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The Rise of XR Storytelling and the Contribution of Consumer Accessibility, Cost Efficiency, & Intrinsic Value to Feasibility

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Abstract

This research assesses the current state of XR (extended reality) publishing and its **feasibility** within an exceptionally virtual landscape. **Feasibility** is measured upon the challenges and opportunities posed by **accessibility**, **cost efficiency**, **demand**, and **intrinsic value**.

Through market analysis of past and ongoing XR storytelling projects, as well as qualitative methods which include industry interviews and public surveys, it has been found that publishers would do well to first adopt augmented reality storytelling methods before venturing further into virtual reality storytelling. Because augmented reality is generally more accessible and cost efficient, its adoption contributes to increased consumer demand, more customers, more market competitors, and lower purchase points.

Contents

Research Question

As publishers begin experimenting with virtual reality adaptations, how has the success of these projects fared? Subsequently, as publishers tackle this emerging venture, in what ways has the process of adapting books into VR posed possible challenges to technology and feasibility? What are the effects of these challenges?

Introduction

Could XR (extended reality) storytelling be the publishing industry's next big venture? With Facebook's adoption of the metaverse, publishers have an opportunity to leverage themselves within an increasingly virtual landscape. Projected to be valued at over 766 billion by 2025, publishers are exploring new ways to capitalize on the XR market and reinvent the parameters of immersive media.[1] It is no longer enough to *read* published media; readers now expect literature to be more engaging and immersive than ever. So, what constitutes a published work—and the publishing sector itself—is swiftly changing. But with these changes comes substantial hurdles. **As publishers begin experimenting with virtual reality adaptations, how has the success of these projects fared? In what ways has the process of adapting books into VR posed possible challenges to technology and feasibility? What are the effects of these challenges?**

Background and Methodology

Methods

This research qualitatively assesses the opportunities that XR storytelling poses across multiple publishing sectors and any resulting challenges that may occur. Past and ongoing XR storytelling

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[1] Market Research Future, "AR and VR Market to Hit USD 766 Billion by 2025 Registering a 73.7% CAGR - Report by Market Research Future (MRFR)," GlobeNewswire News Room (Market Research Future, July 22, 2021), https://www.globenewswire.com/en/news-release/2021/07/22/2267620/0/en/AR-and-VR-Market-to-Hit-USD-766-Billion-by-2025-Registering-a-73-7-CAGR-Report-by-Market-Research-Future-MRFR.html.

projects will be qualitatively measured according to the following markers: **accessibility**, **cost efficiency**, and **intrinsic value**, all of which contribute to a reasonable degree of **demand** and, finally, **feasibility**.

Qualitative methods include public surveys which assess **consumer demand**, as well as industry interviews with publishers and XR developers.

However, it should be considered that, due to the scope of this paper, all research is ongoing at the time of submission. Future analysis will be employed to more substantially inform these findings. Results to public surveys are subject to change, as is any information collected from additional interviews.

Terminology

Technologies

In analyzing the trajectory of virtual reality publishing, it is important to first determine a foundational understanding of these technologies and the criterion by which **feasibility** will be considered.

For these purposes, the following terms will be identified: **publishing**, **virtual reality**, **augmented reality**, **XR technologies**, **accessibility**, **cost efficiency**, **intrinsic value**, **demand**, and **feasibility**.

Publishing is extremely broad and will refer only to all sectors that publish *written* or

journalistic content. For the explicit purpose of this research, academia, comics and graphic

novels, children's literature, and journalism will be primarily explored. Sectors that do not fall

under a *literary* umbrella will not be relevant (music and software development, for example).

Virtual reality is part of a larger umbrella of technologies, referred to as **extended reality**, or

XR. This umbrella term includes **virtual reality** and **augmented reality**, which can then be used

to animate the **metaverse**.

Virtual reality, or **VR,** is "a three-dimensional, computer-generated environment which can be

explored and interacted with by a person."[2] Translated literally, virtual reality simply means

"near reality." The goal of VR is to alter the user's perception of their tangible reality through

profound sensory immersion.

Augmented reality, or **AR**, on the other hand, is "an interactive 3D experience that combines a

view of the real world with computer-generated elements in real time". It can be experienced

through more functional means, such as on a smartphone or tablet screen. AR goggles are

available if one prefers. Whereas VR "places" the user *within* the virtual world, AR transplants a

virtual element within the user's tangible, non-simulated reality.

The **metaverse** is a social network where people can interact with one another in simulations

dictated by XR technologies. In more detail, it is "an online virtual world which incorporates

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[2] **"**What Is Virtual Reality?" *Virtual Reality Society*, 30 June 2017, www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html

augmented reality, virtual reality, 3D holographic avatars, video and other means of

communication".[3]

The following research will refer to **XR** when discussing the larger conglomerate of VR and AR.

When referring to one technology over another, specific terms, like **VR**, **AR**, and the **metaverse**

(the XR *social network*) will be used.[4]

Measurables

In assessing whether XR storytelling has been, or *can* be **feasible**, the stipulations of **feasibility**

will be defined beneath an umbrella of terms which inform both current and projected demand.

Demand, for our purposes, is measured by the felt needs of the individual consumer as well as

their contribution to the greater marketplace. **Accessibility**, **cost efficiency**, and **intrinsic value**

certainly inform markers of demand. Success, in this way, is not a singular accolade, but is

instead the calculated weight of multiple measurable factors that inform demand and feasibility.

The chief economic principle, **demand,** will assess consumer interest in XR storytelling. This

interest will be measured in terms of both *consumer* demand and *market* demand.[5] While both

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[3] Green, Shannon Rae. "The Metaverse Is Here: What Is It? How Will People Use It?" *USA Today*, Gannett Satellite Information Network, 28 Nov. 2021, https://eu.usatoday.com/story/news/2021/11/28/metaverse-here-how-you-use-it-5-things-podcast/8777875002/.

[4] Greenwald, Will. "Augmented Reality (AR) vs. Virtual Reality (VR): What's the Difference?" *PCMAG*, PCMag, 31 Mar. 2021, www.pcmag.com/news/augmented-reality-ar-vs-virtual-reality-vr-whats-the-difference.

[5] Both consumer demand and market demand will be analyzed more granularly in further research beyond the scope of this research.

are the "effective want for a product and the willingness and ability to pay for it", consumer

demand measures individual wants while the latter measures the demand of all consumers within

its target market.[6] So, in essence, consumer demand characterizes the individual while market

demand characterizes the whole. The latter may also inform market competitiveness and

sustainability. The following measurables of **feasibility** determine a reasonable scope of

demand.

