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Digital afterlife: challenges and technological innovations in pursuit of immortality

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ABSTRACT

Digital immortality, the idea of endless life and ultimate happiness in a virtual afterlife, has become a subject of human fascination. This article reports the results of a comprehensive research project focused on identifying the challenges and potential options related to digital immortality. Analyzing 39 relevant studies, our research concentrates on two main themes: the barriers to achieve the digital immortality and the tools created to preserve digital memories. Our findings reveal that the challenges associated with digital immortality are deeply rooted in legal, ethical, and social issues. Importantly, our focus is the challenges related to digital content left by the deceased, its collection method, and integrity in digital immortality research, as content forms the basis for achieving this objective. Furthermore, the research highlights the need for more advanced technology, as the number of studies is limited and current progress is primarily future-oriented. However, our analysis demonstrates that the digital content left by the deceased is paramount, as it constitutes the raw material for achieving digital immortality.

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1. INTRODUCTION

Digital immortality is mainly referred to as a digital afterlife or having a continuity of existence [1], which can be simply understood as a term given to those who are no longer living. The digital immortality referred to here has a similar concept where it achieves the continuity of existence but only for the data and information that has been spent, created, or owned by someone while they are still alive. The data and information of someone who has passed away will possibly still be useful and will be continually used and accessed by the people who are still living [2]-[5].

The term "digital afterlife" has been derived from the word "afterlife" which means life after death [6]. With recent advancements in science and technology, it is now possible to create a virtual or simulated version of human consciousness by capturing and storing the various data produced by the body and brain throughout one's lifetime [7]-[10]. Examples of such data are personal information, memories and emotions. With the use of artificial intelligence, this information can be used to simulate the person's consciousness and

behaviors creating a digital version of the person [9], [11]. This technology has vast potential and implications and may develop to the stage where the digital consciousness of a person can continue to exist and function after the person has deceased in the real world. This has led to the need to differentiate between the traditional afterlife and the digital afterlife. The concept of immortality has always intrigued human beings. And now with rapid advancements in information technology humanity finds itself standing on the verge of a great technological evolution i.e. the evolution of human beings into beings of pure information. In such an age, it is easy to see the allure of immortality in a form in which one would have access to indefinite lifespan and an ultimately fulfilling existence. This is the promise of the digital afterlife (the dream of the ancestors) [12]. It is thus that we must consider the implications and be prepared for this coming age and the technological challenges that it will bring. This will set the stage for the examination of the various challenges and potential problem areas in developing technology that will enable the continuance of a digital afterlife. By understanding the dilemmas in development, we may avoid potential disasters and ensure a smooth transition into and a well-prepared existence in the digital age.

The paper aims to identify a wide set of challenges and barriers which people of scientific trades, businessmen, and ordinary people face on their way to digital immortality's achievement. Digital immortality entails a whole scope of problems that a person or a group of people may face while they seek to maintain or jealously safeguard their interests for such benefits. People who also show interest in other prospects of the possible future are the target demonstrator of this problem.

Digital immortality as explored in this article is a term that has multifaceted meanings. This includes transferring a human brain into a computer, scanning humans' memories and personality traits to make their digital copies, creating artificial intelligence (AI) with similar intelligence and characteristics to a living person, and storing digital remains which may include pictures, videos, and old profiles. As an outcome of this study, we aim to answer the following research questions or give insight towards potential answers backed-up by the current related work: as an outcome of this study, we aim to answer the following research questions or give insight towards potential answers backed-up by the current related work: (RQ1) What are the challenges and barriers to achieving digital immortality, and how do they impact its realization. (RQ2) What are the existing progression technologies aimed at preserving digital legacies?

2. METHOD

Following the recommendations and processes given in the preferred reporting items for systematic reviews and meta-analysis (PRISMA-prisma.io) statement we carried out a structured systematic review [13]. We outline our eligibility requirements, information sources, search approach, data gathering procedure, and selection methodology in the sections that follow. A flowchart Figure 1 shows the exclusion criteria, the number of items at each stage of the selection process, and the total number of things included in the review.

2.1. Eligibility criteria

Our objective is to identify papers that discuss or highlight issues and barriers related to the fulfillment of digital immortality, how they affect it or offer potential technology meant to preserve digital legacies. In light of the features, difficulties, and barriers surrounding the topic of digital immortality, as well as the lack of study on the topic at hand and the interdisciplinary need for information, we have expanded the scope of our analysis beyond human-computer interaction. We have expanded it to include topics like law, ethics, psychology, and more. Furthermore, we do not limit our research to any particular methodology or study format, provided that it consists of reports that are closely related to the subject of our research, papers, book chapters, or articles published in peer-reviewed academic publications Figure 2.

Concerning potential technologies aimed at preserving digital legacies, we seek proven evidence, technological solutions, or realistic design guidelines, while also including articles that offer ideas or inspirations for future research, recognizing that the field is still evolving and exploratory. It's worth noting that some articles have discussed digital immortality from a biomedical perspective, leveraging advancements in technologies such as synthetic biology or nanotechnology, and we have focused only on those that provide explicit contributions to achieving digital immortality from a perspective of storable data.

2.2. Information sources and search strategy

We used a novel strategy in this study by utilizing literature mapping to find pertinent papers in the subject of digital immortality. Our search was started with the term "digital immortality," which the "litmaps" and "connectedpapers" platforms allowed. "Litmaps" and "connectedpapers" use PubMed, arXiv, bioRxiv, medRxiv, and Microsoft Academic Graph databases for their research. We were able to create a visual map of articles, themes, and connections between different topics associated with our research topic using this method as shown in Figure 2. The application of literature mapping was especially important to us

throughout the selection process since it made the study landscape on digital immortality more fully visible and explorable. We might determine the most recent and pertinent papers in this rapidly changing field, as well as any new trends, by examining this mapping [14].

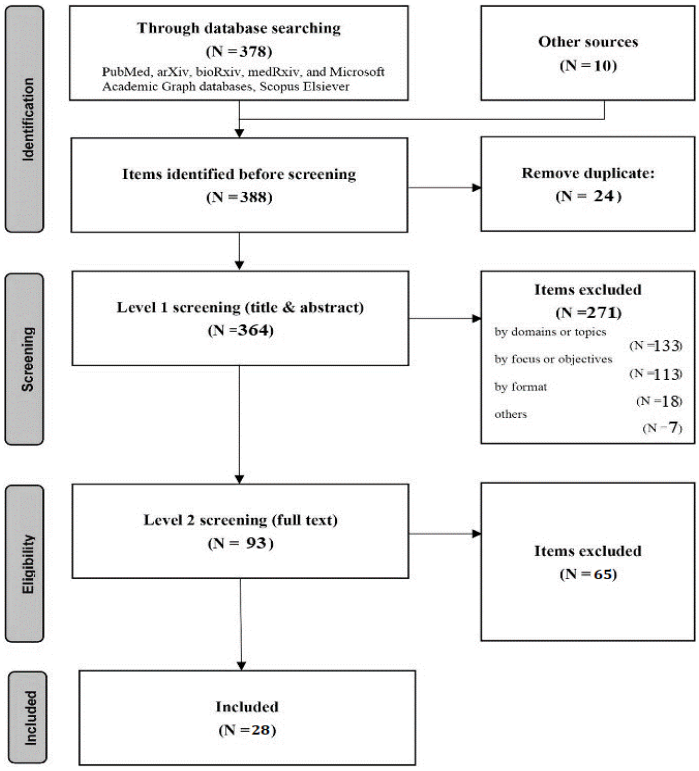

Figure 1. Flow diagram of the selection process, numbers of included and excluded items in each step

