

Research Article

Masaki Iwasaki*

Digital Cloning of the Dead: Exploring the Optimal Default Rule

<https://doi.org/10.1515/ajle-2023-0125>

Received September 17, 2023; accepted December 13, 2023; published online December 27, 2023

Abstract: We conducted a survey experiment in the U.S. to analyze how the consent or dissent of a deceased individual influences the social acceptability of digital resurrection. The results showed a substantial relative treatment effect of consent versus dissent, with a 2-point difference in acceptability on a 5-point scale. When the deceased had consented, 58 % of respondents viewed digital resurrection as socially acceptable, whereas this number was only 3 % when the deceased had dissented. These findings suggest that relevant legal regulations should respect the decision of the deceased. Our study then explored the optimal default rule using observational research: 59 % of respondents were against the idea of their own digital resurrection. An opt-in rule seems socially desirable, where the default is the prohibition of digital resurrection, and exceptions allow it only with consent from the deceased.

Keywords: digital clone; digital resurrection; deep learning; large language model; default rule

JEL Classification: K00; K24; L86

1 Introduction

1.1 Background and Main Results

Death, traditionally viewed as the end of one's narrative, no longer signifies a complete cessation in the digital realm. A digital clone, synthesized from both digital and non-digital information of personal histories, can now potentially extend one's presence beyond physical demise. As artificial intelligence (AI) advances, this simulated continuation of life introduces new legal and ethical quandaries. It raises

***Corresponding author: Masaki Iwasaki**, Seoul National University School of Law, Seoul, The Republic of Korea, E-mail: miwasaki@sjd.law.harvard.edu. <https://orcid.org/0000-0003-3569-2425>

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questions about consent for digital cloning and data ownership in an age where our digital selves can persist.

Digital clones have been created in various contexts up to this point. In terms of visual clones, the movie “Indiana Jones and the Dial of Destiny” showcased the digital de-aging of Harrison Ford (Bedingfield 2023). For thought clones, generative AI chatbot services like Replika and Project December have enabled conversations with chatbots simulating the personalities of specific individuals (Jee 2022).

Digital cloning technology leverages the advancements of deep learning, which is built upon neural networks. Within this framework, large language models are designed to understand and generate human-like text. Furthermore, generative adversarial networks – a subset of deep learning – play a pivotal role in creating realistic visual and audio simulations. Alongside these, computer vision techniques enable computers to interpret and generate visual data with heightened accuracy. This potent amalgamation allows it to trace and emulate an individual’s thought patterns, expressions, and idiosyncrasies with startling accuracy.

While digital clone technology can be applied to both the living and the deceased, this paper narrows its focus to the latter, namely, digital resurrection. For the living, there exists the potential to obtain consent to digital cloning and rectify discrepancies between the clone and the individual’s intentions. However, for the deceased, unless clear instructions were given during their lifetime, there is no clear avenue for consent or rectification. For these reasons, digital cloning of the deceased inherently carries a higher potential for many challenges than that of the living.

Commercial services for digital resurrection accessible to the general public have already emerged, and there is potential for the market to expand in the future. Once, a company named Eternime offered a service that allowed individuals to create their digital clone while they were alive and leave it behind after their death, but they could not secure many users (Jee 2022). However, recently, a company called “You, Only Virtual” began providing a service where users can upload someone’s text messages, emails, and voice conversations to create a chatbot (Zahn 2023). Project December is also currently offering a paid service for the general public, enabling conversations with chatbots of deceased individuals.¹ Additionally, in 2020, Microsoft obtained a patent to create chatbots from text, voice, and image data for currently living individuals, historical figures, and fictional characters (Harbinja, Edwards, and McVey 2023).

Digital resurrection utilizes data left behind by the deceased. This, however, might entail infringements of various legal rights, including copyright, privacy, portrait, and publicity. For instance, the data used for clone creation might

¹ See the website of Project December: <https://projectdecember.net/>.

incorporate the deceased's copyrighted materials. Digital clones might inadvertently expose the deceased's secrets or harm their reputation. Furthermore, there is the potential for unauthorized use of the deceased's likeness. In most legal jurisdictions, rights to privacy and reputation do not necessarily persist after death, suggesting that an individual might not have full control over how their data is handled posthumously. Consequently, prior research has proposed harnessing the deceased's expressed intentions in their will as a prerequisite for digital clone creation (Harbinja, Edwards, and McVey 2023; Roberts 2023). However, these assertions aren't substantiated with empirical evidence, leaving it unclear how the general public truly perceives the role of consent in digital resurrection. Additionally, it is ambiguous whether the conditions for allowing digital clone creation should demand an explicit expression of consent or merely the absence of dissent. The default rule that would be most socially desirable remains an open question.