Accessibility, the first measure of feasibility, refers directly to the consumer's ability to readily

access a virtual reality experience without arduous challenge.

The second measure is **cost efficiency**. Cost efficiency is assessed in loose terms relative to

profit versus loss. Profit and loss measures the cost to produce a product as compared against its

actual net profit.

Finally, **intrinsic value** is the way in which new technologies may enhance one's life or make the

integral daily operations of one's life more efficient. Value may also meaningfully enhance entire

sectors or industries. For instance, eBooks and audiobooks have created a more equitable literary

space, and therefore, demonstrate a high level of **intrinsic value** to the publishing industry and

its growth potential across multi-media sectors.

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[6]Contributor, Chron. "Difference between Individual Demand & Market Demand." Small Business - Chron.com. Chron.com, September 15, 2020. https://smallbusiness.chron.com/difference-between-individual-demand-market-demand-44739.html.

Intrinsic value may seem challenging to measure, even by qualitative means. For this purpose, value will be assessed by public surveys and industry interviews that measure the aforementioned markers of feasibility, including demand, accessibility, and cost effectiveness.

Feasibility is the assessment of important business markers that inform the strengths, weaknesses, demand, and growth potential of XR storytelling. Measurables of **accessibility**, **cost efficiency**, and **intrinsic value)** will therefore help to inform a reasonable scope of feasibility.[7]

The Current Landscape of XR Publishing

This section demonstrates how VR currently behaves apart from publishing and within it.

An Overview

But wait . . . what does XR storytelling actually *look* like?

Extend reality: this is a book's purpose. It should only be fitting then that XR technologies seek—quite literally—to do just that. That being so, both AR and VR technologies must reimagine the archetypal compositions of a book and enlist the reader's active involvement in its resolution.

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[7] It should be clarified that a reasonable amount of **feasibility** does not equate to a reasonable amount of *success*. Where feasibility demonstrates a reasonable degree of certainty, *success* demonstrates the actual output. Only the success of past, unsustained projects can be quantitatively and qualitatively measured.

That is why XR storytelling must be engaging, highly immersive, and reader-focused.

Through varying levels of immersion,[8] "readers" may *become* the characters themselves, step into their favorite literary world, or meet face-to-face with fictional characters.[9] Not all XR stories are full-length novels or even follow a story from beginning to end. Some, if not most, imagine literature as the inspiration *for*, or the source *of*, the experience rather than the totality of it.

The following section will discuss how these concentrations are typically implemented within the following publishing sectors: comics/graphic novels, children's literature, education, and journalism. Overlap does occur within these spaces, and there are extenuating circumstances in which these technologies may also influence outside sectors.

Genre-Specific Iterations

Comics, Graphic Novels, & Children's Literature

Many current XR storytelling projects draw inspiration from literature and create experiences inspired by specific characters, motifs, or key elements. Of course, this reinvents the way that literature is both created and consumed.

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[8] More detail regarding levels of immersion and complexity will be expounded upon in future research.

[9] The transmissions of reality are reciprocal; XR does not always ask the reader to join another world. Sometimes characters appear within a reader's own environment as opposed to the opposite. AR and VR offer different transmissions of reality. AR often allows users to stay grounded within their own reality, while VR transports users.

Being that genre is the most popular form of book discovery among avid readers, graphic novels, comics, and children's picture books are among the most viable iterations of XR storytelling.[10] With the Oculus Quest 2 presenting more practical modes of VR engagement (which I will present in more depth in the "Accessibility" section), graphic novels and adjacent publishing sectors are able to target gamers while still hitting their primary readership.

In 2018, Oculus partnered with Marvel to release *Marvel: Powers United VR* where users can choose between 18 playable superheroes. They have also launched titles that "lean into comic iconography . . . including *Wilson's Heart*, a first-person psychological thriller set in the 1940s, and *Lies Beneath*, a single-player horror title".[11]

Picture books are also popular sources of inspiration for XR storytelling. My Very Hungry Caterpillar AR app, based on the Eric Carle children's book of the same name, was one of the first augmented reality apps developed from a children's book. The app, first launched by StoryToys in 2017, is now a series which boasts millions of downloads, subscriptions, and five-star ratings.

Though the story itself is not recited, users find themselves in the middle of their favorite children's book. An augmented reality egg is placed on the screen within the child's own environment. When the egg finally hatches, a mischievous caterpillar wiggles out of it and

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[10] Rachel Noorda and Kathi Inman Berens (The Panorama Project, February 2021), https://www.panoramaproject.org/news/2021/2/10/panorama-project-releases-immersive-media-amp-books-2020-research-report.
[11] Nicole Audrey Spector, "A Virtual Reality Check for Publishing"

squirms its way into the child's surroundings. Instinctively, the child looks to see if the caterpillar is real. The child may then engage with the caterpillar as it progresses through its lifecycle.[12]

What the My Very Hungry Caterpillar app has done exceptionally well, then, is "play into the child's natural inclination to believe in magic".[13] Likewise, between 2007 and 2012, Carlton Kids, an imprint within the Carlton Publishing Group that publishes picture books in print and AR, sold over 3 million books using these technologies.[14]

Augmented reality literary experiences offer children a way to self-facilitate their own play structures without prescription or excessive guidance, perhaps accounting for its popularity. Literary implementations, however, do not comprise the *totality* of the XR experience, but instead *inform* the most effective utilization of XR.

Education & Journalism

XR technologies have also proved especially useful across education.[15] In particular, augmented reality has been shown to improve reading comprehension through increased engagement. What's more, readers who experience sensory or neurological challenges may be able to experience literature in a manner that is tailored to their specific learning needs.

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[12] When the user's lens pans out of view, the caterpillar always returns to center as if chasing the child within their own home. O'Neil cites this as one of the proudest forms of profitability (see section on "Intrinsic Value")

[13] Barry O'Neil. StoryToys and XR Storytelling. Sarah Moffatt, Personal, 2022.

[14] Hassan, Oscar. *Virtual and Augmented Reality in Publishing.* Kingston University.

[15] Due to the scope of this paper, merely a general overview of XR storytelling usage in education will be explored. Further expansion will be presented in forthcoming research. Other sectors that have especially benefited from XR are medicine, architecture and construction, and so forth.

