs, such as mixed method designs and tracking applications, are assessed in the creation of this study. A mixed method design combining quantitative and qualitative (short answer responses) is first drafted for this study. The complexity of using both quantitative and qualitative data would also decrease the clarity of this study.

A website tracking application, used to track user scroll time and mouse tracking, is proposed in the early stages of brainstorming for study design but is ultimately dismissed due to concerns of user privacy and price concerns for extension purchase. This would also gather quantitative data but the sample of this proposed design would not be large enough to represent the population, therefore creating an inaccurate conclusion. Due to the overall purpose of this study, a quantitative survey is determined to be best for data collection. Using a quantitative survey to measure consumer's attitudes and satisfaction levels towards VTO in art purchasing decisions is the most cost-effective, time-saving approach to gather data with the best possible sampling. A test survey is sent to 5 people before the official survey begins to assess the validity of the questions and establish if the questionnaire makes sense. This gives an interval of confidence for the study to move forward.

Population and sample

The population of this thesis encompasses United States of America residents who are both art enthusiasts and technologically proficient. This group is characterized by an enthusiasm for art and a readiness to adapt to and embrace emerging technology. In regards to their ability to use technology, the study accepts respondents who have access to technology, such as laptops, tablets, and smartphones and have used, heard

of, or seen examples of Virtual Try-On. Before conducting any research, it's imperative to understand the overall population that this study's sample is aiming to encapsulate.

The United States has a significant number of individuals who both engage in the art market and who are proficient with technology, or are "tech-savvy". According to Kemp (2023), 91.8% of United States citizens report using technology or having internet access. This vast access to technology prompts growth in many areas of the tech sector, including e-commerce, which is expected to grow by 12% by 2027 (Mordor Intelligence, 2024). Market analysts also theorize that this uptick in online purchasing is a direct result of the COVID-19 pandemic and the rise in Gen Z's (the generation born between 1997 and 2012) online purchasing habits (Van Gelder, 2024). However, it is the Millennial generation (born between 1981 and 1996) that shows the most promise of buying power. According to Art Basel and UBS, there have been increased sales in 2020 within the Millennial age group, representing the most profitable and numerous buyers of fine art (McAndrew, 2021).

While the Millennial buyer is gaining expertise and a knack for collecting fine art and buying art more readily online faster in comparison, the overall population of technologically savvy, art-enthusiastic consumers is increasing as technology becomes more readily available. According to Dharmesti et al (2021), young consumers in the USA have positive attitudes towards online shopping that significantly affect their online purchase intentions. They are familiar with the online shopping process, increasing a sense of familiarity which triggers their information search behavior which, in turn, leads to increased online purchase intentions. As these Millennials age, they will replace the Gen X demographic the art market is relying upon for 69% of their overall investment (McAndrew, 2021). Understanding the Millennial buying behavior is essential to increasing sales but, to do so, a comparison between current clients and up-and-coming clients is needed.

In regards to art purchasing power, the U.S. contributes significantly to the global art market which, in 2023, was with a contribution of $744 billion, $100 billion more than that of 2018 (Kohl, 2022). The interest in purchasing art for pleasure and investment has been increasing steadily since 2018. Nearly 47% of U.S. residents report being "Involved in creating art" and 68% report having "participated in art-centered activities"

(Jackson & Lemay, 2018). These figures demonstrate the sheer amount of people involved in art, whether it be in purchasing, admiring, creating, curating, or trading, in the United States.

The online art market in the U.S. is extensive and projected to grow due to new technologies such as VTO. According to Global Market Estimates (2024), the U.S. will have a dominant share in the Virtual Try-On software market from 2021-2026, with a significant rise in VTO usage in parallel with the increase in online shopping and customer awareness of new virtual technologies. While popularity is rising, as of now only 4% of online users use VTO regularly, 9% have used it before and 38% report having an interest in using it in the future. This means that around 49% of the general population is not presently interested in using VTO regularly (Lebow, 2022). Despite the adoption rates of VTO now, there is a projected uptick in usage of VTO as it becomes more developed and easier to use, according to developers.

The population for this study comprises U.S., art-enthusiastic buyers who, as outlined above, apparently are quite numerous in population. With the amount of U.S. residents who are involved in the art market and also have access to technology, the potential for economic development in the art market and implementation of VTO is intriguing. Understanding how consumers react to this increased adoption of new technology, such as VTO, during their art-buying experience could lend insight into future marketing strategies, technological development of said VTO, and buyer satisfaction in the art-buying process.

Sample Size

The sample collected captures the characteristics of 370 U.S. potential art purchasers who are both enthusiastic about art and knowledgeable about technology which is shown through their responses. The sample size is determined based on the sample equation offered by Malhotra (2010, p. 379). The following sample size equation, with a 95% confidence interval and corresponding z-score of 1.96, is used to determine this study's sample size:

$$n = \frac{0.49 \times (1 - 0.49) \times (1.96)^2}{0.05^2} \quad (1)$$

$$n = 384\, respondents$$

Therefore, 384 respondents are needed for this sample but a smaller sample size used specifically for test-marketing studies should have a typical range of 300-500 with a minimal size being 200. Therefore, this study aims for 384 respondents, receives 396 responses, and, based on the filter questions implemented, uses 370 responses for the analysis portion.

This methodology ensures that the results of the research will be pertinent and practical in the wider scope of online art acquisition. The questionnaire developed for this study specifically targets the particular population needed to understand the up-and-coming target consumer. The purpose of this study is to gather in-depth information about individual's attitudes and levels of satisfaction regarding VTO, as well as their possible purchasing choices with a high confidence interval. This targeted approach enables a thorough comprehension of the influence of VTO in both demographics' online art purchasing decisions.

In this study, U.S. art-enthusiastic, technologically proficient buyers who have heard of or seen examples of VTO are the main focus of the sample. The study is specifically looking for art enthusiastic persons who can answer the survey online. To do so, the overall sample is obtained from two aforementioned sources; the Benesch Collection and Survey Monkey Audience. The Benesch Collection sample is collected first, followed promptly by the Survey Monkey Audience, or 'Online Audience', a sample that fills the overall required number of needed respondents. Eighty-five of the responses are from the preliminary launch of the questionnaire obtained from the shared Benesch client list of, in total, 193 households or clients. Two Hundred and Ninety-Eight of the responses are from the online sample obtained from Survey Monkey Audience. After cleaning the data, the sample size is 370 respondents which is used in the analyses portion of this study.

The two sources are used to test the aforementioned hypothesis and, consequently, conduct a descriptive analysis of the respondents and their preferences

when using VTO in their purchasing decision process. This comparison lends insight into how the art market operates, upcoming trends using VTO, and how introducing and implementing technology now to the Millennial generation could lend better customer satisfaction and attitudes for the optimal buyer in the future.

The Benesch Collection Sample

The Benesch Collection[2] is an online art gallery based in Yuma, Arizona that has sold pieces all over the United States. Currently owned by Wayne Benesch, the son of the late Louis Benesch, the Benesch Collection boasts a variety of paintings and etchings that depict life in the Southwest. The Benesch Collection graciously shares its extensive 193 household-client list and its website to gather information on user satisfaction and attitudes toward implementing VTO. In return, they receive the preliminary findings from the survey and advice on how to implement VTO based on the results found.