Given the context outlined above, this paper contemplates two major issues. Firstly, we consider the extent to which the wishes of the deceased play a role in assessing the societal welfare or net societal benefits of digital resurrection. Theoretically, if the negative externalities of digital resurrection are significant, it might be conceivable to adopt a rule prohibiting digital resurrection from an ethical standpoint, regardless of the deceased's wishes. Conversely, if the positive externalities of digital resurrection are pronounced, a rule permitting digital resurrection regardless of the deceased's wishes could be contemplated. Moreover, if respecting the wishes of the deceased is essential while considering the externalities of digital resurrection, a rule might be considered that permits digital resurrection in certain cases contingent on the consent or dissent of the deceased. Before pondering what the optimal rule might be, we first need to explore the role played by the consent or dissent of the deceased.

Next, if the wishes of the deceased are found to play a crucial role in evaluating the societal net benefits of digital resurrection, we will consider what the optimal rule might be. Although various rules can be contemplated, for the sake of simplicity, this study will focus on examining the opt-in and opt-out rules as mechanisms to respect the wishes of the deceased.

This study addresses these two issues in the following manner. First, regarding the social net benefits of digital resurrection, we will investigate how the public perceives the societal acceptability of digital resurrection through a survey experiment. The underlying theory for this investigation is as follows: rooted in the Bayesian model of information processing, individuals form beliefs about the societal acceptability of specific cases of digital resurrection, taking into account the perceived social benefits and costs. When an individual believes that the deceased's consent plays a significant role in societal acceptance, awareness of the deceased's expressed intentions should update their beliefs. Thus, we predict that knowledge of

a deceased's prior consent will lead to higher societal acceptance than knowledge of a deceased's prior dissent. Given that a majority of the population is expected to value the presence of consent in digital resurrection, we hypothesize that the deceased's consent will significantly boost the societal acceptance of digital resurrection, particularly when contrasted with cases where dissent is expressed.

Next, to determine whether the opt-in or opt-out rule is preferable as a mechanism to respect the wishes of the deceased, we employ an observational research design and survey the public on the extent to which they would consent to their own digital resurrection under certain assumptions. This analysis is based on a theoretical model that assumes individual net benefits related to digital resurrection follow a probability distribution. As a secondary point of discussion, we also explore the possibility of using the consent of the deceased's parents as a substitute for the deceased's own consent.

In this study, we conducted a pre-post survey experiment targeting adults in the United States (U.S.), where a dependent variable was measured before and after treatments. In the experiment, participants were presented with vignettes, in which a young woman in her twenties tragically dies in a car accident. Following the accident, friends consider using a digital resurrection service offered by a company. Initially, the deceased's consent towards digital resurrection is ambiguous, but her pre-mortem intention is revealed later. There were two treatment versions: one where the deceased had given consent and another where she had dissented. Participants read one of the two versions assigned at random and responded on a 5-point Likert scale about societal acceptability of the digital resurrection both before and after the treatment.

The presence of expressed consent was associated with 2-point higher societal acceptance on average on a 5-point scale compared to the presence of expressed dissent. In the consent scenario, 58 % deemed digital resurrection socially acceptable, compared to a mere 3 % in the dissent scenario. The majority of participants believed digital resurrection was socially unacceptable when the deceased's expressed wishes were unknown. The effect of consent compared to expressed dissent was the largest in this group among all subgroups. This indicates that, for most people, beliefs regarding the societal acceptability of digital resurrection are weak when the deceased's preference remains uncertain, and the revelation of their wish shift their attitudes substantially.

To supplement the experimental study, an observational study was conducted using the same vignette to compare the case where the deceased's consent is uncertain with the case where the deceased's parents have given consent. In the scenario where the deceased's stance is unknown, only 11.3 % believed the digital resurrection to be socially acceptable. This percentage was 27 % when the deceased's parents have consented. Respondents were also asked to imagine themselves in the

position of the character in the vignette: first, if they, as the deceased, would agree to the resurrection and second, if they, as the deceased's parents, would agree to the resurrection of their child. While 28 % answered that they would agree if they were the deceased, only 17 % answered that they would agree if they were the parents.

These results indicate an association between parental consent and an increase in societal acceptance when the deceased's own stance is uncertain. However, the extent of this increase appears to be modest. Furthermore, in the context of the vignette presented, the finding that most respondents would be hesitant about creating a digital clone of themselves post-mortem, or of their deceased child, suggests a public sentiment: regardless of societal acceptability, many individuals personally oppose the concept of digital cloning.

This study aims to serve as a starting point for the topic and does not purport to make strong assertions or definitive conclusions regarding the optimal rule for digital resurrection. However, after comprehensively analyzing the above results, we derive a tentative conclusion that the opt-in rule might be more preferable than the opt-out rule. In other words, the default rule is that digital resurrection is prohibited. Digital resurrection is only permitted when there is an expression of consent.

1.2 Literature Review

This study primarily contributes to two streams of literature: the legal regulation of digital clones and the economic analysis of default rules.