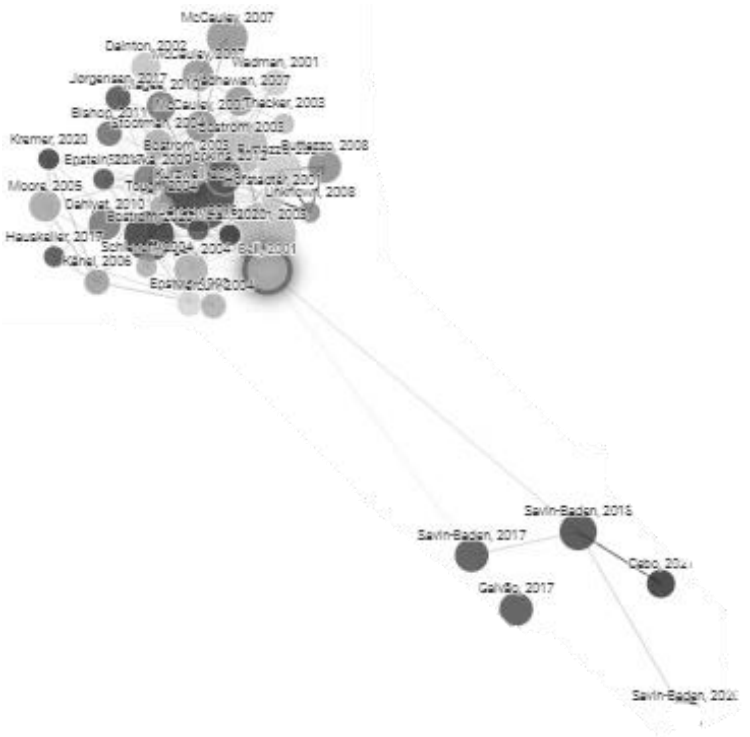

Figure 2. Map view resultat

Papers are arranged according to their similarity, node size is the number of citations, node color is the publishing year, similar papers have strong connecting lines and cluster together. We additionally performed a second search in the Scopus Elsevier database to enhance our investigation of technology intended to preserve digital legacies. We were able to cover a wide range of papers and viewpoints thanks to this additional search, which improved our comprehension of this important subject.

With the help of this creative method, we were able to analyze the body of literature from a comprehensive angle and carefully choose the best pieces for our review. Our methodological rigor was maintained while ensuring a varied variety of publications were included in our selection process by incorporating literature mapping and an additional search in Scopus Elsevier. The Table 1 summarizes all the keywords used and the platforms in which they were used.

Table 1. Search term queries used in all databases

Utilizing literature mapping		
1st keyword	And	2nd keyword
Digital		Immortality
Scopus database		
1st keyword	And	2nd keyword
Digital		Technology

2.3. Data collection

Using Zotero and the Zotero Connector Chrome extension, data was collected and arranged. Details on each entry, including titles, authors, abstracts, and sources, were collated. This was accomplished by importing RIS files created from several databases or by automating capture using the Zotero Connector. During the selection process, full texts of entries were retrieved manually or automatically through the Zotero Connector. The authors' host institution's library made all data access possible.

2.4. Selection process

The flow diagram in Figure 1 above depicts the selection process. Initially, duplicate items were eliminated. Then, we conducted level 1 screening based on their title and abstract, and a few by reviewing the full text. In this phase, we excluded papers pertaining to domains or topics unrelated to digital immortality or with differing interpretations of such concepts; those lacking relevance to our research questions and objectives within related domains or topics; items presented only as abstracts, posters, or demos; as well as retracted items, non-English publications with no available abstracts and full texts. Subsequently, we assessed the remaining items for eligibility through extensive reading when necessary. Those inaccessible via full text were excluded while irrelevant or differently focused ones were also removed along with those lacking foundational groundwork and evidence to support their conclusions. Ultimately, the retained items from previous processes underwent analysis in this systematic review. Finally, 29 scientific articles were selected, as shown in the Table 2, which we considered to provide a suitable environment for discussion.

3. RESULTS AND DISCUSSION

3.1. Preliminary analysis

The number of article publications following the last checks in our systematic review is shown in Figure 3 These chosen studies on the subject show a progressive, though erratic, growth from 2007 to 2019, with particularly noteworthy peaks seen in 2011, 2012, and 2019, followed by a subsequent fall. The scientific community's ongoing interest in the subject is probably what led to the rise in articles between 2007 and 2019. These variations might result from the article selection process, which is predicated on the literature map as outlined in this review's (chapter 2.2). Furthermore, it's possible that the field's futuristic character and continuous advancements have contributed to the shift in motivation from year to year.

But from 2019, there has been a decrease, which may be related to the unfavorable consequences of the COVID-19 epidemic. During this time, research productivity and interest in the topic may have decreased due to negative broadcasts and disruptions caused by the pandemic. The distribution of document types in the selected papers is shown in Figure 4 shows that most of the papers are review papers and conference papers, which indicates that the discussion is mainly based on the recent and peer-reviewed literature. The fact that some of the selected papers include book chapters and books suggests that the papers are based on more comprehensive and elaborate sources, which are also used to establish a background and context. The addition of generic documents increases the variety of the sources, which may bring in fresh views or additional data. In general, this selection seems to offer a fairly comprehensive and balanced starting point for a strong discussion.

Table 2. Overview of selected papers

Reference	Authors	Short summary
[15]	(Marwick and Ellison, 2012)	The document explores the impact of social network sites, particularly Facebook, on public displays of grief and portrayals of the deceased through analysis of posts and comments on memorial pages.
[16]	(Ahmad, 2016)	The document discusses creating simulations of deceased individuals using Big Data for living individuals to interact with by proxy.
[17]	(O'Gorman, 2010)	The subject matter of "Angels in digital armor: technoculture, myth, and suicidal behavior" is the intersection of technology, culture, heroism, and suicidal behavior in the context of modern society.
[18]	(Öhman and Watson, 2019)	The subject matter of the research article is the future accumulation of deceased Facebook user profiles and the challenges of preserving digital remains.
[19]	(Brubaker *et al.*, 2013)	The document discusses how Facebook serves as a platform for expanding death and mourning practices in the digital age.
[20]	(Rauterberg, 2021)	Research in human-computer interaction (HCI) since 2009 has evolved UX/UI design for end-of-life systems, culminating in interactive posthumous personhoods utilizing data from the deceased, integrating natural language processing (NLP) and mixed reality (MR) to enhance fidelity and address ethical and ontological concerns for mainstream acceptance.
[21]	(Graikousi and Sideri, 2020)	The article "Death in digital spaces: social practices and narratives" explores the impact of new technologies on perceptions and practices of death.
[22]	(Savin-Baden and Burden, 2019)	The paper discusses the development of digital immortality through personality capture, brain simulation, and life after death in the digital realm, addressing ethical, social, and religious implications.
[23]	(Paul-Choudhury, 2011)	The subject matter explores the creation, preservation, and management of digital legacies after death.
[24]	(Altaratz and Morse, 2023)	Exploring the use of new photographic technologies for coping with loss, grief, and processing the deceased in a postmortal society.
[25]	(Galvão *et al.*, 2021)	The document explores the implications of digital immortality on human values and emotions through focus group analysis.
[26]	(Massimi and Charise, 2009)	The document explores the intersection of death and technology in the field of HCI and introduces the concept of thanatosensitivity.
[27]	(Hurtado, 2023)	Techno-capitalism and immortality imaginaries in the 21st century, focusing on the intersection of technology, capitalism, and immortality projects.
[28]	(Sas *et al.*, 2019)	Digital death research explores the impact of technology on social connections with deceased loved ones.
[29]	(Farman, 2019)	The document explores the convergence of technology and biology to achieve transhumanist goals of immortality and health beyond the constraints of carbon-based life forms.
[30]	(Bryson, 2012)	The impact of internet memory on life after death and digital memorials across generations
[31]	(Maciel *et al.*, 2015)	The document explores the management of digital legacies after death, focusing on Brazilian users' experiences with Google Inactive Accounts.
[32]	(Galvão *et al.*, 2017)	The document explores digital immortality and the preservation of digital legacies beyond the physical body through technology.
[33]	(Massimi *et al.*, 2011)	Exploring the intersection of technology and end-of-life experiences in HCI research.
[34]	(Maciel and Pereira, 2015)	The subject matter of the paper is post-mortem digital legacy and its impact on HCI systems.
[35]	(Zinchenko *et al.*, 2023)	The document explores the concept of digital immortality and the role of AI in advancing towards unattainable scientific goals.
[36]	(Cebo, 2022)	The document explores the concept of digital immortality, virtual humans, and the implications of advancements in artificial intelligence on society and ethics.
[37]	(Brubaker *et al.*, 2014)	The paper discusses the management of post-mortem data on social network site (SNS) accounts, proposing stewardship as an alternative to inheritance model.
[38]	(Galvão *et al.*, 2019)	The article discusses user perceptions and values regarding digital immortality and the ethical implications of preserving a person's digital identity after death.
[39]	(Maciel and Pereira, 2017)	The subject matter is the challenges faced by Information Systems in addressing death and digital legacy, including technical, legal, ethical, and cultural considerations.
[40]	(Maciel and Pereira, 2013)	The document discusses the challenges and solutions for managing digital legacy after death.
[41]	(Acker and Brubaker, 2014)	The article discusses the challenges and implications of memorialization and bereavement practices on social media platforms in relation to personal archives.
[42]	(Savin-Baden *et al.*, 2017)	The document explores the concept of digital immortality and its implications in knowledge management, communication, AI, ethics, society, and law.