Two often-overlooked challenges to reading comprehension are a lack of motivation and engagement. Augmented reality in schools has been successful in boosting reading motivation because it encourages reciprocal engagement in the form of "access to audio, video, and external internet links." Content is "also . . . versatile, updatable, and available on demand".[16] In an increasingly virtual landscape, such instant gratification is not only expected, it is a must.

In Mexico, AR has improved students' reading and reading comprehension, wherein "Augmented reality has a promising potential to increase literacy because it fosters cognitive attainment and has a positive impact on overall learning effectiveness".[17] In this way, engagement and curiosity are incentivized, restructuring the way that readers *consume, appreciate,* and *retain* literature.

Though AR has been proven to provide access to equitable modes of engagement and literary retainment, VR illustrates an impressive potential to animate academia and any relevant, adjacent sectors.

In what is referred to as "historical information fruition", ancient literature provides the building blocks for animating historical ruins in virtual reality. In 2016, historians brought the 17th-century Marble Hall in Palazzo di Città to life from its descriptions within the then-contemporary book *'Inscriptiones quotquot reperiri potuerunt Opera ed diligentia Emmanuelis Philiberti*

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[16] Juan Cristobal Garcia-Sanchez, "Augmenting Reality in Books: A Tool for Enhancing Reading Skills in Mexico," *Publishing Research Quarterly* 33, no. 1 (February 2017): pp. 19-27, https://doi.org/10.1007/s12109-017-9499-2.

[17] Juan Cristobal Garcia-Sanchez, "Augmenting Reality in Books: A Tool for Enhancing Reading Skills in Mexico."

Panealbi'. Here, historians use virtual reality to better understand baroque culture. Tourists

similarly appreciate the ability to take a walk through the Palazzo as it would have stood in the

17th century.[18]

Journalism, on the other hand, has great potential to be one of the most comprehensive

applications of immersive media, publishing, and XR technologies. In June 2022, Yahoo News

launched The XR Partner Program, integrating a complex network of outsourced developers

(Verizon Media Group), "an in-house production company (RYOT), and the inner workings of a

dozen partner news organizations".[19] Intended to ease the brunt of costly VR projects, this

partnership supports journalist networks with the necessary tools to create more marketable and

economically sustainable stories through a series of engagement strategies, first beginning with

AR.[20]

The Current Market & Immersive Media

Nevertheless, XR storytelling is still developing. Despite this, a stable and evolving interest in

immersive media may be creating a wider market for XR storytelling as consumers catch up with

the market. In 2020, eBooks accounted for 1 in every 6 books sold.[21] Though sales for print

books also increased, the pandemic forced mass-library and bookstores closures, driving readers

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[18] Davardoust, Sanaz, et al. "'Translation' and Fruition of an Ancient Book Through Virtual Reality in the Case of Lost Cultural Heritage." Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection, 2016, pp. 727–736.

[19] "A Guide to AR/XR in Journalism – Ona Resources Center," Online News Association, June 9, 2020, https://journalists.org/resources/a-guide-to-ar-xr-in-journalism/.

[20] More information regarding AR will follow in later sections.

[21]"With More Bookstores Open, Soaring e-Books Sales Fall Back to Earth, NPD Says," The NPD Group, January 26, 2022, https://www.npd.com/news/press-releases/2021/2021-ebook-sales-data/.

to seek literature through digital means. During the pandemic, Oculus headsets also experienced

8,000% consumer growth between 2019 to 2020.[22] Because of this, readers are more accustomed

to multi-tasking as an integral facet of *engaging with* literature.

According to a 2020 study regarding the correlations between avid book readers and multi-media

users and conducted by Dr. Rachel Noorda and Dr. Kathi Inman Berens in affiliation with

Portland State University, those who engage most with multiple forms of media, like film, TV,

and gaming, are also more likely to be avid readers.[23][24] These same consumers also affirm that,

while genre may be their most popular mode of book discovery, the *manner* in which they

discover books is heavily dependent on media exposure.

Here, there is a correlative potential for cross-media discovery between media, books, and XR.

Those who regularly read eBooks or audiobooks, for example, also show an interest in other

forms of immersive media. This same consumer would naturally be the target consumer for XR

storytelling. Not only do these findings illustrate more potentially equitable modes of book

discovery and decreased literary exclusion, but they also suggest that readers already expect

higher levels of immersion and engagement from literature. While augmented reality satisfies the

passive reader's inclination to multi-task, virtual reality provides exceptional immersion the

interactive reader seeks.

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[22] Spencer, Nicole Audrey. "A Virtual Reality Check for Publishing." *PublishersWeekly.com*, 21 Aug. 2020, www.publishersweekly.com/pw/by-topic/industry-news/comics/article/84154-virtual-reality-check.html.

[23] Rachel Noorda and Kathi Inman Berens (The Panorama Project, February 2021), https://www.panoramaproject.org/news/2021/2/10/panorama-project-releases-immersive-media-amp-books-2020-research-report.

[24] Avid readers, according to Dr. Noorda's study, read 4+ books a year

Challenges and Opportunities

Accessibility and Cost Efficiency

This section will provide an overview of the general challenges to both the *consumer* and the *publisher* or *developer*. It will also address any correlations between sales cost, physical accessibility, demand, and profit.

Consumer Challenges to Accessibility

To reap the benefits of XR, the consumer must first access this technology. Unlike eBooks or audiobooks, which are available with a simple download, advanced forms of XR, such as VR, require the consumer to seek out the technology outside of their own homes or purchase costly equipment.

To promote exposure and combat high costs, XR experiences are often available for the general public at technology and gaming conventions, pop-up experiences, and now, the Meta store. Opening in May 2022, Facebook's Meta Store offers consumers the ability to experience the metaverse for themselves so they can "gain an appreciation" for the technology. Zuckerberg hopes this exposure will "keep the consumer experience at the core of its [the metaverse's] development".[25]

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[25] Pamela N. Danziger, "Metaverse Is Here and Zuckerberg Claims Leadership with the Opening of Meta Store," Forbes (Forbes Magazine, May 3, 2022),

Though Zuckerberg assumes a widespread adoption of the metaverse in the coming future, it cannot—and *should not*—be disputed that access to these experiences is not equitable. Despite the intention of these experiences, socioeconomic barriers, among many, may pose challenges to its fruition.