The respondent sample using the Benesch Collection customer database provides information about the perceived ease of use and perceived usefulness of using VTO. The typical respondent of the Benesch Collection is aged 47 or older and has prior experience with technology as seen by their engagement in online auctions, ability to answer email invitations, and RSVP-ing to events online through social media. The majority of these respondents are married (62%) or had previously been married and are middle class or higher (54.7). As mentioned in the Literature Review above, these respondents fit the Generation X target demographic (also known as Baby Boomers), who would most likely buy fine art online due to disposable income levels and their introduction to technology in their adult years. This sample achieves a portion of the intended population but does not reach the intended 384 respondent goal. Therefore, Survey Monkey Audience is utilized to gather respondents that fall into the online and Millennial demographic who are also art enthusiasts and tech-savvy.

[2] www.beneschcollection.com

Online Audience Sample

Survey Monkey Audience's ability to disseminate the survey to a specified respondent database helped bolster the sample to show an increased representation that could not be achieved alone through cold-emailing. Survey Monkey Audience provides this study with 284 respondents who meet the specified criteria to create a separate group in the sample. This portion of the overall sample is reflective of the United States focus and aim of this study, including age groups and income levels that are also represented in the Benesch Collection sample. Characteristics such as "respondents aged 18-99" and "art enthusiastic" were used to ensure the type of audience the survey was similar to the Benesch Collection sample. Along with the questions asked at the beginning of the survey to filter out any non-conforming respondents, Survey Monkey ensured that the responses received were accurate and from participants that fit the intended demographic by negating or blocking any respondents who did not fit our characteristics. In addition, the location filter was also added to ensure that respondents were residents of the United States. The compilation of the Benesch Collection's customer database with the respondents from Survey Monkey Audience resulted in a strong and accurate overall sample that effectively represents the intended audience for this study; United States art enthusiastic residents who are tech-savvy.

These samples are used conjunctively to understand current fine art buyers' attitudes and satisfaction with VTO as compared to the up-and-coming buyers of fine art. These respondents will be the primary consumers that the Benesch Collection, and moreover the larger art industry, will be looking to sell to. Understanding this demographic of buyers is imperative to increasing online sales or purchase decisions through increased satisfaction and positive attitudes in the future.

Study Procedures

A survey analysis of other studies is included to understand how knowledge of VTO can be expanded upon rather than repeated. In addition, understanding how respondents react to surveys is pertinent to getting truthful and extensive responses. Building upon surveys conducted by Kim and Forsythe (2007) and Abdullah & Kassim (2008), an edited and expanded-upon version of the survey is used for this study. For this study and to encourage tech-savvy respondents, the survey is web-based and accessible via Google Forms and email. There is also an incentive offered after the questionnaire is completed.

An online survey is first sent to the Benesch Collection's current client list of 289 individual potential buyers via an email blast followed by a text and email reminder. To encourage participation, a gift of stickers and a set of postcards of Louis Benesch's paintings are presented as prizes upon completion of the survey if proof is sent to the researcher. The respondent is also encouraged to visit the Benesch Collection website to try VTO out in their own home, utilizing the site and their smartphone to do so.

Using an online survey instead of an in-person survey ensured two things; (1) the sample base had a basic understanding of the internet and how to use devices to answer a survey, (2) data collection would be efficient and detailed, resulting in a more accurate and unbiased representation of the demographic of respondents. In addition, embedding videos and visuals of VTO during the survey implementation mitigates any confusion and encourages respondents to answer more critically and honestly. The survey's accessibility is tested on five volunteers to ensure that the answers given by respondents are not affected by lack of attention to detail.

The survey is sent to all of the potential buyers, also referred to as 'supporters', of the Benesch Collection. Their average age is 47 and they have collectively labeled themselves as 'art enthusiasts'. The email campaign receives 10 responses so a survey launch on Facebook is deemed necessary. The followers of the Benesch Collection are art enthusiasts and are notified when they are tagged in the post. The return rate after the social media launch is 97 which gives the study a viable amount of responses for the partial sample. However, there are only 85 viable responses given in this launch so

an additional research source is needed to ensure a viable analysis. Survey Monkey Audience is used to gather the remaining necessary responses.

Seeing the results of the first round of survey send-offs prompted a repetition in the send-off using Survey Monkey Audience. The same survey was used and given to the Survey Monkey Audience along with the desired demographic of responders which were art enthusiasts aged 18 to 99 in the United States of America. Survey Monkey Audience used the demographics given to them to gather 200 respondents that were then used in the final data analysis. The survey is identical to the one launched on social media and through the email campaign except for minor adjustments. The survey could have no incentive attached to the survey and the surveyor could not collect home addresses to send the gifts. However, a specific link to visit the Benesch Collection website is included so that respondents can claim their gift, therefore circumnavigating the terms of Survey Monkey and ensuring some level of replicability.

The survey that is used is largely inspired by other researchers such as Davis (1989), Dina Ribbink (2001), Ramayah & Ignatius (2005), and Kim and Forsythe (2008). Building on their knowledge, the survey consists of four main sections; demographic questions, attitude questions, satisfaction level questions, and purchase decision questions. These four sections address what information is needed to address the research questions in detail.

Once the data is compiled, the combining and cleaning of the responses is necessary for data analysis. Any incomplete answer or respondent who is neither a US citizen nor an art enthusiast is excluded from the overall data set. Next, an analysis is conducted using SPSS. Descriptive statistics is first conducted to understand the sample. Then, a reliability analysis is utilized and factor analysis is conducted to ensure the results to follow are reliable and to see if there is a pattern in the data set. Finally, a correlation analysis is utilized when comparing the relationships in the overall sample, their demographic variables, and between SAT, ATT, and PURD. The data's Cronbach alpha is also analyzed using SPSS.

Materials and Instrumentation

The web-based survey consists of 13 Likert-type scale responses, 9 demographic questions, and 4 filter questions, resulting in 26 overall questions. These statements and questions are aided by visual interpretations of VTO and text explanations to mitigate any confusion the respondents may have. The survey collects demographic data such as age, income level, education level, and marital status. The survey provides anonymity on its landing page before any question is answered by participants to ensure unbiased responses and to uphold ethical guidelines. The survey collects quantitative data on participants' attitudes and overall satisfaction using Likert scales to facilitate the numerical assessment of responses.

During the survey, respondents are shown how VTO applications work in a hypothetical home situation while also being shown other examples of VTO used in the fashion industry and home decorating simulations. The video[3] encompasses real screen footage of a customer trying on a Benesch Collection painting in their home. This video is displayed at the top of the survey on each page of questions. In a later portion of the survey, respondents record their potential likelihood to purchase an art piece using VTO technology.

After the respondent's answers are complete, participants are encouraged to send a screenshot of the final survey page to receive a gift from the Benesch Collection, a Yuma Arizona digital art gallery hoping to implement VTO in their online space. The respondents are encouraged to continue using VTO in their own time by being revealed a keyword that they can then use to access the Benesch Collection's VTOart launch. They must use the keyword, or password, on the site to then be taken to the 'exclusive virtual painting try-on" page. These 3D scans of paintings can also be downloaded or, instead, used directly from the Benesch Collection website where respondents can try on a few available paintings for sale in their own homes.