3.1.1. Articles keywords

The most often used keywords as illustrate in Figure 5 are "Death" and "Digital," indicating the close relationship between the two concepts. This area of study explores the goal of using technological progress to transcend human death, as well as the moral and philosophical implications of this undertaking.

The words "humain" and "people" highlight who stands to gain the most from these new technologies. The goal of digital immortality is to allow people to continue to exist and have an impact after they pass away, providing opportunities for future generations to be remembered and carried on.

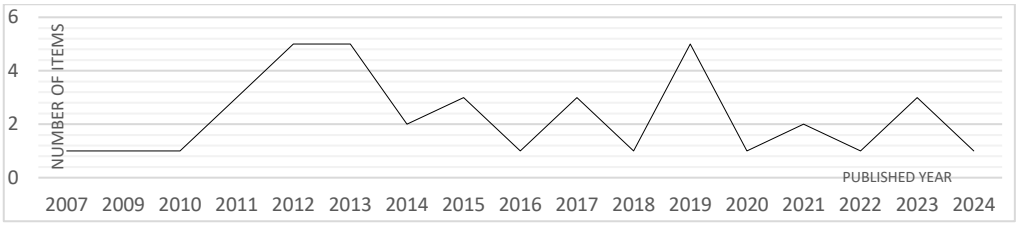

Figure 3. Selected items according to published year

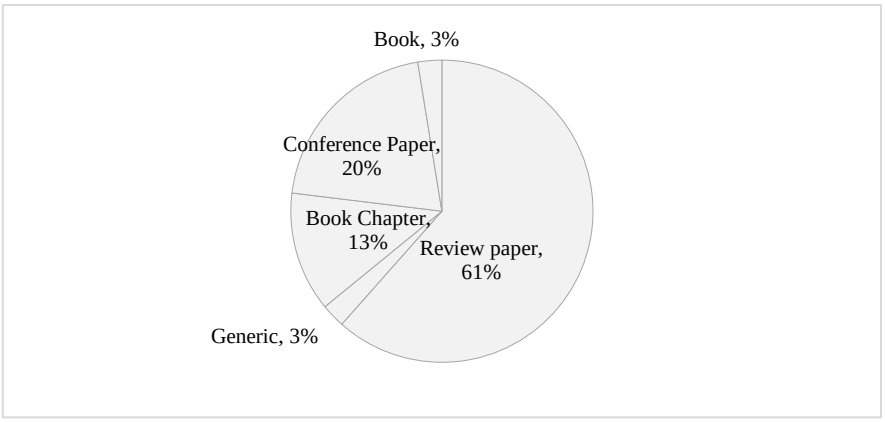

Figure 4. Statistics that show the nature of the selected articles

In the research that are looked at, Facebook comes out as the most popular platform, emphasizing its crucial role in creating and maintaining digital identities. Facebook serves as a platform for social interactions and the exchange of information, making it an ideal place to investigate the effects of digital immortality on the preservation and handling of personal data. The concepts of "data," "information," "design," and "technologies" come to light as crucial factors in the realization of the idea of "digital immortality". Technological developments like virtual reality and artificial intelligence give new opportunities for producing durable digital representations, but data analysis and preservation remain vital to the reconstruction and maintenance of digital identities. Finally, the "cultural" and "social" dimensions show up as major topics throughout the review, and their variations are thoroughly examined. This emphasizes how crucial it is to comprehend the cultural and social ramifications of digital immortality, especially as they relate to the customs, beliefs, and funeral customs that vary among nations and communities.

3.2. The challenges and barriers to achieving digital immortality

In relation to the research questions, our findings indicate that these challenges to achieve the digital immortality can be appropriately categorized as challenges related to digital content (section 3.2.1). This process is complex and is divided into four themes: duplicate content (section 3.2.1.1), save and protect the content (section 3.2.1.2), access to content (section 3.2.1.3), the digital content inheritance and ownership (section 3.2.1.4) and also anther perspectives related with design system (section 3.2.2) related with financial perspective (section 3.2.3) autonomy and integrity of digital selves (section 3.2.4) related with significance of mourning (section 3.2.4) desire of the deceased (section 3.2.5) as summarized in the chart in Figure 6. All of these possibilities represent fairly profound ethical, technical, and legal concerns that must be resolve d in order to realize the digital afterlife. All of these findings are discussed below. In finally, we have presented some of the most important recommendations and innovations aimed at achieving digital immortality (section 3.2.2).

Figure 5. Selected papers keywords

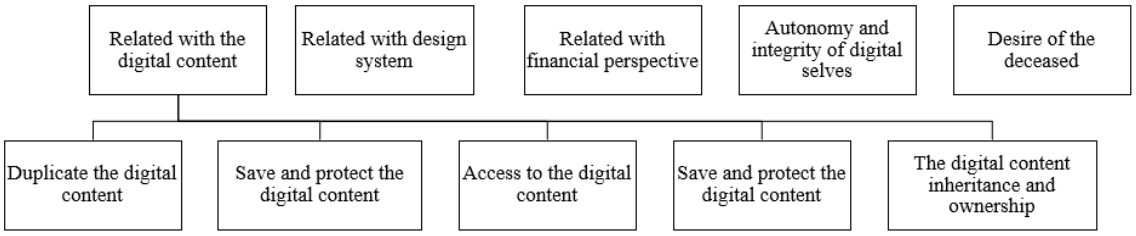

Figure 6. Chart of proposed challenges to achieving the digital immortality

3.2.1. Related with the digital content

In this article, "digital content" refers to any form of data, information, or media that exists in digital format. This includes but is not limited to text, images, videos, audio recordings, social media posts, emails, documents, and any other digital files that contribute to a person's digital footprint or legacy. In the context of achieving digital immortality, digital content encompasses the collection of data and information that can be preserved, accessed, and potentially used to recreate or represent an individual's identity, personality, and life experiences in a digital form. Our analysis revealed several key obstacles to achieving digital immortality, including challenges related to duplicate content, save and protect content, access to content, content inheritance and ownership.

