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2026-11-03

Deposited version:
Accepted Version

Peer-review status of attached file:
Peer-reviewed

Citation for published item:
Cruz, M. & Oliveira, A. (2025). Dr. Strange, are we experiencing the same?: Perceptions of the metaverse among gamers, by gender. In Pascal Lorenz (Ed.), Frontiers of Computer Science and Information Technology: Proceedings of the 2024 3rd Eurasian Conference on Frontiers of Computer Science and Information Technology (FCSIT 2024) (pp. 73?86). Springer. https://doi.org/10.1007/978-3-031-88649-2_9

Further information on publisher's website:
10.1007/978-3-031-88649-2_9

Publisher's copyright statement:
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Dr. Strange, are we experiencing the same? Perceptions of the Metaverse among Gamers, by Gender

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Abstract: On the wave of a great digital revolution, virtual reality enables immersive experience in cyberspace via various devices, gliding virtual worlds in a dynamic multiverse. To what extent can a film focused on the multiverse be linked to the perceptions of the Metaverse among Portuguese adults? And, more: Are there significant differences between men's and Women's perceptions? In this context, we aim to verify the representations of the Metaverse of each gender and verify the importance of a film (related to the Metaverse and the multiverse) on these representations. Embracing technological advancements is crucial for societal progress, with films playing a significant role in conveying complex concepts and fostering acceptance through immersive storytelling and virtual reality. Fictional narratives, especially those enhanced by technology, can shape attitudes and beliefs, demonstrating the transformative potential of virtual reality and fiction. This study emphasises the relevance of gamers in understanding and engaging with the concepts of Metaverse and multiverse.

1. Introduction

Our interactions with technology have become incredibly familiar. Virtual reality facilitates the widespread acceptance of technology, as it is the key factor enabling our submersion into cyberspace [1], which is possible through various devices, allowing immersive experiences [2]. As we delve into the Metaverse, a shared experience unfolds in a virtual world domain encompassing the internet, various applications, and web technologies [3]. The spatial structures, scenes, and characters created by technology are essential as unique data forms [4]. Users interact with the virtual world in a data-driven manner. As the Metaverse evolves, the corresponding data network grows, placing considerable pressure on data processing in the digital realm [5]. This progression may eventually lead to a Multiverse where big data processing technology becomes crucial [5].

Technology's transformative impact extends beyond our daily lives, especially in entertainment, which plays a pivotal role in shaping our engagement with modern technologies [6]. The entertainment sector offers immersive experiences that contribute to transforming human vision and narrative understanding [6]. This power extends to various forms, such as sci-fi novels and animation, where the latter is seen as a creative strategy [7]. Adopting technological innovations often takes inspiration from fictional narratives, allowing science fiction writers to foresee future developments and their real-life impact [8]. Numerous studies have explored the influence of fictional stories on aspects like knowledge, attitudes, beliefs, behavioural intentions, self-concept, and theory of mind [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18]. The cinema and entertainment industry provide avenues to immerse individuals in alternative realities through animation and virtual visual effects, blurring the lines between fiction and reality.

Despite the first definition of Metaverse in 1992 as a game offering an immersive experience through virtual reality technology, the concept is in evolution and dependent on current and future technologies [19], [20], [21]. Metaverse creates a layer between reality and the user, providing a gamified experience [19], [22], [23]. It comprises a top-level hierarchy of persistent virtual spaces intersecting real life, allowing various experiences to emerge through technology [24]. It may also be described as a 3D virtual shared world dependent on augmented and virtual reality technologies, enabling limitless social, economic, and cultural engagements [25], [26], [27]. It represents a post-reality universe with multisensory interactions, merging elements from online games, social networking, augmented reality, and virtual reality [28], [29].

Metaverse differs from multiverse in their definitions, ecosystems, flow, properties, and entities [30]. The multiverse, introduced by Pine and Korn, is an architecture for designing sophisticated XR experiences, comprising three pairs of variables that give rise to eight realms, each offering a different type of reality [31]. Each realm is defined by unique combinations of physical and digital dimensions, covering the entire reality-virtuality continuum [31]. Unlike the Metaverse, the multiverse consists of multiple independent worlds with minimal data sharing [32]. Both concepts, however, aim to blend digital and real worlds, with the multiverse relying on the existence of multiple Metaverses in different contexts.