Though the cost varies, John Holdridge of Fullscreen Media, a social media-focused digital content firm, says that the average cost for a VR headset is $500 to $600, while next-generation consoles retail for about the same. The Oculus Quest, for example, sells for $399.[26]

And for those who do not already have any equipment at all? Well, according to Holdridge, that will cost around $1,000.[27] In an independent public survey, it was found that 30% of those with their own VR gear purchased it for $300, with 10% having spent anywhere from $2,000 to $3,000 for it. Consumers who did not wish to invest in the equipment have named price as a major deterrent.[28] Considering that most avid readers and immersive media users are millennials, a large portion being Black or Latinx, the target consumership for XR storytelling may not be able to afford its most basic equipment.[29] This suggests that one's *current* ability to access VR is an inherently classist privilege which imposes serious economic barriers to its primary consumership.

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[26] Nicole Audrey Spector, "A Virtual Reality Check for Publishing," PublishersWeekly.com, 2020, https://www.publishersweekly.com/pw/by-topic/industry-news/comics/article/84154-virtual-reality-check.html.

[27] Nicole Audrey Spector, "A Virtual Reality Check for Publishing."

[28] See Fig. 1.2

[29] Rachel Noorda and Kathi Inman Berens (The Panorama Project, February 2021), https://www.panoramaproject.org/news/2021/2/10/panorama-project-releases-immersive-media-amp-books-2020-research-report.

Consequently, if consumers cannot be swayed to invest, high production costs may become too unsustainable.

Budget-friendlier options may soon hit the market. With Facebook's adoption of the metaverse and the 2019 release of the Oculus Quest 2 having been a commercial success, Zuckerberg has made every suggestion that the new Quest 3 will be both less expensive and more practical for everyday use[30]. Advancements in practicality, such as the cordless Oculus Quest, are now commonplace. Users are expecting more from their VR devices.

Cost is not the only factor giving consumers pause. Space is also a consideration. While the need for ample space is not necessary for "low-level devices such as the Google Cardboard or Daydream or the Samsung Gear . . . [that require a] headset" be paired with the user's phone through a specific app, the same cannot be said for higher-level devices. Take the Oculus Rift, for example. It requires much more physical space and advanced computer software because the experience is more immersive than lower-budget VR systems[31]. Even the release of the Oculus's cordless headset in 2019 may not be enough for consumers. Users are expecting more from their VR devices. So, potential consumers must have access to hundreds of dollars and ample space.

Nevertheless, there is a strong **market demand** for XR technologies, and consumers are catching up. Publishers, too, are evolving to meet the needs of an increasingly virtual landscape.

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[30] Axel Metz and Henry Leger, "Oculus Quest 3: Everything We Know so Far," TechRadar (TechRadar, February 27, 2022), https://www.techradar.com/news/oculus-quest-3-price-release-date-specs.
[31] Dave Johnson, "What Is Augmented Reality? Here's What You Need to Know about the 3D Technology," Business Insider (Business Insider, December 4, 2020), https://www.businessinsider.com/what-is-augmented-reality.

As XR technologies evolve and gain popularity, XR will continue to become more of a *felt* need

for individual consumers.[32] As this need grows, publishers adopt more advanced business models

for XR storytelling, and XR becomes more commercially viable. This is the growth stage of the

product life cycle,[33] which corresponds with the cyclical economic principle of **demand.**

Consider the growth of smartphones as an example.

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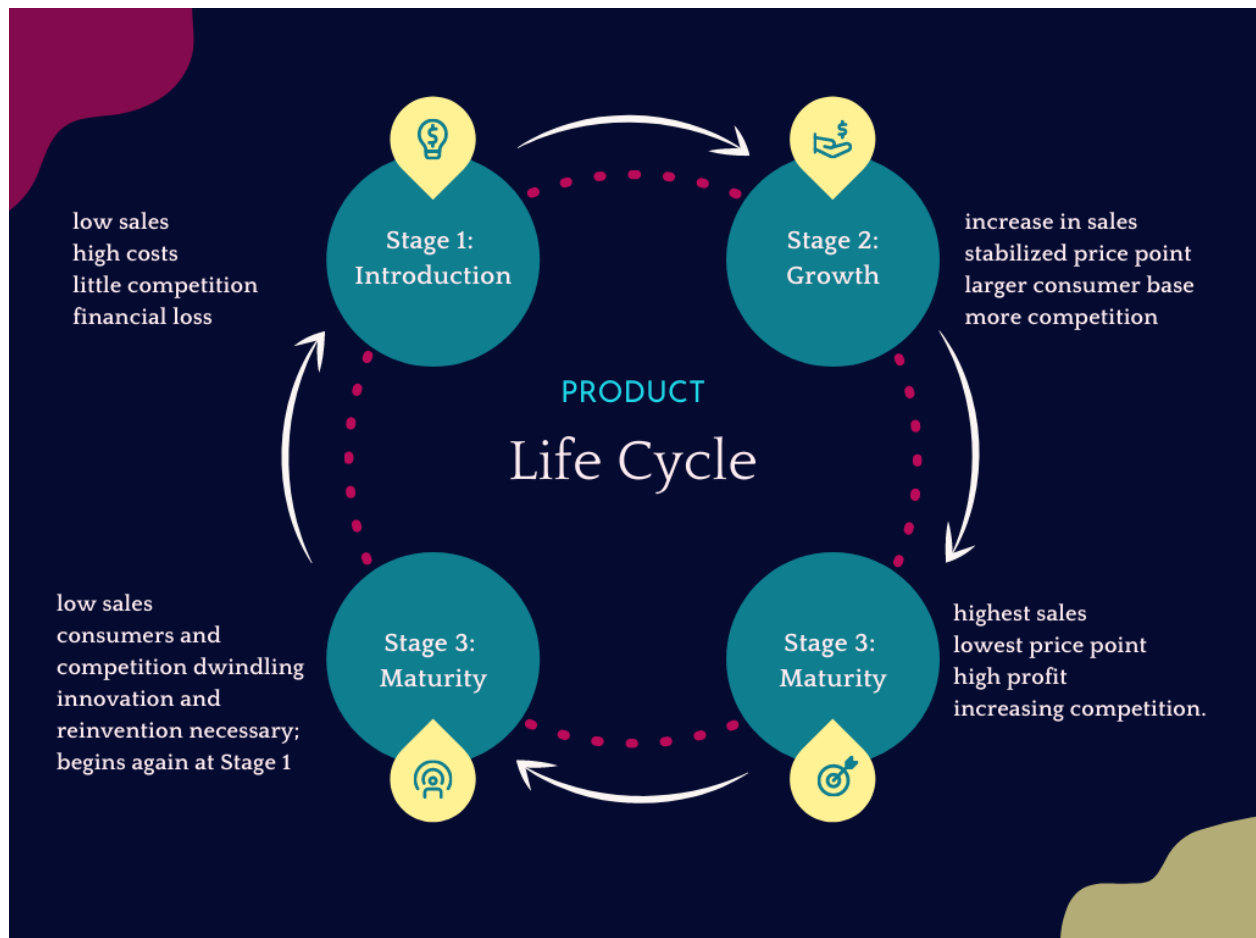
[32] Baker, Michelle. "Virtual and Augmented Reality in Publishing - BISG." *Book Industry Study Group*, 30 Aug. 2018, bisg.org/news/416447/virtual-and-augmented-reality-in-publishing.htm.
[33] See Fig 1.1