A. Duplicate the digital content

The passing from life to death in the digital world brings with it a host of complications, especially with regard to the expansion of identities mediated by technology and the digital preservation of assets. Concerns about digital footprint duplicate, security, and privacy were clarified by Massimi and Charise [26]. The persistence of several incarnations of an individual's identity after death becomes a tragic reality, frequently deviating from the deceased's original wishes, with the ease with which digital copies of personal data may be created and stored. The problem of duplicate material and identity replication is made worse by the widespread use of social networking sites like Facebook. The difficulties in determining legitimacy and authenticity on memorial pages are highlighted by Marwick and Ellison [15], who point out that the distinctions between virtual impersonation and sincere remembering are blurred by the replicability of identities.

Furthermore, Brubaker *et al*. [19] explore the complexities of navigating postmortem identities in the midst of the clamor of competing stories that surface on social media platforms. The recollections and viewpoints of numerous persons from different social spheres combine to create a mosaic of identities that poses substantial issues to the management and symbolic ownership of representations of the departed. The collision of stories highlights the technological constraints in balancing conflicting representations in a common online environment while also making the process of negotiating identity more difficult.

B. Save and protect the digital content

Paul-Choudhury [23], conserving one's digital heritage has become a critical issue in today's digital environment. People are creating enormous volumes of internet data from social media postings to private images and the difficulty is in efficiently handling and saving this material for the next generation. This archive of digital artifacts, which are sometimes referred to as a person's "digital soul," is extremely valuable as a future resource for academics and historians.

But there are many moving parts involved in building and managing a digital legacy. In spite of their best efforts, people frequently find themselves at the mercy of social media sites like Facebook, which have significant power over how user data is saved and handled. Even though projects like Diaspora are trying to give people more control, there are still worries about how susceptible digital legacies are to things like server outages Maciel and Pereira [34].

Furthermore, as noted by Cebo [36] the emergence of digital immortality brings with it a new set of ethical conundrums, notably with regard to confidentiality and safety of data. Virtual humans contain digital selves that contain a plethora of personal information, such as memories and thoughts, that could be misused or exploited. In the pursuit of digital immortality, maintaining the privacy and security of these digital entities is a significant ethical challenge.

Innovative thinking and interdisciplinary cooperation are required to tackle the complex issues related to digital content preservation. Ensuring the integrity and endurance of digital legacies requires navigating legal and cultural variations and designing resilient systems that can last beyond the life of an individual. With technology developing at an accelerating rate, we must take proactive measures to protect the rich tapestry of digital memories that make up our collective online identity.

C. Access to the digital content

Accessing digital legacies after death poses many difficulties as society grows more dependent on digital technologies to save personal data. The complexity of gaining access to private information kept on digital platforms, such as emails, documents, images, and social media accounts, is covered by Massimi and Charise [26]. Protecting sensitive data with passwords or biometric security methods is a major barrier that makes it difficult for loved ones to access vital information.

Privacy and security are raised by the question of who should be authorized to access the deceased's digital possessions. The difficulties engineers have in handling digital legacies are highlighted by Maciel *et al.* [31], especially in relation to data exclusion and a lack of platform interoperability. Unexpected events might cause users to lose access to their accounts, which raises concerns about how accounts are managed and preserved across different services. Moreover, the danger of illegal access or inadvertent use of personal data is increased by the absence of explicit policies for controlling access to files after death. Digital legacies are susceptible to abuse or exploitation when thanatosensitive concerns are not explicitly taken into account throughout the design process. In addition, engineers must ensure that digital legacies are managed with clear communication and user-friendly interfaces. In the absence of user-friendly technologies, people could unintentionally erase crucial information or make judgments about their digital assets that cannot be undone. The management of digital heritage is further complicated by the integration of data across numerous platforms. Although Google Inactive Accounts provides some relief, a more complete strategy to managing postmortem digital legacies is required, as seen by the absence of thorough integration in current solutions.

D. The digital content inheritance and ownership

When analyzing the complicated dynamics of content inheritance and ownership on social media platforms when a user passes away, it is clear that the environment is complex and varied. According to Acker and Brubaker [41], social media sites like as Facebook have an ethical dilemma when it comes to determining who should control and maintain the accounts of departed members. Although some argue that ongoing updates to the profile indicate ownership by the contributors, the harsh truth is that platforms like Facebook retain ownership and have the power to remove profiles when they see fit.

Furthermore, how a dead user's profile is accessed and interacted with is heavily influenced by the privacy settings that are already in place. Users frequently indicate that they would like their profiles to be available after death, although there are differing views on the specifics of managing profiles after death. This conundrum highlights the urgent need for a sophisticated strategy to manage the difficulties associated with digital legacies. Social networking sites are accurately described by Brubaker *et al*. [19] as developing memorialization platforms where profiles live on as interactive digital memorials that continue to accumulate information after the user's death. This occurrence calls into question conventional ideas of representation and ownership, which forces an assessment of current paradigms.

Brubaker *et al*. [37] offer a different approach and support stewardship in post-mortem data management, especially on Facebook and other platforms. Assuming stewardship involves managing data accounts on behalf of the departed while continuing to answer to surviving family members. This paradigm shift highlights the complex relationship between technology capabilities and social obligations by emphasizing the need to accommodate the demands of stewards in addition to the needs of the deceased and survivors.

Maciel *et al*. [31] point out, the lack of a strong legal framework for digital legacies makes postmortem privacy and data protection issues worse. The legal environment is further complicated by the differences between terms of service agreements and local legislation, which calls for immediate attention and extensive adjustments. Galvão *et al*. [25] highlight the need for more lucid legal frameworks to tackle the dynamic nature of digital legacies as they grapple with the legal ramifications of digital immortality. To find morally sound answers to the many issues surrounding the ownership and succession of digital assets, legislators and tech companies need to work together.

3.2.2. Related with design system

The ethical, cultural, and sociological ramifications of designing technological systems that interact with or handle data pertaining to deceased persons must be carefully taken into account. In managing such data, Massimi *et al.* [33] stress the requirement of tact and deference, emphasizing that researchers and designers must approach the design process with empathy and cultural sensitivity. Cultural viewpoints are crucial in determining how people view and interact with digital legacy left behind after death, as Maciel and Pereira [40] and Maciel *et al.* [31] have pointed out. Death-related taboos, ideologies, and beliefs affect the creation of systems, especially when those involved come from different cultural origins. In order to create inclusive and courteous digital systems that accommodate a wide range of user demands and preferences, it is imperative to comprehend and integrate cultural norms and values.

Cultural values have an impact on the design process, which makes it difficult to deal with mortality and digital legacy in information systems Maciel and Pereira [39]. Software developers' expectations and solutions for digital legacy left behind after death are influenced by cultural ideas, which raises concerns about how much personal values affect design choices. In addition, ethical issues like data reuse for AI and privacy rights need to be taken into account to guarantee the appropriate development and application of digital legacy solutions.