In a big data context, analysis has become the focal point of modern science [33]. Big data, characterised by vast and varied datasets, poses challenges that conventional software cannot handle [5]. Over time, it has stabilised, offering opportunities for solving unprecedented issues across various fields [5]. Its core objective is to extract valuable insights from massive datasets, encompassing structured, semi-structured, and unstructured data [5]. The convergence of fields is facilitated by big data, providing organisations and industries with in-depth insights to address real-world challenges [34].

The present study emphasises qualitative data analysis using text analytics, an extension of data mining, to extract meaningful information and knowledge from non-structured

sources [35], allowing sustainable decision-making and prediction analysis providing more accurate and insightful results.

As part of a PhD project delves into the representations of immersion, Metaverse, and multiverse through a comprehensive approach encompassing quantitative and qualitative data analysis. The intersection of Metaverse, multiverse, and big data opens new avenues for navigating an evolving digital landscape. Do films play a role in influencing viewers to embrace concepts such as the Metaverse, the multiverse, and virtual reality?

2. Objectives

The main goal of this article is to understand to what extent a film focused on the multiverse can be linked to the perceptions of the Metaverse among Portuguese adults. It also explores gender perceptions, considering thoughts, feelings, and experiences about these concepts. In this context, we aim to verify the representations of the Metaverse by gender group and the importance of a film (related to the Metaverse and the multiverse) on these representations.

3. Method

A questionnaire was meticulously developed for this study based on insights drawn from prior research [19], [20], [36] and was methodologically integrated on our ongoing PhD project. We validated its content by leveraging key concepts and dimensions identified previously. It was implemented using Jotform, an online user-friendly form builder. Both quantitative and qualitative data were collected and analysed, targeting Portuguese adults. Descriptive statistics, including frequencies (N) and percentages (%), were calculated. The questionnaire encompassed demographic and movie-related inquiries, with Cronbach's Alpha ($\alpha = 0.85$), signifying a robust connection between the questionnaire items. Moreover, the high statistical significance in the correlation between questions confirmed the questionnaire's reliability and validity. The questions were:

Demographic questions:

1) Gender

2) Age

3) Are you somehow connected to Information Technologies?

4) Academic degree

5) How often (approximately) do you play digital games (on mobile phones, consoles, computers, or other digital media)?

Other questions:

6) Doctor Strange in the Multiverse of Madness - Do you know this movie?

7) Doctor Strange in the Multiverse of Madness - Have you seen this trailer/teaser?

8) Doctor Strange in the Multiverse of Madness - Have you seen this movie?

9) Doctor Strange in the Multiverse of Madness - Do you want to see the trailer?

10) Doctor Strange in the Multiverse of Madness - Classify how much you like this movie

11) Doctor Strange in the Multiverse of Madness - Have you seen the trailer that we made available?

12) To what extent do you associate this film(s) with…

The non-demographic questions (6 to 12) employed a Likert scale to gauge participants' depth of sentiment on the presented topics, revealing the dimension of their attitudes [37]. Film selection aligned with our study's concepts and objectives, "Doctor Strange in the Multiverse of Madness" (2022), exploring the titular character's journey across alternate realities. The questionnaire comprised "yes or no" and Likert scale questions. Before accessing it, the participants had to read and answer the informed consent; only with their agreement could they proceed. It was also explained that they could decide not to respond. In that case, none of the answers were to be used.

4. Results

The results will be presented through tables (cf. Tables 1 to 12). We had 50 participants, 25 women and 25 men. The average age of the women was 39 years old, and the average age of the men was 37 years old.

Regarding the question "3. Are you somehow connected to Information Technologies?" (Table 1), 48% of women (N=12) and 44% of men (N=11) are connected professionally through information technologies. So, most participants are connected professionally through information technologies. No significant gender differences are observed.

Table 1 Are you somehow connected to Information Technologies?