Survey Design

The questionnaire developed for this study was designed to capture detailed insights into the attitudes (ATT) and satisfaction levels (SAT) of art-enthusiastic, tech-savvy buyers regarding Virtual Try-On (VTO), as well as their potential purchasing

[3] https://www.youtube.com/shorts/F7sQKN6uk6I

decisions (PURD). The following passage describes the questionnaire and its sections. It refers to the overall Google Forms questionnaire which can be found in the annex of this thesis.

Designed and launched on Google Forms, this survey is divided into five main sections: filter questions, attitude questions, satisfaction level questions, purchase decision questions, and demographic questions. Each section is tailored to address the specific hypotheses and overall research objectives. Respondents use the link https://forms.gle/Xj8d8Cvd6Y1TLQXH8 to fill out the questionnaire and record their responses. In addition to using this survey format on Google Forms, this survey is replicated on Survey Monkey Audience and is used to gather responses from 298 survey takers.

Filter Questions

The filter questions are placed at the beginning of the survey after the welcome page which describes the purpose of the survey, explains the layout and time needed to complete it, and includes a thank you paragraph. The filter questions are as follows:

- *Do you enjoy art?* Yes or No
- *Have you bought art in the last 12 months? (i.e., paintings, decor, sculptures, stickers, rugs, high-fashion clothing, or similar items)* Yes or No
- *Do you use a cellphone?* Yes or No
- *Do you use a tablet?* Yes or No

These questions help identify whether a respondent fits the characteristics of the intended sample group. If the respondents specifically answer ‘no’ to “Do you enjoy art?”, they are removed from the data collection set and excluded from the overall analysis.

Attitude Questions

The attitude (ATT) portion of the survey aims to measure the ease of use and perceived usefulness of VTO technology. The questions in this study are derived from

research conducted by Ramayah & Ignatius (2005) in online clothing retail. The original questions these researchers use are changed to incorporate art and VTO instead of “World Wide Web” in retail clothing or fashion sites. For example, Ramayah & Ignatius (2005) pose the statement;

“Using the World Wide Web would enable me to accomplish shopping more quickly than using traditional stores.” which is altered to

“Using VTO technology would enable me to accomplish shopping more quickly than going to multiple, traditional galleries or storefronts.”

While these two phrases have their differences in their subjects, the keywords “enable” and “more quickly” are what the survey intends to measure for the overall ease of use factor for VTO. Ramayah & Ignatius (2005) also have four Ease of Use questions and four Perceived Usefulness questions whereas this study uses only three for each. The reasoning behind eliminating one of the questions in the ease of use and perceived usefulness sections is the lower Chronback alpha scores of .69 and .72, respectively. Due to the needed brevity of the survey, the questionnaire uses the three top-scoring questions to base the new VTO scale on and excludes the lower-scoring questions.

Ramayah & Ignatius (2005) report their Cronbach alpha scores for each question in their “Attitude” section, resulting in a total average score of .8. The questions measuring ATT, which in this case was Percieved Usefullness and Percieved Ease of Use, are taken and adapted to encompass VTO and its technical abilities. A five-point Likert scale is used to measure the four questions. The scale goes from agree(5) to disagree (1). Altogether, the attitude questions are designed and adapted to create a more comprehensive overview of the user's perception of VTO in the online art gallery scene.

When a respondent reaches the Attitude section page, they see the VTO explanation video at the top of the screen and then the following blurb, asking them to take time to finish this section;

> Please fill out the next part of this survey. The questions encompass the **perceived ease of use and usefulness of VTO technology**. Answer to the best of your ability and please **do not skip any questions**. Again, these answers will remain anonymous.

Estimated time for completion of this section: 4 minutes

In case you need to see the video again, press play on the video icon below.

Attitude Scale

Original Scale *(Ramayah & Ignatius, 2005)*	**VTO Scale**
I would find doing online shopping and webbased online transaction easy. (Ease of Use)	Based on the video depiction, I would find online shopping and transactions using VTO technology easy.
I would find interaction through web pages clear and understandable. (Ease of Use)	Based on the video depiction, I would find interacting with VTO technology to be clear and understandable.
I would find it is easy to become skillful at navigating the web pages. (Ease of Use)	I would find it easy to become skillful at navigating VTO online and use it for trying on potential pieces.
Using the World Wide Web would enable me to accomplish shopping more quickly than using traditional stores. (Usefulness)	Using VTO technology would enhance my ability to visualize art in my desired space.
Using World Wide Web would enhance my effectiveness in shopping or information seeking. (Usefulness)	Using VTO technology would enable me to accomplish shopping more quickly than going to multiple, traditional galleries or storefronts.

Table Continued

I would find the World Wide Web useful. (Usefulness)	I would find VTO useful for the decision-making process in buying a piece of art.

These questions are specifically related to Hypothesis 1, which suggests that buyers will have positive attitudes towards VTO regarding their online art purchasing decisions (PURD). By assessing the ease of use and perceived usefulness of VTO, these questions aid the study in determining whether the technology can have a beneficial impact on customer attitudes and reduce buyer apprehension.

Satisfaction Level Questions

The satisfaction (SAT) portion of the survey measures overall satisfaction with the VTO application. The questions are derived from Ribbink's (2004) study, which assesses the overall trust, quality, and loyalty consumers have toward an online shopping experience. For example, in Ribbink et. al's (2004) study, the statement

"I am generally pleased with this company's online services" is posed, whereas, in this study, the statement was changed to encapsulate VTO. To measure VTO customer satisfaction, this study worded the question to be;

"I would be generally pleased with the online VTO presentation."

The general statement remains the same but with a different context to measure the overall potential satisfaction of using VTO in online art gallery purchases. The satisfaction questions aim to evaluate the SAT respondents' level with VTO technology within the context of online art purchasing.

The measurement of potential user SAT level is based on Ribbink et al.'s (2004) research. Their study measures several variables, but the satisfaction level of consumers is of great importance for this study. Particularly, their measurement of e-satisfaction focusing on online sales is what prompts this study to use their questions as a guide. Ribbink et. al (2004) also reports their Cronbach alpha scores for each question, reporting over .75 on all four questions, averaging a .8075 score. The four

questions measuring SAT are taken but adapted to encompass VTO and its technical abilities. A five-point Likert scale is used to measure the four questions. The scale goes from agree(5) to disagree (1). In the end, the users' scores for each section are totaled and the users can then be separated into different categories of respondents based on their responses. For example, a total score resulting in ‘4’ places respondents in the “Low SATs” group, and a score of ‘20’ places them in the “High SATs” group.

When a respondent reaches this page, they see the VTO explanation video at the top of the screen and are then the following blurb, asking them to take time to finish this section;

> Please fill in the next part of this survey so the study can understand what **level of satisfaction** respondents would have using VTO. Answer to the best of your ability and please **do not skip any questions**. Again, these answers will remain anonymous.
>
> *Estimated time for completion of this section: 2.5 minutes*
>
> *In case you need to see the video again, press play on the video icon below.*

Satisfaction Level Scale

Original Scale ***(****Ribbink et. al’s, 2004)*	**VTO Scale**
I am generally pleased with this company’s online services.	I am generally pleased with the online company’s VTO presentation.
The website of this online company is enjoyable.	The VTO shown in this video looks enjoyable.
I am very satisfied with this company’s online services.	Based on the video depiction, I am very satisfied with the idea of using VTO online services.
I am happy with this online company.	Based on the video depiction, I would be happy to use VTO technology online.