Designing thoughtful and respectful digital legacy systems requires interdisciplinary cooperation and interaction with a range of viewpoints. The information systems community may aid in the creation of solutions that are consistent with cultural values and beliefs around death and the digital afterlife by recognizing the diversity of data, technical devices, and user profiles Maciel and Pereira [39]. Furthermore, as Maciel and Pereira [39] point out, cultural, political, and religious convictions have an intrinsic effect on the creation of digital immortality solutions. Understanding the many cultural contexts and sensitivities surrounding the digital afterlife is necessary to create personas that can learn after death.

3.2.3. Related with financial perspective

Massimi and Charise [26] highlight the pervasiveness of death-related business activities, such as the use of software such as asset lock to manage and distribute digital assets following the account owner's passing. But most consumer software packages don't explicitly prepare for death, which means that end-of-life planning must be done using already-existing technology, underscoring the need for more specialized solutions. Maciel and Pereira [39] stress the need of seeing digital assets as essential parts of a person's estate from a financial standpoint. Deciding how much to value digital assets and include them in an estate plan is a difficult decision that affects inheritance, taxes, and financial obligations. The expenses of maintaining digital legacy platforms and building digital monuments should also be taken into account during the financial planning phase.

Öhman and Watson [18] also analyze the effect of digital death on the profitability of online platforms, pointing out that memorialized profiles on sites like Facebook can draw additional visits from live users who are grieving. This occurrence highlights the financial incentives associated with conserving digital legacies and indirectly helps to the platforms' financial viability. In their investigation of the moral and practical issues related to digital remains legislation, Sas *et al.* [28] highlight the necessity of legal frameworks that protect human dignity and forbid economic exploitation. The "informational corpse of the deceased" debate highlights how difficult it is to strike a balance in the digital sphere between business and morality.

Concerns regarding the commercialization of digital immortality and its effects on social inequality are also brought up by Zinchenko *et al.* [35]. Existing inequalities are made worse by the possibility that only the rich will have access to life-extending technology, which might spark new class conflicts centered around

the value and length of human life. Furthermore, there are ethical concerns around permission, privacy, and the appropriate use of AI when emotional ties to departed loved ones are exploited for financial gain.

3.2.4. Autonomy and integrity of digital selves

The idea of "digital immortality," in which people live on virtually even after they pass away, presents difficult moral and legal issues about the integrity and autonomy of digital identities. Ahmad [16] raises questions surrounding the validity and integrity of these representations, as well as the possible repercussions of mimicking a person's identity through digital traces and the creation of convincing avatars. Savin-Baden *et al.* [42] highlights the complex ethical issues related to digital immortality, especially with regard to autonomy. Keeping up a digital presence after death challenges concepts of agency and control over one's digital self by obfuscating the line between the virtual and physical domains. Questions of permission and decision-making autonomy are among the rights and obligations related to digital identities that are brought up by this blurring of boundaries. Additionally, talks about the moral ramifications of maintaining a digital presence after death. Concerns over the preservation of personal autonomy and the possibility of outside manipulation or exploitation of the digital persona may arise if a person's digital personality persists after death. Concerns are raised over the degree to which a digital self can accurately represent the desires, principles, and convictions of its physical counterpart, as well as the possibility of future divergence between the two.

Additionally, Savin-Baden and Burden [22] address the legal nuances associated with managing digital identities after death, raising issues about the autonomy of digital selves apart from the mortal presence's control. In the digital sphere, concerns of ownership, agency, and accountability become more complicated due to the legal ramifications of having a presence that goes beyond one's physical existence. Galvão *et al.* [25] tackle the moral and legal quandaries surrounding the treatment of digital replicas as human beings and assigning accountability for the actions of virtual avatars. The ethical landscape of digital immortality is further complicated by the contrast between one-way and two-way immortality, commercialization challenges, and consequences on grief processing; these factors call for careful evaluation of concerns of autonomy and integrity.

The important ethical ramifications of digital immortality are emphasized by Cebo [36], especially with relation to the autonomy and rights of digital selves. Traditional ideas of identity and autonomy in the digital era are called into question as technology makes it possible to create digital copies that are capable of independent life. These problems center on ownership, agency, and permission for these entities.

3.2.5. Related with significance of mourning

Deep considerations regarding the value of grieving and the emotional process of coping with loss are brought up by the development of digital immortality and the preservation of digital legacies. In his discussion of the moral implications of the mourning process, Ahmad [16] raises questions concerning the possible effects of connecting with virtual representations of departed loved ones. There is concern that prolonged engagement with these kinds of simulations can lessen the significance of grieving and grief, so changing how people perceive loss and the process of emotional recovery.

Additionally, Savin-Baden and Burden [22] talk on the difficulties associated with how digital immortality affects grieving, the afterlife, and mourning customs. The rise of technology-enabled digital immortality may reshape conceptions of death, postmortem adoration, and embodiment. The intricacy of the problem is highlighted by the understudied emotional, social, and economical effects of active digital immortality on friendships, coworkers, and institutions.

Galvão *et al.* [32] explore how the idea of digital immortality subverts conventional ideas about life, death, and the use of technology to achieve everlasting life. The ethical implications of creating systems that anticipate users' impending deaths are called into question by this, especially in light of the potential effects on emotional closure and grieving customs. Galvão *et al.*, 2021 [25] emphasize the ethical issues of digital immortality, specifically with regard to the preservation of human values and emotions. Posthumous interactions with digital avatars of deceased persons highlight the need to be sensitive to and respectful of the mourning process by raising issues of autonomy, relational dynamics, emotional well-being, trust, and informed consent.

The possible effects of digital immortality on cultural behaviors, religious beliefs, and societal standards are highlighted by Cebo [36]. The advent of digital entities that emulate departed persons has the potential to upend conventional concepts of life, death, and the afterlife. This might provide a challenge to established ethical frameworks and require a reassessment of values and beliefs in light of technical breakthroughs in this domain.

Zinchenko *et al.* [35] also voice worries on the psychological effects on people who are mourning a loved one's passing. Engaging with virtual clones has the ability to obstruct the normal grieving and

acceptance process, so impeding emotional recovery and resolution. The development of avatars and other digitally immortal personalities presents difficult moral, legal, and societal questions in the context of digital immortality. Though it's still difficult to create a completely digital immortal, businesses like Eter9, Lifenaut, and Eternime are leading the way in providing chatbot-based forms of digital immortality Savin-Baden and Burden [22]. Aspects such as ancestor veneration avatars and inadvertent digital footprints left by the "restless dead" raise concerns about the effects of the digital afterlife on receivers and society, especially in light of the rise of digital legacies and traces.

3.2.6. Desire of the deceased

Respecting the wishes of the deceased in the context of digital immortality raises significant ethical problems that include consent, autonomy, and privacy. Emerging technologies that can use personal data of departed people to simulate them bring complicated moral issues that need to be carefully considered. The concept of permission is one of the main ethical issues. Ahmad [16] concerns the extent to which portrayals of the deceased are based on their express consent. Although there are legal precedents for managing the likeness and estates of deceased celebrities, it is unclear how these cases relate to regular people. The ethical conundrum concerning the consent of departed people to be simulated without their express permission is highlighted by this lack of clarity.

Furthermore, Zinchenko *et al.* [35] delve into the ethical implications of digital immortality, particularly concerning the development of interactive chatbots and digital twins of deceased individuals. They raise concerns about the lack of consent from the deceased themselves, highlighting the ethical complexity inherent in perpetuating digital representations without explicit authorization. This ethical dilemma underscores the importance of ensuring that technological advancements in digital immortality are aligned with the desires and autonomy of individuals, even after death.