	Results %	
	Women	Men
Student	0.0	0.0
Leisure	0.0	4.0
Professional	48.0	44.0
Working-Student	4.0	12.0
No	48.0	40.0
Professional and Leisure	0.0	0.0
Professional and Student	0.0	0.0

Both genders have most participants with a bachelor's degree (Women: N=18, 72%, Men: N=14, 56%) (Table 2).

Table 2 Academic degree

	Results %	
	Women	Men
12.º grade	12.0	20.0
Bachelor	72.0	56.0
Master	16.0	24.0
PhD	0.0	0.0

Regarding the question "How often (approximately) do you play digital games (on mobile phones, consoles, computers, or other digital media)?" we can observe in Table 3 that both participants play regularly, which we can say that they are gamers. The only difference is how often they play. Most women participants play weekly (N=14, 56%), and the men participants play daily (N=17, 68%).

Table 3 How often (approximately) do you play digital games (on mobile phones, consoles, computers, or other digital media)?

	Results %	
	Women	Men
Daily (or very often)	44.0	68.0
Weekly (or often)	56.0	32.0
Monthly (or sometimes)	0.0	0.0
Rarely	0.0	0.0
Never	0.0	0.0

Regarding the question "6. Doctor Strange in the Multiverse of Madness - Do you know this movie?" we can observe in Table 4, we can observe that the majority of the participants saw this movie (N=20, 80%) and that only almost half of the women participants saw it (N=12, 48%).

Table 4 Doctor Strange in the Multiverse of Madness - Do you know this movie?

	Results %	
	Women	Men
Yes	48.0	80.0
No	52.0	20.0

Regarding the question "7. Doctor Strange in the Multiverse of Madness - Have you seen this trailer/teaser?" we can see (Table 5) a difference between the men participants, which the majority have seen the trailer (N=13, 52%), and the women participants which the majority have not seen the trailer (N=14, 56%).

Table 5 Doctor Strange in the Multiverse of Madness - Have you seen this trailer/teaser?

	Results %	
	Women	Men
Yes	44.0	52.0
No	56.0	48.0

Regarding the question "8. Doctor Strange in the Multiverse of Madness - Have you seen this movie?" we can observe in Table 6 that most of participants have not seen this movie (Women: N=15, 60%, Men: N=16, 64%).

Table 6 Doctor Strange in the Multiverse of Madness - Have you seen this movie?

	Results %	
	Women	Men
Yes	40.0	36.0
No	60.0	64.0

Regarding the question "9. Doctor Strange in the Multiverse of Madness - Do you want to see the trailer?" we can observe in Table 7 that most of the participants did not want to see the trailer (Women: N=17, 68%, Men: N=18, 72%).

Table 7 Doctor Strange in the Multiverse of Madness - Do you want to see the trailer?

	Results %	
	Women	Men
Yes	32.0	28.0
No	68.0	72.0

Regarding the question "10. Doctor Strange in the Multiverse of Madness - Classify how much you like this movie", we can observe in Table 8 that most of the participants did not like it or did not see it (Women: N=13, 52%, Men: N=14, 56%). Although the participants who saw the movie were women or men, most liked it (Women: N=6, 24%, Men: N=4, 16%).

Table 8 Doctor Strange in the Multiverse of Madness - Classify how much you like this movie

	Results %	
	Women	Men
I didn't like it (or I didn't see it)	52.0	56.0
I liked it a little	4.0	8.0
I liked it reasonably	8.0	12.0
I really liked it	24.0	16.0
I liked it a lot	12.0	8.0
I didn't like it (or I didn't see it)	52.0	56.0

For the question "11. Doctor Strange in the Multiverse of Madness - Have you seen the trailer that we made available?" we can see in Table 9 that most of persons did not see the trailer we made available (N=17, 68%).

Table 9 Doctor Strange in the Multiverse of Madness - Have you seen the trailer that we made available?

	Results %	
	Women	Men
Yes	32.0	32.0
No	68.0	68.0

Regarding the question "12. To what extent do you associate this film with…" we can observe in Table 10 and Figure 1 the answers from the women participants. The men participants' answers are observed in Table 11 and Figure 2.