These questions are aligned with Hypothesis 2, which proposes that customers will report high levels of satisfaction (SAT) while using VTO as a helpful tool in their online art purchasing decisions (PURD). By measuring the levels of satisfaction, these questions provide insight into how VTO can overall improve the PURD and purchasing experience of potential users and whether it meets customer's expectations.

Purchase Decision Questions

The purchase decision (PURD) questions were adapted from Ramayah & Ignatius' (2005) research which measures "intent to purchase" or purchase decision (PURD). The questions have been adapted by the subject to include VTO instead of the Internet. For example, Ramayah & Ignatius (2005) wrote;

> "I intend to use the Web (e.g. purchase a product or seek product information)" to measure intent to purchase online. This study uses the phrase;
>
> "I intend to use VTO to purchase art (if it is available to me)" which is similar to Ramayah & Ignatius' (2005) statement.

The phrases inspired by Ramayah & Ignatius' (2005) study were reworded to focus on VTO and intent to purchase. These phrases aim to understand if VTO influences purchasing decisions in the online art gallery scene. The table below shows the original scale, or questions, written by Ramayah & Ignatius (2005) as compared to the adjusted scale in this questionnaire.

When a respondent reaches this page, they see the VTO explanation video at the top of the screen and are then the following blurb, asking them to take time to finish this section;

> Please fill the next part of this survey so the study can understand what **purchase decision** respondents would have using VTO. Answer to the best of your ability and please **do not skip any questions**. Again, these answers will remain anonymous.
>
> *Estimated time for completion of this section: 2 minutes*

In case you need to see the video again, press play on the video icon below.

Purchase Decision Scale

Original Scale *(Ramayah & Ignatius, 2005)*	**VTO scale**
I intend to use the Web (e.g. purchase a product or seek product information)	I intend to use VTO to purchase art (if it is available to me).
Using the World Wide Web for purchasing a product is something I would do.	Using VTO for purchasing an art piece online is something I would do.
I could see myself using the World Wide Web to buy a product.	I could see myself buying a piece of art online after using VTO to “try it on” in my own space.

The measurement of potential user SAT level is based on Ramayah & Ignatius’ research (2005). Their study measures several variables, but the dependent variable purchase intent of consumers was of great importance for this study which focuses on online sales. Ramayah & Ignatius (2005) also report their Cronbach alpha scores for each question, reporting over .82 on all three questions, averaging a .89 score. The three questions measuring purchase intent from their study are taken and adapted to encompass VTO and its technical abilities to measure PURD for this study. A five-point Likert scale is used to measure the four questions. The scale goes from agree(5) to disagree(1). The three questions included in the questionnaire help establish a link between ATT and SAT with the use of VTO. By analyzing the PURD responses, the study can ascertain whether positive attitudes and high satisfaction levels correlate with an increased likelihood of purchasing art online using VTO technology.

Demographic Questions

The demographic section of the survey gathered crucial data regarding the respondents' age, gender, education level, income, employment status, marital status, and country of residence. Including these factors in the data was essential for comprehending the characteristics of the survey participants and guaranteeing that the sample was a true reflection of the intended population. The demographic questions were inspired by Survey Monkey Audience, a professional survey company, and the Census Bureau's Income in the United States: 2022 report, which is the U.S. government's benchmark for analyzing their resident's statuses (Survey Monkey Audience, 2018) (Guzman & Kollar, 2023). The information gathered from these questions also classified user types in the analyzing stage. These user types and further information gleaned provide a framework for evaluating user attitudes and levels of satisfaction concerning VTO which also makes comparing the two samples, the Benesch Collection sample and the Online Audience (Millenial) sample, easier.
When a respondent reaches the Demographic question page, they will not see the VTO explanation video at the top of the screen but will instead see this final paragraph of instruction;

> Please fill out the next part of this survey so the study can understand what kind of respondents are taking part in our survey. Answer to your best ability and please **do not skip any questions**. Again, these answers will remain anonymous.
>
> *Estimated time for completion of this section: 1 minute*

Demographic Questions

Aspect	**Question/ Statement**	**Answers: Drop Down or type in**
Age	Please enter your age:	Fill in the number (has to be over 18 or above)

Table Continued

Gender	Please select your gender:	Male, Female, Transgender/ gender non-conforming, Prefer not to say
Education Level *(Survey Monkey Audience, 2018)*	What is your highest level of education?	N/A, No formal education, Trade school or certificate, GED, High School Graduate, Associates Degree, Bachelors Degree, Masters Degree, Ph.D.
Income Level *(Guzman & Kollar, 2023)*	What is your annual household income?	$0-$30,000, $31,000- $60,000, $61,000 - $90,000, $91,000 - $120,000, $121,000 +
Employment status *(Guzman & Kollar, 2023)*	What is your current job status?	Employed, Self-Employed or Business Owner, Currently Unemployed, Student, Retired, Other
Relationship Status *(Survey Monkey Audience, 2018)*	What is your current marital status?	Single, Married, Widowed, Civil Partnership, Prefer not to answer
U.S. Resident *(Guzman & Kollar, 2023)*	Are you a United States resident? (*A United States Resident is someone who simply resides primarily in the US or its territories. This is not to be confused with a United States citizen.*	Yes, No, Prefer not to answer

Table Continued

Last Purchase	When was your **last purchase** utilizing an **application on your mobile device**?	I have never utilized an application on my mobile device to purchase something., Today, A day ago, Between three and six days ago, A week ago, More than a week ago (but less than two weeks), Two weeks ago, More than two weeks ago

The final page of the survey has the following paragraph;

> Your responses have been submitted and recorded. **Thank you so much for taking the time to complete this survey!**
>
> Your participation is greatly appreciated and has contributed to the science that surrounds Virtual Try-On and customer satisfaction. As a thank you, we are offering a **free gift** for your participation. **Email mckenna.mellon@cetys.mx.edu with a screenshot of this page** to be sent your **free postcard** and limited edition Benesch Collection **stickers**!
>
> Did you think the VTOart application was cool? **Visit www.beneschcollection.com** to download or use VTO for yourself. Use the **keyword 'VTOartnow'** to access exclusive VTO capabilities and try on a one-of-a-kind piece of art today!
>
> Thank you again!
> Mckenna (MBA Student, CETYS Universidad, Triple Degree MBA Program)

The respondents can receive a collection of postcards and stickers from the Benesch Collection should they choose to. They are also allowed to try VTO in their own time, separate from this study, by gaining keyword access to try VTO art at the Benesch Collection online art gallery. Because this information is presented at the end of the survey, the responses should not be biased or skewed in any way.

Validation of the Questionnaire

To ensure the validity and reliability of the questionnaire, a pilot test is conducted. The survey is trialed with five respondents that meet the population characteristics to identify any potential issues with question clarity, interface complications, and overall flow of the questionnaire. The feedback obtained from the pilot test is utilized to make modifications, which may confirm the ultimate questionnaire is user-friendly and effectively acquires the necessary data. An additional 4 filter questions and 2 demographic questions are added to ensure the questionnaire is effective and clear in its intended purpose. The new questionnaire, consisting of 26 questions, is used for the entire survey launch in which 270 respondents' answers are used. This questionnaire is meticulously researched, crafted, edited, tested, and launched to offer reliable and accurate information that yields precise insight into the established hypotheses.