Moreover, the concept of "digital immortality" prompts inquiries into the autonomy of individuals in determining the fate of their digital legacies. Galvão *et al.* [25] highlighted the importance of autonomy in decision-making regarding the immortalization of digital legacies, emphasizing a strong preference for individuals to retain control over their own digital afterlife. This underscores a fundamental desire for agency even beyond death.

Researchers have also emphasized how important it is to honor the deceased's autonomy when it comes to releasing personally intimate information after death Sas *et al.* [28]. People's views about how their digital assets should be managed after death are greatly influenced by cultural values pertaining to privacy, trust, ethics, and interpersonal relationships Maciel and Pereira [39]. Control and power over one's digital presence after death are among the ethical issues raised by digital immortality. Concerns are raised by Savin-Baden *et al.* [42] on who should be able to control and erase digital data after death. In the context of developing technologies like data mining, machine learning, and AI, where decisions made by digital immortals may have an impact on actual circumstances, these ethical considerations become even more crucial.

Respecting the wishes of the dead is difficult because it involves deeply ingrained cultural and societal conventions in addition to legal and technological issues. According to Graikousi and Sideri [21], the idea of digital immortality poses ethical concerns concerning emerging technology, the will of the departed, and the impact of our digital presence on how our memories are shaped after we pass away. These social observations highlight the necessity of a complex strategy that takes into account the wider ethical ramifications woven throughout our cultural fabric in addition to legal and technological considerations.

The wishes of the departed are at the center of arguments on postmortem representations in the current discourse surrounding digital immortality. Galvão *et al.* [38] draw attention to apprehensions surrounding the unquestionable immortality of digital entities and stress the significance of honoring the desires of loved ones when preserving their legacy. This statement emphasizes the moral necessity of honoring people's autonomy and choices even after they pass away.

Technology-wise, it can be difficult to make sure that digital platforms and systems are made to respect the wishes of the departed. In their 2017 paper, Maciel and Pereira [39] address the moral dilemmas information systems have when dealing with death and the ensuing digital legacy. The need to protect users' data after their passing while honoring their desires for access and control over their digital legacy is one of these difficulties. In order to do this, technological security measures must be accompanied by a strong moral commitment to respecting people's autonomy and wishes for all time. It will be crucial to manage the difficulties of permission, autonomy, and privacy as the field of digital immortality develops. In order to create frameworks that protect the rights and wishes of the deceased while simultaneously resolving the moral dilemmas raised by the ongoing use of digital legacies, stakeholders from the legal, technological, and societal spheres must communicate and work together.

3.3. Technologies and platforms aimed at preserving digital legacies

Hurtado [27] talks about how brain scanners are essential to obtaining digital immortality. By virtually mimicking the structure and functioning of the brain, these scanners aid in the transfer of consciousness from the human body to an electronic medium. These developments open the door to uploading consciousness to a data server, which redefines people as cybernetic creatures made of coded information rather than just biological beings. It is expected that techno-capitalist enterprises would spearhead the construction of this digital infrastructure.

By changing the human form into nonbiological substrates, synthetic biology aims to transcend human limitations and explore the idea of health beyond biological restrictions. Farman [29] delves into this idea. Through the release of the mind from biological limitations, this metamorphosis seeks to achieve immortality and make people indiscernible from sentient machines. By combining artificial intelligence, synthetic biology, and nanotechnology, the goal is to fundamentally alter human existence by redefining the limits of what is considered to be nonlife.

Cebo [36] investigates the possibility of achieving digital immortality by implanting neuro-nanorobots in the brain. The prospect for maintaining consciousness within a specialized computer following the natural death of the physical body is presented by these nanorobots, which are intended to replace brain cells and communicate with computers. As the hub and processor of the data field, this digital brain that houses the person's consciousness raises important issues regarding identity, awareness, and the rights of digital selves in the digital era.

In order to maintain digital memorials and achieve digital immortality, Bryson [30] emphasizes the significance of developments in digital storage medium and data types. Through these developments, people can continue to impact society and culture long after they pass away by preserving and making digital memorials accessible throughout time. By enabling the permanent preservation of thoughts and memories, externalized memory via digital technology provides a type of immortality.

O'Gorman [17] talks about how people can experience immortality through internet connections and artificial intelligence in the digital sphere. As a result of ongoing technical developments, there is a possibility for human awareness to interact and exist in virtual realms perpetually, which challenges accepted ideas about existence and mortality. As part of the virtual Barry project Savin-Baden and Burden [22], a virtual character named Barry was created based on a real-life human. In order to collect information about Barry, the project used a variety of techniques, including in-person interviews, audio transcription, Skype voice interviews, Skype text-chat interviews, and responding to questions uploaded onto an interview application. Additionally, as part of the development process, information was extracted from documents and social media posts created by Barry as well as imported and filtered data from his web browser, address book, calendar, and mobile phone.

In order to memorialize the deceased, Rauterberg [20] investigates the emergence of posthumous personhoods through the use of MR technology. In order to improve fidelity and evidentiary status, this approach entails building interactive digital representations of people. MR technology is utilized to create a spatial presence, agency, identity, and subjectivity. In order to improve the validity of these representations, the co-construction process makes use of particular data sources and NLP methods. Through the resolution of technical issues and the promotion of trust in the depictions, MR technology plays a role in continuing conversations and engagements with the deceased, transforming the ways that modern society mourns and memorializes the dead. In order to attain digital immortality, Altaratz and Morse [24] investigate how computational photography, virtual reality, and AI come together to allow users to engage with incredibly lifelike avatars of deceased people. These technologies are changing the ways that people mourn and remember their loved ones by enabling posthumous encounters and new narratives.

4. A DISCUSSION OF THE MOST IMPORTANT CHALLENGES INVOLVED IN ACHIEVING DIGITAL IMMORTALITY

This paper is the full report to the current research that aimed to attain digital immortality. Our study comprised of the search for relevant literature to figure out the barriers and possible solutions of this field. A total of 39 studies were selected and analyzed, focusing on five main topics: i) the obstacles to achieve digital immortality and ii) technologies that are designed to safeguard digital legacy. In light of our results, we are convinced that the problem of digital immortality is rooted in various legal, ethical, and social issues. Also, the key role of content, its method of collection and integrity in digital immortality research is highlighted as the content (data) is the basis for the success in achieving this objective. In addition to being considered the largest content that has received the most attention on the subject, this is natural considering that content is the raw material for achieving digital immortality. Along with these, the report has found that

technology is generally improving but is still weak and the results have mostly been future oriented. Now we will begin to answer the research topic:

4.1. What are the challenges and barriers to achieving digital immortality, and how do they impact its realization?

4.1.1. Dealing with deceased digital content is the biggest challenge

Based on the literature review, we have established several key research questions concerning digital content that hinder the achievement of digital immortality. These are the issues of duplicity of digital content, archiving and safeguarding of digital content, availability of digital content and questions regarding the legacy and ownership of digital content. The replication of digital assets is a major issue, as Georges [43] also notes, as multiple versions of a person's digital presence may exist after their death, contrary to their wishes, because of the ease of copying and storing digital information. Riechers [44] also stress the challenges of preserving the integrity of the digital memorials, as the distinction between the real and the fake is often vague. The issues of digital content preservation and protection are crucial, as Carroll and Romano [45] underline the need to control and store the enormous amount of digital information people generate, which is called their 'digital essence'. However, the use of social media platforms such as Facebook for data storage has its weakness for instance; server breakdown [46], [47]. Obtaining information after the death of a person is challenging, especially when it comes to privacy and security of the data. Holt *et al.* [48], [49] also explain that it is not easy to access personal data on digital platforms because of the security and privacy settings that may hinder other family members. Likewise, the issues that engineers encounter in handling digital legacies, particularly regarding data exclusion and the inability of platforms to communicate with one another, are highlighted by Heutelbeck *et al.* [50], Khalil and Stravoravdis [51]. The ownership and succession of digital assets are also not without issues. Rauterberg [20] and Farooqui *et al.* [52], Moncur [53] explain the ethical issues of who gets to control the accounts of the deceased and the consequences of digital legacy. Further, Brubaker and Callison-Burch [54] explain how social media platforms become sites of memorialization, disrupting the conventional concepts of representation and ownership. Edwards and Harbinja [55] have noted that the lack of sound legal systems worsens postmortem privacy and data protection concerns. Another surprising finding was the level of influence that social media platforms have over the destiny of digital remains, which may be in contrast to the user's wishes. This is why there is a need to increase user control and openness in how content is handled after the user's death. Moreover, the ethical aspect of digital afterlife, especially regarding the privacy and security of digital avatars, was deeper than expected [36].