According to the perceptions of the women participants, the majority considered this film to be quite related to Virtual Reality (N=13, 52%), Animation (N=11, 44%), Gaming (N=11, 44%), Escape (from reality)(N=11, 44%, Leisure or fun (N=9, 36%), Virtual World (N=8, 32%), Multiverse (N=8, 32%), Well-being (N=7, 28%), Future (N=7, 28%), Metaverse (N=7, 28%), Restleness (N=7, 28%) and Personal Projection into the virtual (N=7, 28%). Concept as Present (N=12, 48%), Present (N=10, 40%), Reality (N=9, 36%), Immersion (N=7, 28%) and Restleness (N=7, 28%) were considered of little association.

We can observe that major concepts such as Metaverse, Virtual Reality, Animation, and the gaming world tend to be interrelated. Also, these concepts are precepted as something that brings well-being, that is, from the future, that brings some restlessness, but also Leisure or fun, that allows one to escape from reality by personal projection into the virtual.

Table 10 Women - To what extent do you associate this film with…

Women Results %					
Concepts	**Nothing**	**Little**	**More or less**	**Quite**	**Very much**
Animation	20.0	12.0	20.0	**44.0**	4.0
Well-being	24.0	24.0	20.0	**28.0**	4.0
Future	12.0	16.0	**28.0**	**28.0**	16.0
Gaming	16.0	16.0	16.0	**44.0**	8.0
Immersion	8.0	**28.0**	**28.0**	24.0	12.0
Metaverse	8.0	12.0	**28.0**	**28.0**	24.0
Virtual World	16.0	12.0	16.0	**32.0**	24.0
Multiverse	8.0	12.0	20.0	**32.0**	24.0
Past	16.0	**48.0**	12.0	24.0	0.0
Present	8.0	**40.0**	16.0	32.0	4.0
Reality	20.0	**36.0**	16.0	24.0	4.0
Virtual Reality	16.0	16.0	0.0	**52.0**	16.0
Restlessness	12.0	**28.0**	**28.0**	**28.0**	4.0
Leisure or Fun	4.0	12.0	16.0	**36.0**	32.0
Hobbie	12.0	12.0	**32.0**	**32.0**	12.0
Escape (from reality)	4.0	8.0	16.0	**44.0**	28.0
Personal projection (or continuity) into the virtual	20.0	12.0	20.0	**28.0**	20.0

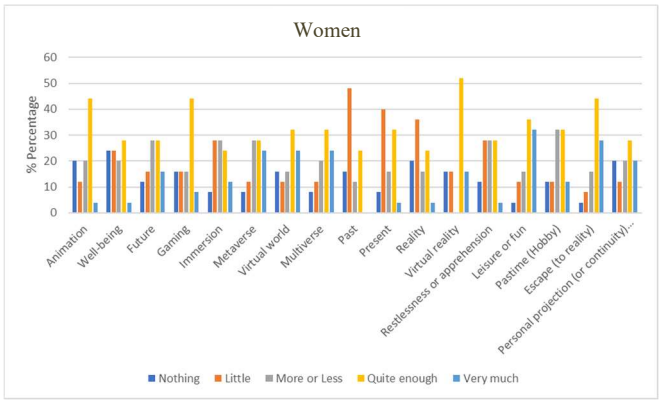


Fig. 1. *Graphic Women – To what extent do you associate this film with…*

According to the men participants we can observe that the higher classifications were given to Virtual World (N=8, 32%), Multiverse (N=7, 28%), Animation (N=7, 28%), Gaming (N=9, 36%), Virtual Reality (N=10, 40%), Leisure or fun (N=9, 36%), Escape (from reality) (N=8, 32%) and Personal Projection into the virtual (N=8, 32%).

We can see a connection between Animation, Gaming, the Virtual World and Virtual Reality, which gives us an understanding of the importance of their relationship. Although the majority score was in the Metaverse concept, there is a knowledge of its presence, which is essential for us to understand that there is a recognition of its importance. We can also see these concepts associated with Leisure or fun, escape from reality, and personal projection into the virtual.