In addition to the assurances made during the creation of the survey as well as during the validation process, a sensitivity analysis can be conducted. Due to time constraints and the characteristics of the study, it is deemed not necessary. The sensitivity analysis is something that, in the future, can be conducted.

Statistics for Analysis

In this thesis, quantitative data is analyzed using SPSS, an exploratory data analysis software created by IBM. Descriptive statistics, such as means, standard deviations, and frequencies summarize participants' responses. Inferential statistics, including correlation and factor analyses, examine relationships between SAT, ATT, and PURD *(refer to Fig. 1)*. Correlation analysis is used in this analysis, based on

respondent characteristics such as age, job status, and education level. The regression analysis results help identify overall patterns within the data, outlining which customers would be most pleased using VTO as a helpful tool in their purchasing decision. To run these analyses, the following linear regression equations are needed:

$$PURD = a + bATT + e \quad (2)$$

$$ATT = Ease\ of\ Use + Usefulness \quad (3)$$

$$PURD = a + bSAT + e \quad (4)$$

The first equation explains the relationship between ATT, the independent variable, and PURD, the dependent variable. The attitudes (ATT) that a respondent has is hypothesized to be highly and positively related to purchasing decisions (PURD). The two factors that directly affect or make up ATT are ease of use and usefulness of the intended technology, or VTO. To measure ATT, the questionnaire focuses on both perceived ease of use and perceived usefulness to quantify the attitudes (ATT) of respondents concerning their final purchasing decision (PURD). Finally, the error term (e), also known as the margin of error, is factored in to give an accurate result.

The second equation intends to measure the satisfaction correlation of respondents to PURD in the context of VTO. The level of satisfaction (SAT) is hypothesized to be highly and positively related to purchasing decisions (PURD). This linear regression equation is implemented during the analysis process through correlation analysis. The margin of error (e) is also accounted for in this second equation. These two equations measure the hypotheses about VTO in online art galleries and are analyzed using descriptive statistics, factor analysis, and correlation analysis.

Descriptive statistics is run first in the data set to understand the sample, its characteristics, and any variables that need to be accounted for. Variables such as age, gender, education level, marital status, job status, income level, and the respondents' last online purchase are all used to paint a clear picture of the sample. Measures such as frequency, mean, and standard deviation of the listed variables above are used to

simplify the sample's large number of responses and gain a better understanding of the data present.

Confirmatory factor analysis is also used to assess the relationships between variables in this study. In Price's Book (Tierney et al., 2023) International Encyclopedia of Education, he states that "confirmatory factor analysis (CFA) is a technique used to analyze the efficacy of measurement models where the number of factors and their direct relationship is specified" (p.608). In other words, the relationship between all variables is analyzed and the variables with the strongest relationship are narrowed down and the results are presented, similar to a decision tree analysis. This is used to make sure all variables are being accounted for and that the hypothesis is not being skewed due to unforeseen circumstances.

A correlation analysis is used to determine the strength of the relationship between ATT, SAT, and PURD. This correlation analysis is used to either prove or disprove the hypotheses presented in this study. Using an overall sum score from each set of presented questions in the survey, the total scores are analyzed and run through a Pearson Correlation test where a final score of correlation is given. This score signifies either the strength or weakness of two variables. Outside factors need to be taken into consideration when this test is run, but the Pearson Correlation score should give a clear indication of whether or not a variable is related to another variable. In this study, a correlation analysis is conducted regarding ATT and PURD, SAT and PURD, and, finally, ATT and SAT.

SPSS, the Statistical Package for the Social Sciences, is used for all the analysis processing needed for this thesis. This program is commonly used by survey companies and in market research for complex statistical analysis. The analyses and tests were run multiple times to demonstrate that the findings presented in this study are also replicable and representative of the true relationships found between consumer satisfaction (SAT), attitudes (ATT), and purchasing decisions (PURD).

Results

Descriptive statistics

A descriptive statistical analysis was conducted on the 370 respondent sample. The survey collected information about gender, age, job status, marital status, income level, education level, and purchasing habits. These variables were run through a descriptive statistical analysis in SPSS and were used to understand the overall sample better. The majority of respondents are 47, 55.9% male, had an education level above an associate degree, are married, employed, and have an income level greater than $90,000 a year after taxes. 30.3% of respondents also confirmed that they purchased an item online the same day they answered the survey and more than 45% admitted to buying an item within the last week. This not only proves that our survey respondents are tech savvy, but that they also regularly buy items using an electronic device.

Table 1

Descriptive Statistics of VTO Survey Respondents

Characteristic	Frequency	Percent
Gender		
Male	207	55.9%
Female	159	43.0%
Age		
18-30	47	12.7%
31-40	81	21.9%
41-50	107	28.9%
51-60	65	17.6%
61-70	52	14.1%
70+	18	4.9%
Average Age	*47*	
Education Level		
N/A, No formal education	5	1.4%
Trade school or certificate	16	4.3%

Table continued

GED	1	0.3%
High School Graduate	35	9.5%
Associates Degree	31	8.4%
Bachelors Degree	133	35.9%
Masters Degree	115	31.1%
Ph.D.	34	9.2%
Marital Status		
Single	60	16.2%
Married	298	80.5%
Job Status		
Employed	259	70.0%
Self-employed or Business owner	56	15.1%
Currently Unemployed	7	1.9%
Student	8	2.2%
Retired	33	8.9%
Other	7	1.9%
Income Level		
$0-$30,000	18	4.9%
$31,000-$60,000	52	14.1%
$61,000-$90,000	68	18.4%
$91,000-$120,000	97	26.2%
$120,000 +	133	35.9%

**Only items with more than 1.5% were included.*

This descriptive analysis gives a better understanding of what type of respondent is being analyzed and can serve as a reminder that some answers could be influenced by any of the dominant variables such as age, gender, and income level. The results showed that, while more male respondents are aged 47, the distribution score for age is also within a normal range and the male respondent percentage is only slightly higher than female. This descriptive statistical analysis gave a basic understanding of the response pool that was attained. This finding led to the next step; the testing of the hypotheses through correlation analyses.

Pearson Correlation Analysis

A Pearson Correlation Analysis was conducted to determine the relationship between ATT, SAT, and PURD, ultimately testing the two hypotheses presented in this thesis. This test compares two variables against each other to see if they have any correlations with one another. In this test, the score can range from -1 to 1. A negative in front of the score means they are adversely related, or negatively correlated and the opposite is true of a positive number, meaning the relationship between the variables is positively correlated. If the score is closer to (±)1 means the relationship is strong, anything from (±)0.5 to (±)0.7 means there is a significant relationship, and a score from (±)0.1 to (±)0.3 means there is a moderate relationship. Anything below (±)0.1 would be considered of no relation.

First, the relationship between ATT and PURD, hypothesis 1, was tested. The Pearson Correlation test resulted in a .743, showing a strong and positive correlation between ATT and PURD. This confirms the previously stated hypothesis ATT is highly and positively related to PURD in the context of VTO. This means that the better attitude someone has towards VTO, the more likely they are to purchase something using the technology. Attitude is also influenced, as previously mentioned, by perceived ease of use and usefulness of the new technology, meaning enhancing these variables could also positively increase attitudes towards VTO, thus increasing the likelihood of an online purchase.