One of the main limitations of the present study is that the literature used in the research focuses on the Western context of digital immortality. This geographic bias may fail to consider how people from different cultures approach the management of digital legacies and the legal systems in different parts of the world. Further, due to the fast-growing rate of technological development, it is possible that the results of this study will become outdated soon, which calls for further research in this rapidly evolving area. Further research should be conducted on the creation of best practices for handling digital estates that take into account cultural differences and laws. Exploring the possibilities of decentralized data storage systems, including the use of blockchain technology, may provide better protection and ownership of the stored data. Future research should also explore the psychological and social effects of digital immortality on the remaining family and the society. In conclusion, digital immortality is a complex process that entails several major issues concerning the replication, archiving, retrieval, and succession of digital assets. Solving these problems calls for creativity, interprofessional cooperation, and strong legal frameworks to facilitate the proper and safe handling of digital estates. The significance of this research goes beyond the personal and concerns the role of identity and memory in the culture of the digital society.

4.1.2. The impact of digital immortality on the importance of mourning is significant

The exploration into the significance of mourning in the context of digital immortality reveals several critical insights. Prolonged interaction with digital avatars of deceased individuals can potentially diminish the traditional grieving process and alter perceptions of loss and emotional recovery. Studies suggest that engaging with these virtual representations can delay acceptance and resolution of grief, impacting emotional well-being [56]. This finding aligns with broader research on the psychological effects of interacting with digital entities posthumously. Previous literature has highlighted the potential for digital immortality to reshape traditional mourning customs and posthumous adoration, demanding a reevaluation of cultural behaviors, religious beliefs, and societal norms regarding death and the afterlife [57]. An unexpected yet significant result from this exploration is the potential for digital immortality to create a sense of continuous presence that can interfere with the natural progression of grief. This is particularly pertinent as it challenges the conventional understanding of death and the finality required for emotional closure. The literature has started to address these concerns, noting the psychological effects on individuals who are mourning and the broader societal implications [58].

A primary limitation of this research is the nascent stage of technology-enabled digital immortality. The long-term effects of engaging with digital avatars of deceased loved ones are not fully understood, and current findings are based on preliminary studies. Additionally, the emotional and psychological impacts are deeply personal and can vary widely among individuals, making it challenging to generalize the results. Future research should focus on longitudinal studies to better understand the long-term psychological impacts of digital immortality on the grieving process. Additionally, there is a need for more comprehensive studies that explore the cultural, religious, and societal implications of digital immortality. Research should also investigate the ethical considerations, including informed consent and the preservation of human values and emotions in digital representations. The exploration into digital immortality and its effects on mourning underscores the potential disruption to traditional grieving processes and emotional recovery. Prolonged interactions with digital avatars of the deceased can impede emotional closure and alter perceptions of loss. These findings highlight the need for careful consideration of the psychological, ethical, and societal implications as technology continues to evolve. In conclusion, while digital immortality presents innovative ways to preserve legacies, it also necessitates a reevaluation of our approaches to mourning and emotional healing. Ensuring that the mourning process remains meaningful and respectful is crucial in the age of digital immortality.

4.1.3. Self-determination must be respected

Digital immortality also raises the issue of the self-determination of people regarding the destiny of their digital assets. Hutson and Ratican [59] state that people's expectations about their digital legacy can be quite diverse, which is due to individual, cultural, and ethical factors. Another emergent issue is the lack of consideration of the end-of-life preferences of the user when designing the digital platforms and systems. This leads to the question of how technological security can be implemented in a way that is consistent with the decedent's wishes regarding access and control of their digital property [60]. This variability shows that it is crucial to honor the subject's choices in designing and implementing digital afterlife. One of the most significant yet surprising discoveries is the multicultural nature of values that define attitudes toward post-mortem control over digital assets. People from different cultures have different perceptions towards privacy, trust and handling of digital assets after their demise and therefore, they have different ways in which they would like their digital assets to be managed. This cultural variability underlines the fact that there is a need to approach the issue of digital immortality with a cultural sensitivity, that is, the need to consider the cultural norms and beliefs of the society in question [1].

Another weakness of the current research on digital immortality is that there is no extensive legislation that protects the rights and preferences of ordinary people. There are legal cases that address the management of the digital estates of celebrities, but these do not work well for the common populace. Furthermore, technology interventions should be developed in a way that honors the patient's preferences, which is a major concern as highlighted by Caon [61]. Further research should be aimed at creating effective ethical and legal guidelines for digital immortality that would guarantee the subject's consent and self-determination. It is crucial to have legal scholars, computer scientists, and ethicists work together to develop policies that respect the rights and preferences of the deceased. Moreover, it is also important to continue the research on the role of cultural values in managing digital legacy to have a broader perspective on the ethical aspects. Therefore, honoring the preferences of the deceased in digital immortality entails several ethical concerns concerning consent, autonomy, and privacy. These challenges can be met by obtaining express consent, taking into account cultural differences, and creating sound legal and technological approaches. This discussion raises the question of how to ethically approach the development of digital immortality technologies with the help of a multidisciplinary approach.

4.1.4. Financial impact is one of the key drivers controlling digital immortality

There are many financial consequences of digital immortality. The digital presence after death affects relationships, institutions, and businesses financially. Digital immortality of intangible cultural heritage can also be useful for cultural preservation and tourism industries. There is a clear necessity for specific software to handle digital estates after the owner's death, and the monetization of memorialized accounts on social media platforms is a clear sign of tangible revenue for businesses. These results are in line with existing research on the economic dimensions of digital estates. Digital immortality is not only about keeping the memories of a person alive but also about economic activities concerning the maintenance of the digital assets. The requirement for the particular software and services to handle the digital belongings after the person's death is essential [62]. Also, the possibility of making money by having memorialized profiles on social media platforms shows that there is a financial gain for companies to support digital immortality services [56].