Table 11 Masculine - To what extent do you associate this film with…

Women Results %					
Concepts	**Nothing**	**Little**	**More or less**	**Quite**	**Very much**
Animation	12.0	20.0	**28.0**	**28.0**	12.0
Well-being	16.0	36.0	**40.0**	4.0	4.0
Future	8.0	4.0	**32.0**	28.0	28.0
Gaming	8.0	24.0	16.0	**36.0**	16.0
Immersion	8.0	8.0	**40.0**	24.0	20.0
Metaverse	16.0	8.0	**36.0**	24.0	16.0
Virtual World	8.0	8.0	24.0	28.0	**32.0**
Multiverse	24.0	4.0	24.0	20.0	**28.0**
Past	**32.0**	**32.0**	20.0	12.0	4.0
Present	12.0	24.0	**44.0**	20.0	0.0
Reality	16.0	20.0	**44.0**	12.0	8.0
Virtual Reality	8.0	8.0	24.0	**40.0**	20.0
Restlessness	24.0	20.0	**32.0**	16.0	8.0
Leisure or Fun	4.0	8.0	**36.0**	**36.0**	16.0
Hobbie	8.0	12.0	**36.0**	28.0	16.0
Escape (from reality)	4.0	12.0	**32.0**	**32.0**	20.0
Personal projection (or continuity) into the virtual	12.0	12.0	28.0	**32.0**	16.0

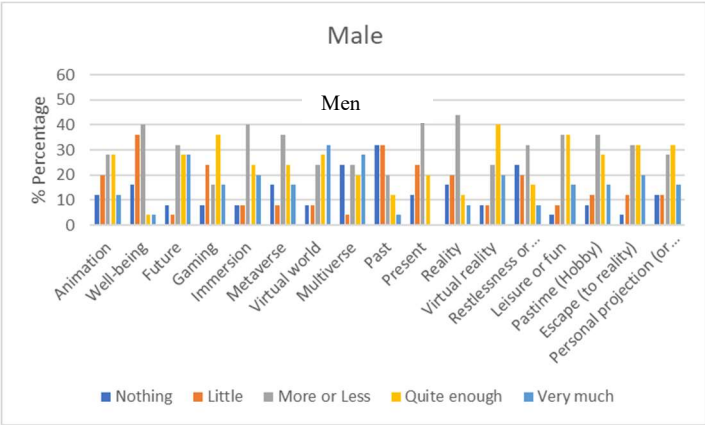


Fig. 2. *Graphic Men – To what extent do you associate this film with…*

We can see profound or wither connections from the women participants the concepts present. There is a clear statement that the film is not only connected to the main concepts (Animation, Gaming, Metaverse, Virtual Worlds, Multiverse and Virtual Reality) but it also it is also associated with general well-being emotions and beliefs that allow this escape from reality and projection of themselves through the virtual world. This virtual reality is therefore seen more by women than by man, as a promoter of positive emotions that

allow peaceful immersion and acceptance of these new realities, focusing on the present and past experiences.

For the men participants there is much more uncertainty, feelings, and beliefs regarding the concept and the films. The film brings both positive and negative feelings that create a more reluctant experience in these new realities, not allowing themselves to escape from reality and neither to project themselves into that reality. Nevertheless, they acknowledge the immersion state needed to experience these.

In sum, men reveal more fearsome or reluctance to immerse themselves in new realities. However, they accept them as a part of their leisure or fun idea for projecting themselves into the virtual world. Women are more willing to accept these new realities, seen as positive experiences. As for men, we observed reluctant, uncertainty feelings and beliefs that don't allow them to explore these new realities deeper. Even though they see them as a fun idea, they cannot overcome the fearsome idea, for the future perspective, that would allow them to fully experience these new realities as different as their own reality and therefore the incapacity to project themselves into these new realities.

Comparing the gender results on an overall view, we observe similar perceptions regarding the Metaverse, Virtual Reality, Animation and Gaming concepts. The association of these concepts shows us a tendency to associate the perception of these concepts with Leisure or fun, escape (from reality), and personal projection into the virtual. Weel-being is also referenced, but it was rated higher among the women participants.