Then, the relationship between SAT and PURD, hypothesis 2, was tested. The test resulted in a score of .803, a very strong and positive correlation between SAT and PURD. This confirms the hypothesis that SAT is highly and positively related to PURD in the context of VTO. When satisfaction with VTO technology increases, the likelihood of purchasing an item using the VTO tech also increases. Understanding this could be instrumental in increasing sales in online art galleries.

An additional test was conducted to see the relationship between ATT and SAT. This test was not hypothesized and was done purely out of curiosity. The results show a high correlation score of .835 to one another, confirming that the more positive an attitude one has toward VTO, the more satisfied one will be with the new tech and vice

versa. This highlights that ease of use, usefulness, and satisfaction are all interrelated and ultimately increase one's likelihood to purchase something using VTO.

Correlations Table

		Total Attitude Score	Total Satisfaction Score	Total Purchasing Decision Score
Total Attitude Score	Pearson Correlation	1	.835	.743
	Sig. (2-tailed)		<.001	<.001
	N	370	370	370
Total Satisfaction Score	Pearson Correlation	.835	1	.803
	Sig. (2-tailed)	<.001		<.001
	N	370	370	370
Total Purchasing Decision Score	Pearson Correlation	.743	.803	1
	Sig. (2-tailed)	<.001	<.001	
	N	370	370	370

Factor Analysis

After looking at the strong correlations between ATT, SAT, and PURD, a factor analysis was conducted to ensure that the relationships between the variables were accurate. To do so, two tests were run regarding the three primary variables, ATT, SAT, and PURD, regarding different levels of education. The first test was conducted regarding Bachelor's Degree respondents in regards to ATT, SAT, and PURD and the scores were then compared to the second test which encapsulates the Master's Degree respondents. The scores were very similar with less than a .046 difference in component matrix scores in total.

Communalities Tables

Bachelors Degree Education Level

	Initial	Extraction
Total Attitude Score	1	.841
Total Satisfaction Score	1	.874
Total Purchasing Decision Score	1	.793

Extraction Method: Principal Component Analysis.

a. Only cases for which Education Level = Bachelors Degree are used in the analysis phase.

Masters Degree Education Level

	Initial	Extraction
Total Attitude Score	1	.852
Total Satisfaction Score	1	.870
Total Purchasing Decision Score	1	.824

Extraction Method: Principal Component Analysis.

a. Only cases for which Education Level = Masters Degree are used in the analysis phase.

The factor analysis also provided a component matrix, or loading factor, which showed how strong the relationship was between the variables and the selected demographic value. For example, in this study, the relationship between ATT, SAT, and PURD and a Bachelor's Degree is almost identical to the relationship between ATT, SAT, and PURD and a Masters degree. This not only strengthens the argument that the relationship between education, an indicator of intelligence, and the ability to understand and appreciate VTO technology is strong but that the survey was also accurate and was able to demonstrate that the questions measure the construct that it was intended to measure.

Loading Factor Tables

Bachelor and Masters Degree Education Level

	Bachelors Degree	Masters Degree
Total Attitude Score	.917	.923
Total Satisfaction Score	.935	.933
Total Purchasing Decision Score	.890	.908

Extraction Method: Principal Component Analysis.

a. Only cases for which Education Level = Bachelors Degree and Education Level = Masters Degree are used in the analysis phase.

The results from the factor analysis show that the survey not only measured what it was intended to measure but that the correlation between the variables is quite strong and ultimately supports the proven hypotheses.

Analyses not used

Before collecting data, it was hypothesized that we might need to run a few different statistical tests. One of these tests was the ANOVA (Analysis of Variance) test to compare the Benesch Collection and Online Audience group samples. ANOVA, a statistical test used to analyze the differences between two or more groups, gives information about the differences and similarities between means to determine if their differences are due to coincidence or actual correlation. Because of time constraints and the lack of evidence of glaringly obvious differences between the two samples, it was determined that the ANOVA test would be excluded from the analysis.

In addition to the ANOVA test, a sensitivity analysis was also suggested to determine the strength of uncertainty inside the data set. A sensitivity analysis slightly alters the input variables and sees how the output variables are affected, testing how certain or uncertain the results are. In this study, an uncertainty analysis was ruled out due to time constraints and also due to the high correlation score received from the Pearson Correlation test.

Conclusion

Discussion and Implications

This study proposes that attitude (ATT) and satisfaction (SAT) when using Virtual Try-On technology (VTO) both directly and positively affects consumers purchasing decisions (PURD) when acquiring art in an online art gallery. The result of the correlation analysis and factor analysis prove the two hypotheses. There is, in fact, a positive and direct relationship in regards to both ATT and SAT when correlated with PURD. In addition, a positive correlation between ATT and SAT was found which other past studies conducted separately from this one had already confirmed.

These hypotheses were tested to answer whether attitudes towards Virtual Try-On technology and satisfaction with using said technology affect the customer's final purchasing decision. Because there was a strong and positive correlation between both ATT and SAT to PURD, one can conclude that these factors do influence a final sale. This information could be used to further enhance marketing in the online art gallery scene, which can, in turn, bolster online sales, and customer satisfaction, and reduce return rates of unwanted art pieces. For small art galleries, this adoption of technology could mean staying open for business longer and the expansion of the art market to include a more diverse set of customers. Naturally, the adoption of technology in traditionally brick-and-mortar storefronts or, in this case, art galleries, comes with some resistance. Hopefully, this data could help smaller galleries trust a new technology such as VTO and help them thrive in a highly competitive and corporate-dominated industry.

Limitations

While the results of this study provide illuminating information on VTO and its potential uses, there are still limitations to consider when internalizing its results. For example, the sample size of this study was fairly small when compared to nationwide surveys. A larger sample size would have bolstered the potential findings as well as rounded out the data set regarding age, education level, income level, and gender. This study was limited to educated, wealthier individuals who might have access to more technology such as cell phones and tablets. The sample respondents were also

obtained through social media, email, and a third-party site. With more time, the elimination of a third-party site would have been ideal and created a more organic and realistic sample.

In addition to the actual sample, the survey had some innate limitations. Because the data needed had to be disseminated to many people with varying levels of technology access, a video was created to easily portray VTO and its capabilities. The video shown demonstrated VTO but the users did not interact with VTO themselves, meaning they might have different opinions if left to try on the technology in their own time, space, and abilities. Instead of a perfect example, they might have had complications leading to lessened satisfaction rates. The inability to launch the VTO tech in the survey for the respondents to use in real time was a limitation of this study.

The survey launch and data analysis was also limited to only United States residents. To understand global perceptions of VTO and its sales implications, a more robust study without location restrictions should be conducted. In addition to the location limitation, respondents' average age was also 47 years old. Any conclusions made regarding a specific age group of buyers using this data should be scrutinized heavily as the data covers a wide spread of ages. Any inferences or further application of the information this study provides should be carefully considered.