Current Consumer Demand & Public Survey

At the very least, consumer *interest* is there. According to an ongoing public survey of **78** respondents assessing consumer interest for VR storytelling, **66%** of respondents affirmed they *would* be interested in participating in a virtual reality pop-up experience, while **17%** suggested they *may* be interested.[34]

These same respondents were asked if they are currently purchasing, or planning to purchase VR equipment, without incentive or contextualization. Only **21%** of respondents affirmed they *are* planning to purchase the gear as compared to **70%** who are *not* interested.

However, that does not mean XR storytelling is a bust. When survey participants were asked if they would be interested in purchasing more *books* should they be offered in XR—whether VR or AR—**58%** would *consider* it, while **25%** certainly *would* purchase gear for XR storytelling purposes.

What's more, when asked if they would be moved to invest in more *virtual reality gear* should it be used for literary purposes, **38%** would consider it, and **42%** affirmed they *would* invest. Interestingly, **38%** of respondents would be interested in **purchasing** XR storytelling for their (a) child, and **33%** would consider it. This means that contextualization within the framework of

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[34] Moffatt. Sarah. Virtual Reality Storytelling. Survey, 2022.

everyday functionality establishes a purchasing motive for consumers. When VR is meaningfully contextualized, both the affirmation to invest and the consideration to invest increased.[35][36]

It is important to understand that this interest demonstrates an opening in the market. A correlative potential exists for publishers to appeal to consumer intrigue, slowly and subconsciously exposing buyers to XR storytelling, first through more accessible technologies, like AR, then through more immersive and niche technologies, like VR. Only then can XR sway consumers to bridge a glaring gap in accessibility.

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[35] Moffatt. Sarah. Virtual Reality Storytelling. Survey, 2022.
[36] See Fig 1.2

XR Storytelling survey

This survey assesses consumer interest in XR technologies, their familiarity with these technologies, and their interest in XR storytelling.

The Survey Pool

76 respondents (ongoing)
Respondents include: Ages 18–65+, PSU Book Publishing students, Facebook members across XR, VR, AR, and literary groups, industry professionals, and the general public with no bias or connection to ether XR or literature.
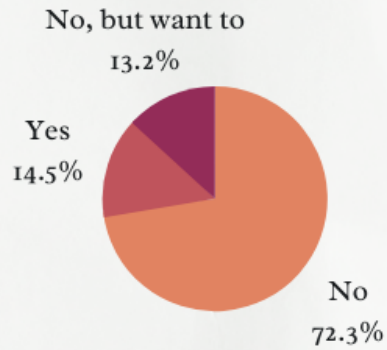
51.3%
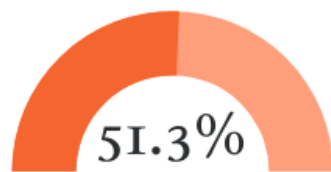
Have you ever played a VR game?

51.3% of respondents have already played a VR game

Interest

Would consider
17.1%

No
17.1%

Yes
65.8%
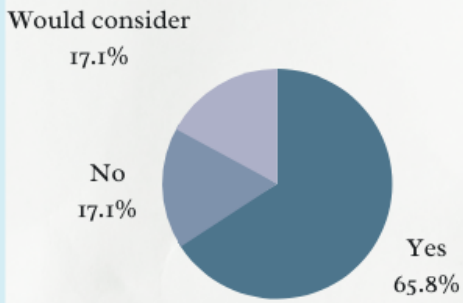
65% of respondents who would participate in VR at a pop-up experience, like at a mall kiosk, gaming store, convention, or something of the like

Accessibility

No, but want to
13.2%

Yes
14.5%

No
72.3%

Respondents who have access to VR gear in their own homes

Supporting details

98% of respondents have heard of VR, while 90% have heard of AR

Cost

How much did those who own VR gear actually pay?

$3,000–$6,000
12.5%

$250
12.5%

$600
12.5%

$425
12.5%

$330
12.5%

$300
37.5%
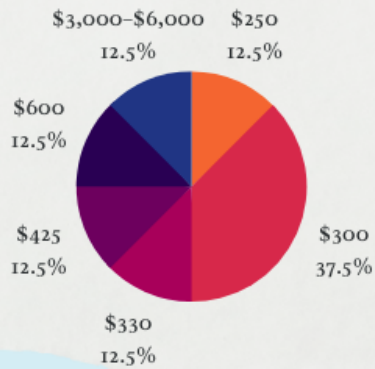
XR Storytelling

Would respondents be interested in books being adapted into virtual or augmented reality?

Maybe
34.2%

Yes
48.7%

No
17%

References   Moffatt, "Virtual Reality Storytelling", survey. February 2022–ongoing
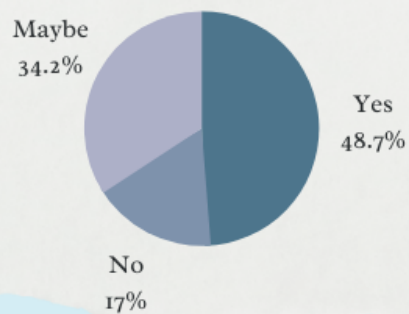
Figure 1.2. Comprehensive XR Storytelling Survey Results