Both genders confuse us regarding future, present, or past concepts. They acknowledge the presence of the three, but they do not score them very highly, uncovering the idea that the Metaverse is not quite defined. Although it can be considered a present concept, it is not quite developed, so it is possible to be from the future. However, the idea has been around for some time, so it can be considered from the past.

5. Conclusions and future work

Technological evolution is paramount, shaping our lives and influencing societal progress. It accelerates innovation, fostering breakthroughs in all domains. Embracing this evolution is crucial, as it propels us towards a future where advanced technologies enhance our capabilities and contribute to global advancements.

In pursuing our primary goal of understanding to what extent a film focused on the multiverse can be linked to the perceptions of the Metaverse, we observed both direct and indirect depictions. Participants explicitly recognized the Metaverse as a film concept (Table 10 and 11), while indirect representations included crucial elements like virtual reality, gaming, animation, and immersion. The Metaverse, defined as an immersive gaming experience with virtual reality technology [20], establishes a distinct layer between reality and the user [22]. This fosters engagement through digital means, creating opportunities in entertainment [36] by blending various elements [29] accessible through different devices [38]. Due to the concept's ambiguity [36], the lack of a precise definition contributes to knowledge gaps and confusion.

In addressing our objective to verify the representations of the Metaverse by each gender and verify the importance of a film (related to the Metaverse and the multiverse), exploring the film's impact on Metaverse and multiverse representations, our study underscores the extraordinary role of movies as influential channels for conveying entertainment and fostering acceptance of diverse concepts through storytelling and virtual reality. Consistent with existing literature [39], our findings align with the idea that fiction, coupled with technological advancements, breathes life into innovative concepts and anticipates future developments.

Our research contributes to understanding the impact of fictional narratives on attitudes and beliefs [12], [13], [14], revealing the transformative potential of virtual reality and fiction to surpass human perceptual boundaries [40]. Virtual reality enables users to access inaccessible places, while fiction legitimizes these representations [40], creating an immersive storytelling experience that evokes a sense of presence in the depicted scenes [40]. Notably, our predominantly gamer participants (Table III) exhibit heightened engagement with these concepts, emphasizing the relevance of gaming culture in connection with the studied movies.

In response to our research question — To what extent can a film centred on the multiverse be associated with adults' Metaverse perceptions? —, the answer is unambiguous: a movie has the communicative prowess to inspire new possibilities and dismantle the boundaries between reality and fantasy. The film vividly showcases the Metaverse, multiverse, and its immersive experience, providing viewers with a practical lesson. As characters navigate the Metaverse, spectators are immersed in the cinematic world, experiencing 'virtual reality' through identification with the characters. The film's role, particularly one with animation and special effects, demonstrates the potential to elucidate a virtual world, showcasing the transformative power of virtual reality as a dream realm [41].

Our study provides insights into Metaverse development and its synergy with the entertainment industry, especially cinema. Embracing technological advancements is crucial for societal progress and innovation. This study explores how films focused on the multiverse can influence the perceptions of the Metaverse, highlighting both direct and indirect representations of it through elements like virtual reality, gaming, and animation. Films significantly convey complex concepts and foster acceptance through storytelling and virtual reality, creating immersive experiences that blend reality and fantasy. Fictional narratives, especially those enhanced by technological advancements, can shape attitudes and beliefs, demonstrating the transformative potential of virtual reality and fiction. Here we emphasise the relevance of gaming culture in understanding and engaging with concepts related to the Metaverse and multiverse, particularly among gamers. Films may inspire new possibilities and break down the boundaries between reality and fantasy, showcasing the potential of virtual reality to create immersive and educational experiences.

The present study underscores the synergy between technological evolution, entertainment, and the development of the Metaverse, highlighting the importance of embracing these advancements for future progress.

6. Acknowledgement

This work was carried out at ISTAR - Information Sciences and Technologies and Architecture Research Center of ISCTE - Instituto Universitário de Lisboa, Portugal, and was partially funded by the Foundation for Science and Technology (Project "FCT UIDB / 04466/2020").

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