Future Research

Further studies may extend the understanding of VTO and its implications on purchase decisions for a younger generation of art buyers, which could inherently change the way we buy art online. VTO can sell a piece to a customer virtually without a salesperson being present, so expanding the VTO experience to be more interactive or to include AI could further its sales capabilities. In addition, testing VTO using other art forms such as sculptures and textiles could greatly benefit the small art galleries looking to improve their sales numbers. These VTO advances could be built upon the data collected during this study as it paints a picture of the user’s experiences and capabilities when introduced to VTO.

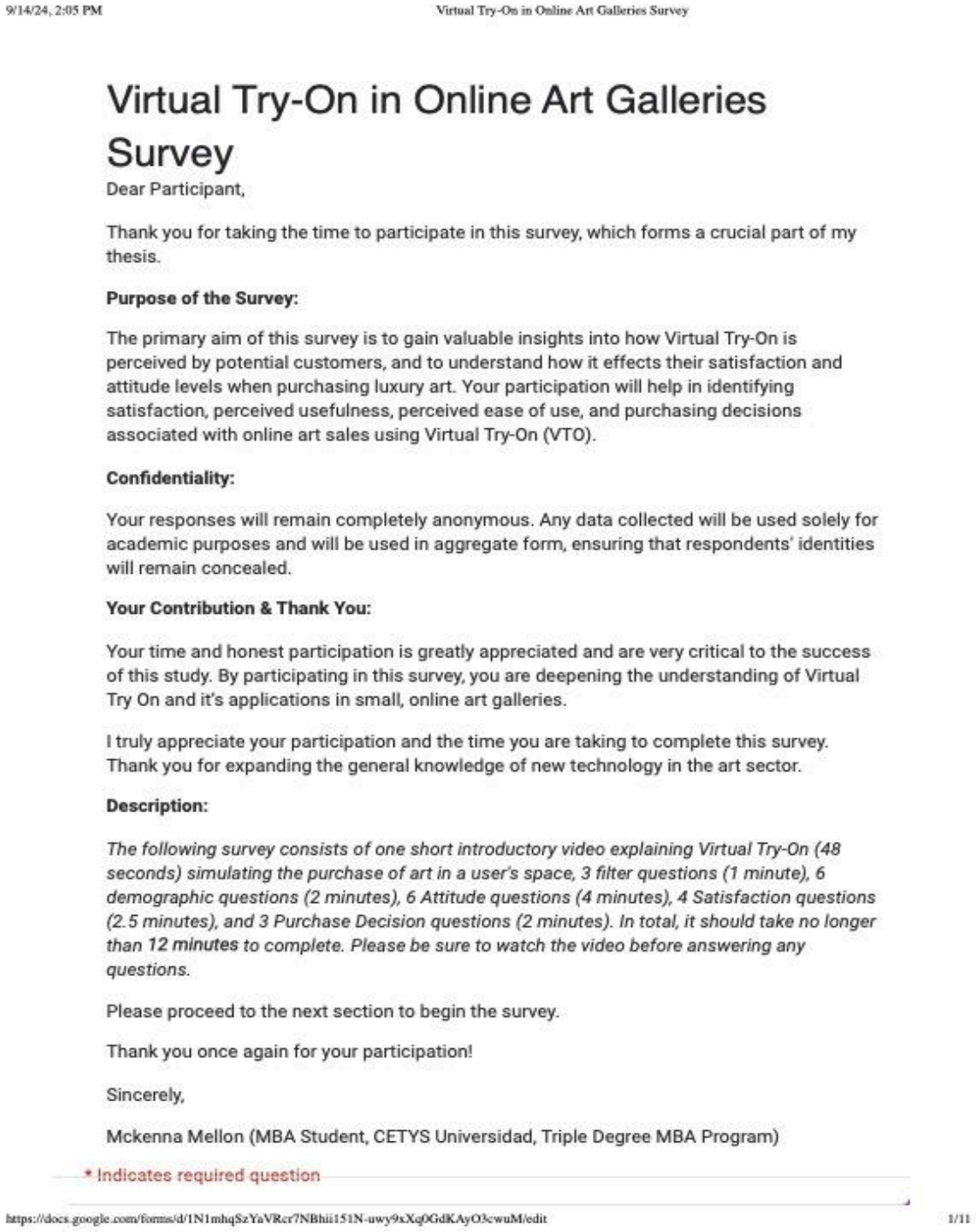
In addition to the data presented in this study, a qualitative study could bolster the existing data and, in consequence, the understanding of how art buyers interact with

VTO technology. A qualitative study could also measure user experiences not captured during a survey such as micro-emotions while using VTO and questions asked during usability testing. A follow-up qualitative study with a wide audience could help researchers understand the current and upcoming demographic of technology-proficient, art-enthusiastic buyers.

Annex

VTOart Survey

The following images are the survey that is used for this research. It includes a starting page, 8 pages of questions, and a 'survey complete' page. The survey is also accessible at this link and the video used during the survey is available here.



9/14/24, 2:05 PM Virtual Try-On in Online Art Galleries Survey

Virtual Try-On in Online Art Galleries Survey

Dear Participant,

Thank you for taking the time to participate in this survey, which forms a crucial part of my thesis.

Purpose of the Survey:

The primary aim of this survey is to gain valuable insights into how Virtual Try-On is perceived by potential customers, and to understand how it effects their satisfaction and attitude levels when purchasing luxury art. Your participation will help in identifying satisfaction, perceived usefulness, perceived ease of use, and purchasing decisions associated with online art sales using Virtual Try-On (VTO).

Confidentiality:

Your responses will remain completely anonymous. Any data collected will be used solely for academic purposes and will be used in aggregate form, ensuring that respondents' identities will remain concealed.

Your Contribution & Thank You:

Your time and honest participation is greatly appreciated and are very critical to the success of this study. By participating in this survey, you are deepening the understanding of Virtual Try On and it's applications in small, online art galleries.

I truly appreciate your participation and the time you are taking to complete this survey. Thank you for expanding the general knowledge of new technology in the art sector.

Description:

The following survey consists of one short introductory video explaining Virtual Try-On (48 seconds) simulating the purchase of art in a user's space, 3 filter questions (1 minute), 6 demographic questions (2 minutes), 6 Attitude questions (4 minutes), 4 Satisfaction questions (2.5 minutes), and 3 Purchase Decision questions (2 minutes). In total, it should take no longer than 12 minutes to complete. Please be sure to watch the video before answering any questions.

Please proceed to the next section to begin the survey.

Thank you once again for your participation!

Sincerely,

Mckenna Mellon (MBA Student, CETYS Universidad, Triple Degree MBA Program)

* Indicates required question

https://docs.google.com/forms/d/1N1mhqSzYaVRcr7NBhii151N-uwy9xXq0GdKAyO3cwuM/edit 1/11

Some easy questions first...

1. Do you enjoy art? *

   Mark only one oval.

   - ◯ Yes
   - ◯ No

2. Have you bought art in the last 12 months? (i.e., paintings, decor, sculptures, stickers, rugs, high-fashion clothing, or similar items) *

   Mark only one oval.

   - ◯ Yes
   - ◯ No

3. Do you use a cellphone? *

   Mark only one oval.

   - ◯ Yes
   - ◯ No

4. Do you use a tablet? *

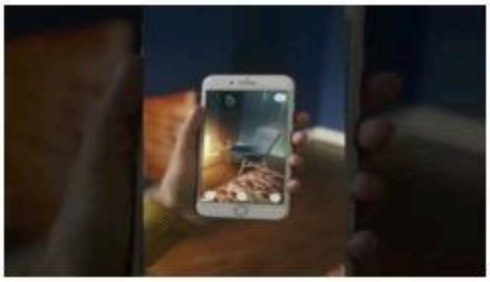
   Mark only one oval.