One of the surprising observations is the focus on the possible profit that can be made by companies and sites from digital immortality. For example, the capability to continue having celebrities present in the digital world and keep their images alive can create new sources of income and keep the celebrities' marketable after their death [56]. Thus, the digital legacies have a commemorative and commercial function at the same time. Some limitations are as follows. It is still challenging to determine the value of digital assets and has no unified approach, which creates problems in financial and legal processes [62]. Moreover, the issue of consent and privacy in the case of digital immortality also raises significant ethical concerns, which require proper regulation [63]. Future studies should aim at identifying the best approaches to valuing digital assets in estate planning. There is a need for more empirical research that focuses on the long-term financial consequences of preserving digital legacies for the individual and the online platforms. Exploring the ethical concerns and developing sound legal defenses for the prevention of the commodification of digital remains will also be other important areas for future research. Understanding the user perceptions and acceptance of digital immortality, as pointed out by [64], can be useful in creating financially sustainable and socially acceptable digital immortality services. It takes into account all segments of society, regardless of their income

4.1.5. The integrity of digital selves after death is a major concern

Digital afterlife, or the ability of people to continue their existence in the digital world after their death, raises many ethical and legal issues. It raises questions about the nature of the digital avatars that can learn and develop after the death of their owner, focusing on the questions of identity and credibility. Furthermore, it discusses the general consequences of digital immortality, including emotional, social, and legal aspects and raises the question of the need for such technologies. These findings are relevant to current debates in the literature on the moral issues of artificial intelligence and digital technologies. Kocarev and Koteska [65] describe the ontological and ethical characteristics of digital personas and the possibility of their having their own ethical code. This underlines the importance of further research on the ethical implications of digital immortality and its compliance with the current ethical framework.

One of the unforeseen consequences is that digital immortals may act independently and in a way that is quite different from the original person's values and goals. This is a cause for concern in terms of the stability and ownership of online avatars. In the study by Calvo *et al.* [66] stressed the need to incorporate human autonomy into AI systems and pointed out that failure to do so may result in ethical issues. The first weakness of the current research on digital immortality is that the technology and its ethical issues are still hypothetical. Since these systems are still in the developmental stage, many of the discussions are still hypothetical. Therefore, there is a requirement for future research to investigate the concrete application and consequences of digital immortality, as Zlatovic [67] did, focusing on the practical feasibility and social acceptance of digital immortality practices. Further research should be directed towards the creation of sound ethical principles and legal regulations concerning digital afterlife. This includes examining the legal status of digital selves, the veracity and accuracy of avatars, and the possibility of deceit or coercion. Furthermore, future studies should investigate the psychological effects of digital immortality on grieving processes and the public's attitudes, as White pointed out [68]. All in all, digital immortality raises significant ethical and legal issues regarding the nature and agency of digital selves. Solving these problems implies a reconsideration of the ownership, agency, and consent in the context of digital media. Further research should be focused on creating a set of rules and strategies for dealing with the issue of digital immortality as it is a rather vast area.

4.1.6. A design system must respect cultural diversity and ethics

The results of the study are consistent with existing literature emphasizing the challenges of designing information technologies that are culturally sensitive and ethical. Zlatovic [67] describes the state of current digital immortality practices and their accessibility, and the social and cultural consequences of these. Furthermore, Kobyzhcha [69] stress the importance of the interdisciplinarity in the digital thanatology to investigate the effects of the digital immortality on the cultural memory and the society. Among the surprising discoveries, the authors identify the importance of personal values in the design process, which poses ethical questions regarding the reuse of data for AI and privacy. In a similar vein, White [68] dismisses the attempts at achieving digital immortality because they are based on metaphysical misconceptions about information and change. This underlines the necessity of the creation of the clear rules and ethical norms for the proper usage of the digital legacy tools.

The following are the limitations of this study; the cultural bias of the researchers, the dynamic nature of digital technology and culture. The future studies should involve participants from different cultural backgrounds and should take into account the development of new technologies that can influence the use of digital legacy systems. Also, there is a lack of empirical research to substantiate the ethical frameworks suggested for dealing with digital legacies. Further studies should focus on the integration of sociology,

anthropology, and ethics into the creation of digital immortality systems to develop better solutions that are culturally sensitive. There is also the need to set international policies and ethical measures on how to handle digital assets in a responsible manner while respecting privacy and cultural aspects. More research should also be directed towards the creation of systems that can be updated to reflect the dynamic cultural trends and the ever-improving technologies.

4.2. Progression technologies for preserving digital legacies

The studies on technologies and platforms that focus on the creation of digital afterlife have revealed various strategies and findings. One of the most striking observations is the need for proper digital storage and organization of personal documents and items, and the possible involvement of libraries in this process [70]. Another view focuses on the role of digital technologies in the art context to maintain cultural heritages especially those concerning historical genocides using VR and AR [71]. In addition, intelligent agent and web service based architectures like the PROTAGE system are being designed to support and improve long term digital preservation [72]. Also, the use of digital platforms in palliative care to address grief and memorials demonstrates the changing use of social media and digital assets in end-of-life situations [73].

Finally, the community-based approaches to archiving and curating of intricate digital objects provide new ways of sustaining digital culture in the long run [74]. These findings contribute to the existing knowledge on digital legacy preservation by incorporating perspectives from library science, digital arts, information technology, and health care. The involvement of libraries and museums in digital preservation has been an emerging issue, which corresponds to the demand for long-term and effective preservation solutions [75]. The use of digital technologies in art to record and communicate with history opens up new opportunities for interacting with cultural values [71]. In addition, the application of intelligent agents and web services for automated systems also solves the scalability issues in digital preservation [72]. One of the surprising findings was the high possibility of using digital platforms in palliative care and in dealing with grief and digital afterlife through social media and blogging. This was not expected to have such a profound influence on the practices of palliative care, which shows a paradigm shift in the use of digital assets in end-of-life situations [73]. However, there are some significant drawbacks that can be mentioned. The technological solutions for the digital preservation systems are still in the process of evolution and there are significant ethical and legal issues related to the control and ownership of the digital assets. The requirement of specialist skills and large capital investment is also a problem. Furthermore, the incorporation of digital legacy services into conventional settings such as libraries and healthcare centers is still limited and not fully developed. Future research should aim at creating a more elaborate framework that would encompass the ethical and legal aspects of digital legacy preservation. Multidisciplinary research integrating elements of library science, digital arts, information technology, and health care will be important. Furthermore, the research on the applicability and availability of these technologies will guarantee their expansion and equal distribution. Future research should also explore the possible psychological effects of digital legacy management on people and societies. In conclusion, the technologies that have been developed to ensure that people's digital assets are preserved are a step towards attaining digital afterlife. The use of multiple digital platforms and intelligent systems provides new approaches to the long-term storage and interaction with digital resources. However, the ethical, legal, and infrastructural issues will have to be solved in order to fully harness these technologies.

5. CONCLUSION

Digital afterlife is an interesting concept that defines a new direction in the development of technology, culture, and morality. This work reveals the important issues that remain open, such as the issues of digital content archiving, the changes to mourning, the respect for the deceased's will, the costs, the digital self-governance and the integration of culturally sensitive systems. These challenges show that digital immortality is not a simple concept, which explains why this topic is important. Analyzing the obstacles to digital afterlife not only helps to improve the practice of digital estate planning but also makes us think about such primary concepts as identity, memory, and legacy in the context of digital culture. The issues of ethical, legal, and psychological nature of DI require the cooperation of IT specialists, lawyers, philosophers, and psychologists. These limitations of this study, for example, the fact that the research is conducted from a Western perspective and the relatively young age of the technologies in question, indicate the further need for research. Further research should investigate the influence of culture, legal systems, and the effects of engaging with digital avatars on individuals' mental health in the future. Overcoming these limitations can offer a better understanding and help in building sound, moral, and culturally appropriate digital immortality systems. Finally, it is crucial to state that the importance of this study is in the ability to affect the further practice of handling digital assets, the need to respect the will of the deceased, and the process of mourning.

As the world advances in technology, these issues have to be solved in order to make digital immortality a positive force that does not violate human rights and dignity. Digital immortality is not only a technological process of becoming but also an ethical and emotional process of becoming in the digital world.

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