Challenges to Cost Efficiency

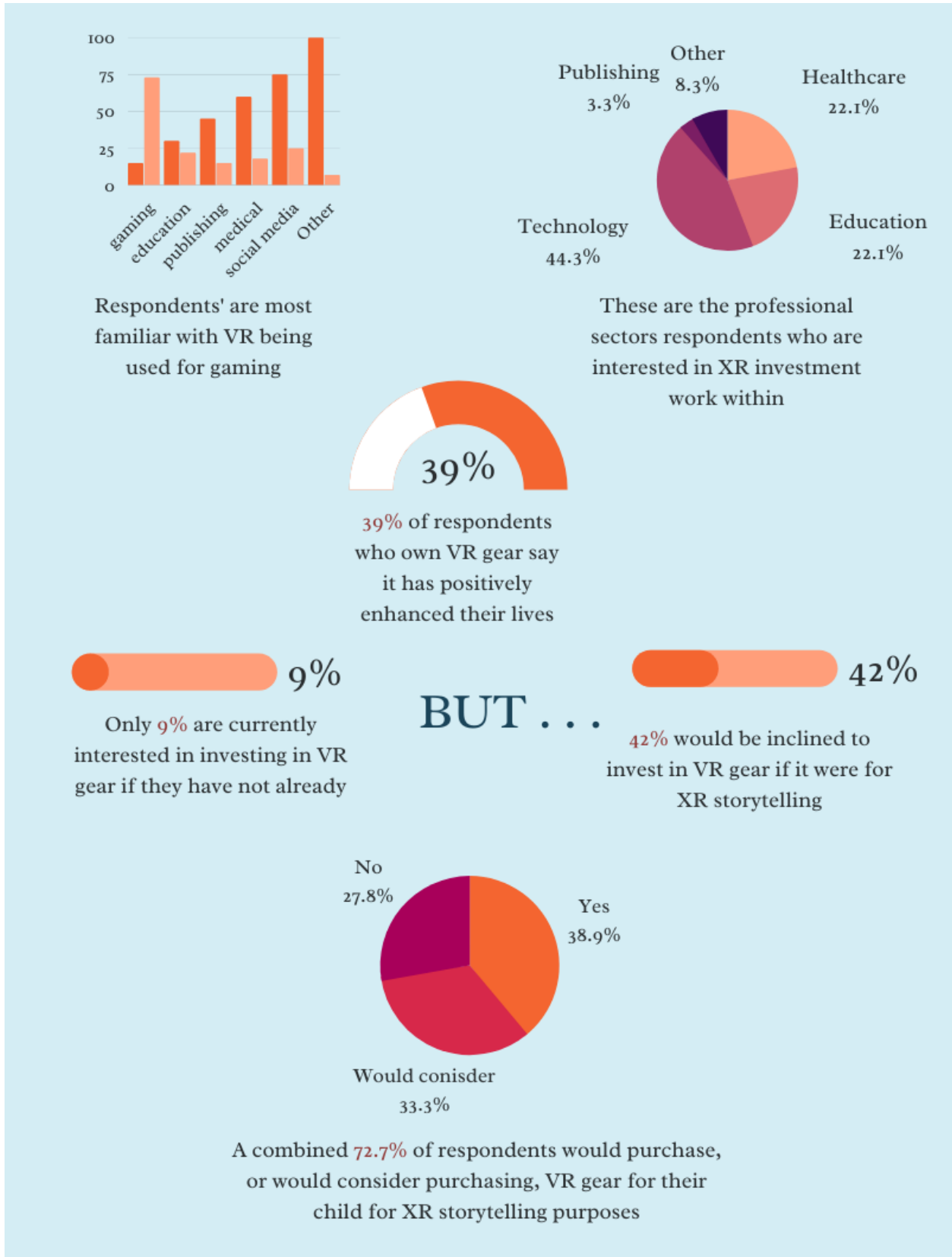Considering the high cost of development, technological intricacies, growing market, and the resulting challenges to consumer accessibility, publishers are expected to have multiple sources of funding or drive a hefty profit should projects be sustainable.

The cost of development is contingent on the level of complexity, length of the project, and its level of engagement. Stories that offer multi-player capabilities or those that are configured for high-level devices require more time, and capital, and physical and emotional labor.

Profit and loss margins for **augmented reality** versus **virtual reality** must also be considered. Simpler, marker-based AR games can cost as little as $2,000, while more advanced, markerless or SLAM-based AR apps can cost up to $200,000 and six months to one year to complete.[37] Depending on the project's scope and complexity, *starting* costs for VR games cost anywhere from $5,000 in its simplest form to $200,000 for advanced, free-roam games.[38][39]

In an interview with John Luxford of Flipside XR, "a virtual reality animation studio" that allows content creators to outsource their VR projects, Luxford admits that development cost is one of the biggest hurdles to production output and sustainability. Naturally, the scope of Flipside's projects varies greatly based on the client and their needs.

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[37] OTR. "How Much Does Augmented Reality Cost? Key Factors & Real-World Examples." *ITRex*, 8 Nov. 2021, https://itrexgroup.com/blog/augmented-reality-cost-factors-examples/#

[38] "Virtual Reality Game Development: How Much Does It Cost?" OTR, December 2, 2020. https://otr.eu/articles/virtual-reality-game-development-cost/.

[39] Further details regarding the level of complexity between different forms of AR and VR will be more thoroughly explored in later research.

Luxford says that a recent VR theater production in the UK, equipped with five actors, had cost

approximately $200,000 to develop. And that, according to Luxford, has been a "shoestring

budget." Marketing costs were an additional consideration. Other games, such as a low-level VR

card game app produced before Flipside's formal origination, had also cost approximately

$200,000 and took more than one year to complete.

Despite the burdensome cost of production, independent clients pay little for Flipside's services.

Many independent clients happen to be "starving artists" whose primary source of funding comes

from government or private grants. Of course, the amount Flipside charges depends on the

project's scope and the client's ability to pay. Even still, in order to drive a sustainable profit,

Flipside recognizes they must pursue "larger service contracts to make ends meet [and] keep

surviving".[40]

The Guardian's Quest for VR Accessibility and Cost Efficiency

Other consumer-centric ventures have been explored. Before the release of the Quest 2, The

Guardian attempted to capitalize on the growing XR market by creating a virtual reality

experiment free for the consumer. This experience provided users with a free cardboard headset

that immersed users in "23 hours of solitary confinement" in some of the world's most depraved

prison systems. In an exclusive interview with Adam Foley, Chief Communications Officer of

The Guardian, despite these efforts, the venture was largely unsuccessful. Foley maintains that

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[40] Luxford, John. Flipside and XR Storytelling. Personal, February, 2022.

Despite the Guardian giving away a Google Cardboard headset free with the paper, it was difficult to get a level of users that would seriously interest advertisers. While most would accept there was a trade-off between the depth of experience and the number of people participating, the actual volumes were too low to make it appealing, especially when set against high production costs. It was too much of a risk, with little guarantee of cut through.[41]

The Guardian's immersive solitary confinement experience did not gain traction amongst users and advertisers alike, regardless of a reduction in equipment cost. This reduction in cost to the consumer could not be outweighed by the technology's production cost, and advertisers were not moved to promote the experience as a result. Perhaps this demonstrates that content drives usability. A topic as harrowing as solitary confinement, albeit a suitable subject for VR, was simply too jarring for users. Considering that most users would have been relatively new to the technology, this level of immersion may have proved traumatic and unappealing for the unprepared audience. So, while accessibility is generally characterized by socioeconomic or demographic limitations, experiential or emotional barriers may prove detrimental as well.