   - ◯ Yes
   - ◯ No

VTO VIDEO

Please **watch this video about Virtual Try-On before moving on** to the rest of the survey.
Video Length: 48 seconds.

Virtual Try-On

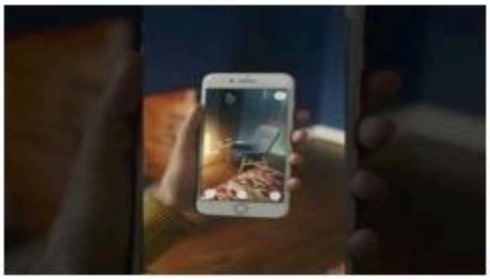


http://youtube.com/watch?v=lL32ZDfgz1g

Customer Attitude towards VTO technology as a helpful tool

Please fill the next part of this survey so the study can understand what kind of **attitudes** respondents have towards VTO. The questions encompass the **perceived ease of use and usefulness of VTO technology**. Answer to the best of your ability and please **do not skip any questions**. Again, these answers will remain anonymous.
Estimated time for completion of this section: 4 minutes
In case you need to see the video again, press play on the video icon below.

Virtual Try-On



http://youtube.com/watch?v=lL32ZDfgz1g

5. Virtual Try On (VTO) technology seems **easy to access and use** when implemented on a website. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

6. The VTO application demonstrated seems **user-friendly and manageable** for me. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

7. Navigating and interacting with the VTO application on the website seems **straightforward and intuitive**. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

8. Using VTO technology would **enhance my ability to visualize art** in my desired space. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

9. Using VTO technology would enable me to **accomplish shopping more quickly** than going to multiple, traditional galleries or storefronts. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

10. I find VTO **useful for the decision-making process** in buying a piece of art. *

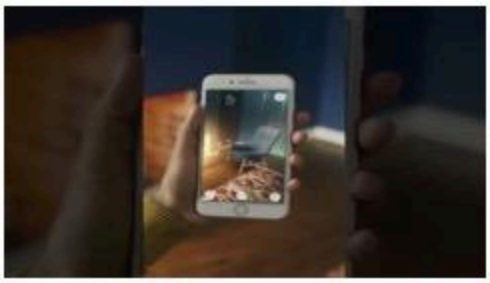
Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

Customer Satisfaction with VTO technology as a helpful tool

Please fill the next part of this survey so the study can understand what **level of satisfaction** respondents would have using VTO. Answer to the best of your ability and please **do not skip any questions**. Again, these answers will remain anonymous.
Estimated time for completion of this section: 2.5 minutes
In case you need to see the video again, press play on the video icon below.

Virtual Try-On



http://youtube.com/watch?v=lL32ZDfgz1g

11. The VTO technology process seems **enjoyable to use.** *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

12. I would **enjoy using VTO** technology via my smartphone or tablet device to **better visualize potential art pieces** in my space. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

13. If available to me, I am **likely to use VTO** technology as a helpful tool in my **online shopping** experience. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

14. If available to me, I predict I would be **generally pleased using the VTO** technology. *

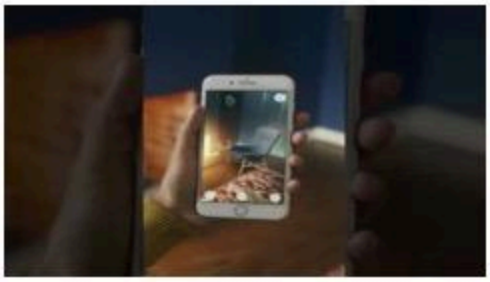
Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

Purchase Decision using VTO as a helpful tool

Please fill the next part of this survey so the study can understand what **purchase decision** respondents would have using VTO. Answer to the best of your ability and please **do not skip any questions**. Again, these answers will remain anonymous.
Estimated time for completion of this section: 2 minutes
In case you need to see the video again, press play on the video icon below.

Virtual Try-On



http://youtube.com/watch?v=lL32ZDfgz1g

15. **I intend to use VTO to purchase art** if it is available to me. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

16. Using VTO would make me **more likely to purchase a piece of art online**. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

17. I could **see myself buying a piece of art online** after using VTO to "try it on" in my own space. *

Mark only one oval.

	1	2	3	4	5	
Disa	◯	◯	◯	◯	◯	Agree

Demographic Questions

Please fill the next part of this survey so the study can understand what kind of respondents are taking part in our survey. Answer to your best ability and please **do not skip any questions**. Again, these answers will remain anonymous.
Estimated time for completion of this section: 1 minute

18. Please enter your **age**: *

_____

19. Please select your **gender**: *

Mark only one oval.

- ◯ Female
- ◯ Male
- ◯ Transgender/ gender non-conforming
- ◯ Prefer not to say

20. What is your **highest level of education**? *

Mark only one oval.

- ◯ N/A, No formal education
- ◯ Trade school or certificate
- ◯ GED
- ◯ High School Graduate
- ◯ Associates Degree
- ◯ Bachelors Degree
- ◯ Masters Degree
- ◯ Ph.D.

21. What is your **marital status**? *

Mark only one oval.

- ◯ Single
- ◯ Married
- ◯ Widowed
- ◯ Civil Partnership
- ◯ Prefer not to answer

22. What is your **job status**? *

Mark only one oval.

- ◯ Employed
- ◯ Self-employed or Business Owner
- ◯ Currently Unemployed
- ◯ Student
- ◯ Retired
- ◯ Other: _____

23. What is your **total yearly household income (after taxes)**? *

Mark only one oval.

- ◯ $0-$30,000
- ◯ $31,000-$60,000
- ◯ $61,000-$90,000
- ◯ $91,000-$120,000
- ◯ $121,000 +
- ◯ Other: _____

24. Are you a **United States legal resident**? *

A United States Resident is someone who simply resides primarily in the US or in one of its territories. This is not to be confused with a United States citizen.

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

25. How often do you utilize online applications through either a **cellphone or tablet?** * (Banking application, weather app, email, etc.)

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
I car	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	I use them everyday with ease.

SURVEY COMPLETED!

Your responses have been submitted and recorded for the *Customer Satisfaction and Attitudes in Virtual-Try On Technology in Digital Art Spaces and Their Effect on Purchase Decision* survey. **Thank you so much for taking the time to complete this survey!** Your participation is greatly appreciated and has contributed to the science that surrounds Virtual Try-On and customer satisfaction. As a thank you, we are offering a **free gift** for your participation. **Email mckenna.mellon@cetys.mx with a screenshot of this page** to be sent your **free postcard** and limited edition Benesch Collection **stickers**!

Did you think the VTOart application was cool? **Visit www.beneschcollection.com** to download or use VTO for yourself. Use the keyword **'VTOartnow'** to access exclusive VTO capabilities and try on a one-of-a-kind piece of art today!

Thank you again!

Mckenna (MBA Student, CETYS Universidad, Triple Degree MBA Program)

Thank you again!
Mckenna (MBA Student, CETYS Universidad, Triple Degree MBA Program)

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