But there may have been other challenges at work. Cardboard headsets, while free, cannot produce the level of immersion that seasoned XR users or those new to the technology would expect. As a result, little purchase incentive exists to offset the hefty cost of equipment.

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[41] Foley, Adam. Email correspondence with Sarah Moffatt. Personal, January 2022

Solutions to Cost Efficiency

Funding sources are crucial to sustainability. While Flipside XR is independently funded,

StoryToys is funded both by its contract with the Eric Carle Foundation and more than 12

million dollars in venture capital.[42] Venture capital has allowed StoryToys to create a My Very

Hungry Caterpillar series without taking a detrimental hit to profit.

Mixed business models can help publishers merge with developers to ease the brunt of in-house

production.[43] In this way, publishing houses do not have to hire teams of in-house XR

developers. Instead, through an intricate process of outsourcing or rights acquisition, XR

storytelling can belong to the developer, or a combination of the publishing house and the

developer.[44] To offset production costs and increase accessibility, StoryToys is in contract with

the Eric Carle Foundation, having been approached by the author's legacy network before the AR

app's creation. The choice of AR over VR and the adoption of a mixed business model

redistributes production costs and offers more forms of profitability.

Although still costly to produce, AR is more cost efficient for the publisher and consumer.[45] For

example, O'Neil suggests that the My Very Hungry Caterpillar app has been sustained by more

than 10 million downloads. App subscriptions have also contributed to the app's growth. These,

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[42] O'Neil, Barry. StoryToys and XR Storytelling . Personal, March 2022.

[43] What constitutes "publishing" is also changing. XR developers who create storytelling experiences by gaining literary rights may be considered publishers.

[44] Other business models exist. XR developers may own all rights to literary works and not work with publishing houses at all; large enough publishing houses may create separate XR experiences in-house if scope of capabilities allot for this.

[45] In further research, the development costs for augmented reality and virtual reality will be more closely compared.

along with venture capital funding and subscription plans, have afforded StoryToys the

necessary capital to create an entire app series.[46]

However, this is not to say all forms of capital are purely financial. The following section will

discuss the profitability of **intrinsic value** and its contribution to fruition and sustainability.

Intrinsic Value

Intrinsic value has the potential to outweigh other measurables, such as consumer accessibility,

financial profit, and consumer demand. Naturally, as demand and intrinsic value increase, so too

will cost efficiency and profitability. As a result, profit will drive down price; or an increased felt

need for XR storytelling will outweigh socioeconomic barriers.

Intrinsic value exists when a product or service enhances the consumer's life or the daily

operations within it. It may also positively impact an entire sector and encourage growth. For

John Luxford, Flipside is rather unique in its mission to empower "starving artists", agreeing not

to "monetize those relationships so much as give them what they need to get started." Luxford

cites an example of an independent comedian that has made over $10,000 using Flipside's

services for "corporate gigs over Zoom". Flipside considers this a huge success.[47]

For StoryToys's O'Neil, "Achieving any level of profitability within the children's app space is

very difficult." So, while the number of downloads and commercial success may look great on

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[46] O'Neil, Barry. StoryToys and XR Storytelling. Personal, March 2022.
[47] Luxford, John. Flipside and XR Storytelling. Personal, February 2022

paper, this is not the only contingency which may denote a sustainable XR product. Creating a platform that successfully harnesses a "suspension of disbelief" and encourages self-facilitated play patterns has proved especially rewarding to O'Neil. Where other developers have failed in this regard, creating "technology for technology's sake", StoryToys has succeeded.[4849]

Consumers seem to agree. According to user reviews of the My Very Hungry Caterpillar app, one user's "Three-year-old is totally enamored by the caterpillar and all the little things he can do . . . Definitely worth paying a few bucks for the enjoyment that a small kid will get." Evidently, the richness of experience has outweighed barriers to cost and accessibility.

Another reviewer raves "My [sic] autistic 2 y/o[50] loves this game. We've bought it on five different devices . . . He holds down the leaf on the sleeping caterpillar, drags it away and then brings it back and it goes to the next day. He does this over and over until he sees the picnic basket because he likes to watch the food jump out of the basket." Children with neurodivergent learning capabilities also benefit from AR. It affords them the opportunity to learn in an interactive, stable, and predictable environment both within the realm of their own comfortability and outside of it. These factors have likewise contributed to an increased felt need for consumers, thereby empowering market growth.

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[48]O'Neil, Barry. StoryToys and XR Storytelling. Personal, March 2022.

[49] O'Neil cites Sony's Wonderbook as an example of both a technological and commercial failure. The book was covered in QR codes, and according to O'Neil, was poorly rendered and offered little interaction between the story and the reader.

[50] This research supports person-first speech. This quote is quoted directly from the reviewer, which is why wording was not altered to accommodate person-first language.

The My Very Hungry Caterpillar AR app has also created a means of possibility and **feasibility** for more forms of children's literature to be adapted into AR, and soon enough, into VR. With the commercial success of the My Very Hungry Caterpillar AR app, StoryToys is able to expand on the series and contribute to the continued development of XR storytelling.

The Solution

Augmented Reality

Challenges posed by VR are overcome by the relative ease of AR for the more passive reader. Reading passiveness requires an exceedingly popular level of engagement due to an increased time engaging with multiple forms of immersive media. Readers now expect multi-tasking to be an integral facet of the reading experience, as found in *Books & Immersive Media 2020*.

Michelle Baker of Book Industry Study Group posits that AR may be a better immediate avenue for book publishers. Not only does it offer more spatial flexibility, but it is also comparatively less expensive to produce, easier for consumers to access, and offers exceptional forms of intrinsic value outside of profitability. Importantly, "augmented reality . . . represents the movement towards the empowerment of young readers and a way to engage them in reading as a creative process".[51]

Unlike VR, AR requires little equipment other than a smart device and virtually no additional costs outside of small app purchases or subscriptions, like the My Very Hungry Caterpillar app.

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[51] Hassan, Oscar. *Virtual and Augmented Reality in Publishing.* Kingston University.

This, and similar apps, offer AR experiences that are conducive for use in education spaces without the need to invest in VR equipment.[52]

Yahoo News's XR Partner Project recognizes the limitations posed by VR and has invested its resources toward using AR as an avenue to VR.[53] In this way, AR storytelling is altering the literary landscape, and, at the same time, *promoting* a market in which VR storytelling will be both **feasible** and lucrative.

Conclusion

Feasibility

Success is not guaranteed but can certainly be anticipated if risk assessment presents a promising enough result. This research suggests that while past and ongoing XR storytelling adaptations have posed challenges, none of these challenges are inherently insurmountable. Rather, they present opportunities and encourage value to be sought outside of monetary profit. Ultimately, the weaknesses of XR storytelling follow the typical cycle of **demand** and its evolution from the individual consumer to the whole.

That being so, general **accessibility** must be improved to dispel socioeconomic barriers. To do this, increased **demand** must create less disruptive profit and loss margins, resulting in lower purchase points, more consumers, and more competitors. **Augmented reality** kickstarts this

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[52] Baker, Michelle. "Virtual and Augmented Reality in Publishing - BISG." *Book Industry Study Group*, 30 Aug. 2018, bisg.org/news/416447/virtual-and-augmented-reality-in-publishing.htm

[53] "A Guide to AR/XR in Journalism – Ona Resources Center." Online News Association, June 9, 2020. https://journalists.org/resources/a-guide-to-ar-xr-in-journalism/.

cycle because it presents an opportunity for publishers to create immersive stories while reaching

more consumers across adjacent markets, and without expending so many resources. Simply put:

AR storytelling is not publishing's *future*; it is its *present.*

Appendix

Processes and Acknowledgments

Inspiration for this research was spontaneously inspired by the Business of Book Publishing course taken in pursuit of a Master's of Book Publishing at Portland State University. After building a robust business plan for a virtual reality publisher, I had the opportunity to further develop this research in an entrepreneurship course, and finally, through extensive scholarly analysis of current XR storytelling projects, past projects—both failures and successes—and within adjacent sectors for this thesis.

This information could not have been gathered without the unparalleled knowledge of Adam Foley, John Luxford, and Barry O'Neil, all of whom contributed their unwavering passion, transparency, and unique expertise to this developing research through interviews. I would also like to thank all public survey participants for contributing their honest opinions which helped inform XR storytelling's current and projected marketability.

Limitations to Consider

Because many XR projects are ongoing at the time of any conducted interviews, actual production costs had been asked to be kept confidential. Likewise, StoryToys's future developments cannot be publicly disclosed at this time.

Survey results may require further clarification. As my research began to evolve, it became apparent that in order to accurately assess product exclusion and consumer accessibility within

XR publishing's target market, more assessment will be required within the millennial, BIPOC age range.

Cost production and production time frames vary significantly. There is no one timeframe or development structure that is currently widely adopted or considered best practice.

Further Research

Due to the scope of this paper, further research must be employed to assess the contribution of developing projects within the rapidly evolving XR space, with regard to the metaverse and Oculus's newest devices.

Further research will include, but is not limited to:

- The technological differences and intricacies between AR and VR. This concerns the varying levels of immersion afforded by hierarchical technologies within the scope of AR and VR, respectively. Consider **non-immersive**, **semi-immersive**, and **immersive XR**.
- Ongoing developments in the XR space with particular regard to XR storytelling
- The metaverse (the Meta Store's opening on May 9, 2022 presents new possibilities)
- The adoption of AR experiences in new Oculus devices
- Updated survey responses
- Further industry interviews (two upcoming in June)
- Revisions or additions to survey questions to account for further clarification
- Best practices for business models and XR development

- More explanation regarding the product life cycle and cycle of demand. This will be its own section which may more readily inform feasibility.

- Further assessment of millennial, BIPOC consumer population in public surveys

Survey Questions

1. What age range are you?
   a. 18–24
   b. 25–34
   c. 35–44
   d. 45–54
   e. 55–64
2. Have you heard of virtual reality?
   a. Yes
   b. No
3. Have you heard of augmented reality?
   a. Yes
   b. No
4. Have you ever played a virtual reality game?
   a. Yes
   b. No
5. Would you ever participate in virtual reality at a pop-up experience, like at a mall kiosk, gaming store, convention, or something of the like?
   a. Yes
   b. No
   c. Would consider
6. Do you have access to any virtual reality gear (i.e. a headset) in your own home?
   a. Yes
   b. No
7. If you answered yes to the previous question, do you feel the investment in virtual reality technology has enhanced your life? Leave blank if your answer was no.
   a. Yes
   b. No
   c. Other
8. If you answered yes, approximately how much did you pay for your virtual reality gear?

9. If you answered no, are you interested in investing in virtual reality gear or are you currently planning to purchase any kind of virtual reality gear?
   a. Yes
   b. No
   c. Maybe
10. If you are not interested in investing in virtual reality gear, why not?
11. If you answered no, how much would you guess virtual reality gear costs?
    a. Less than $100
    b. $100–$200
    c. $200–$300
    d. More than $300
12. In what context have you seen VR being used or used VR yourself?
    a. Video gaming
    b. Education
    c. storytelling/publishing
    d. Medical purposes/healthcare
    e. Social media
    f. history/scientific research/discovery
    g. Other
13. Have you ever played an augmented reality game (augmented reality apps may include games like Pokemon Go, for example)?
    a. Yes
    b. No
    c. I'm not sure
14. If yes, which game did you play?
15. Would you be interested in books being adapted into virtual or augmented reality?
    a. Yes
    b. No
    c. I would consider it
16. If yes, would you purchase more books if they were offered in virtual or augmented reality?
    a. Yes
    b. No
    c. I would consider it
17. If yes and you do not have any virtual reality gear, would you be more inclined to invest in virtual reality if books were made available on this platform?
    a. Yes
    b. No
    c. I would consider it
18. If yes, for what purpose would you purchase virtual reality storytelling?

      a. Personal
      b. Professional

19. If you answered "professional" to the above question, what sector is your occupation within?

      a. Education
      b. Healthcare
      c. Technology
      d. Leisure & hospitality
      e. Government
      f. Retail Trader
      g. Health & Fitness
      h. Marketing & Advertising

20. If you answered yes, would you consider purchasing virtual reality storytelling for your (a) child?

      a. Yes
      b. No

21. If you answered yes to the above question, what is your child's age range?

      a. 0–7
      b. 8–12
      c. 13–17
      d. Over 17

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