First, examining the literature on the legal regulation of digital clones, Truby and Brown (2021) classified digital clones into several types and argued that regulations are necessary to protect people from unauthorized development of digital thought clones and the harmful use of personal data. Lees, Bashford-Rogers, and Keppel-Palmer (2021) discussed the ethical and legal issues surrounding the creation of deepfakes of the deceased celebrities, while Boothe (2022) focused on broader concerns, encompassing digital clones in general, of which deepfakes are but one form. Both Harbinja, Edwards, and McVey (2023) and Roberts (2023) propose using the testamentary expression of the deceased's wishes during their lifetime as a requirement for digital clone creation. However, the former believes in an opt-out rule, where digital resurrection is prohibited if dissent is expressed, while the latter supports an opt-in rule, permitting it only if consent is expressed. Much of this literature is theoretical, with scant empirical evidence. Therefore, this study empirically analyzes the role of consent in digital resurrection, filling the gap between theory and empiricism, and contributes to the literature on the legal regulation of digital clones.

Next, when considering the literature on the economic analysis of default rules, many studies have shown that the design of default rules can lead to improvements or deteriorations in social welfare. Ayres and Gertner (1989) pointed out that not only transaction costs but also the strategic behavior of contract parties stemming from information asymmetry can be reasons for incomplete contracts and discussed the possibility of default rules improving efficiency. Sunstein (2002) discussed the potential influence of default rules on people's preferences and behaviors, analyzing the effects of changes in default rules. Bar-Gill and Ben-Shahar (2021) analyzed the role of information costs in opting out of default rules against the backdrop of the increasing importance of default rules as policy tools.

Morse and Birnhack (2022) argue that the so-called "privacy paradox" – a gap between users' expressed preferences and their actual behavior when it comes to protecting privacy – persists in a changed form in the data people leave behind after death. They further discuss the potential for default rules to have a significant impact on posthumous privacy issues. This research seeks to determine whether prohibition or allowance is better as a default rule in the context of digital resurrection, thereby contributing to the economic analysis of default rules.

Section 2 delves into our theory and hypotheses, Section 3 details the methodology for hypothesis testing, Section 4 showcases the results, and Section 5 deliberates on the policy implications.

2 Theory and Hypotheses

The extent to which digital resurrection requires legal regulation hinges on its net social benefits. The social benefits of digital resurrection could manifest in numerous ways: healing the emotional wounds of the deceased's family and friends, enabling audiences to experience new works from a renowned actor after their passing, or even hearing posthumous opinions from celebrated thinkers. In contrast, the social costs could be multifaceted, potentially distorting our perceptions of life and death, or infringing upon the deceased's rights to privacy and likeness. Given that these societal benefits and costs largely depend on public perception, it becomes essential to gather people's views. In this research, we aim to achieve this through a survey experiment.

In soliciting opinions on this topic, a critical factor is how people perceive the importance of consent. Since digital resurrection can potentially violate individuals' rights, the role of consent emerges as a pivotal element. Hence, this section begins by providing an overview of the current legal regulations concerning digital resurrection and elaborates on the possible significance of consent within the legal landscape.

2.1 Legal Regulations

Legal regulations concerning digital resurrection may seem intricate at first glance, but comprehending the processes involved in creating and using a digital clone of the deceased can simplify the understanding.

The creation of a deceased individual's digital clone involves the collection and utilization of data left behind by that individual. During the data collection process, some of the data might include the deceased's copyrighted works, and unauthorized use may raise issues of copyright infringement. When using the deceased's data for machine learning, there is potential for copyright issues specific to machine learning. Depending on the purpose of the digital resurrection and the type of data used, legal restrictions might apply. There are relatively clear legal stipulations, such as Articles 3 and 4 of the European Union (EU)'s Digital Single Market Copyright Directive,² which delineate when machine learning is permissible. On the other hand, regulations like the Fair Use Doctrine under U.S. copyright law (Section 107) determine on a case-by-case basis when machine learning is allowed,³ leaving the boundaries ambiguous. Thus, legal considerations might vary based on the purpose and methods of the digital resurrection and the jurisdiction in which it is conducted.

Furthermore, during the data collection and usage processes, the deceased's secrets might be disclosed, or their likeness used without permission. A digital clone could potentially make statements or exhibit behaviors contradictory to the deceased's beliefs or philosophy. Consequently, potential infringements on rights concerning privacy, likeness, and personality can arise in digital resurrection. The content of these rights may vary by jurisdiction. However, in most jurisdictions, including the U.S. and EU, these rights typically do not persist after death, with exceptions granted only in limited cases. For instance, in the U.S., some states recognize post-mortem rights of publicity, but unless it concerns commercial use of a celebrity's likeness, winning an infringement lawsuit can be challenging (Roberts 2023). The European Commission, on April 21, 2021, introduced a regulation proposal regarding AI, demanding explicit labeling of content generated artificially when using deepfakes.⁴ However, this regulation might not be sufficient to address all the issues raised by digital resurrection.

2 Directive (EU) 2019/790 of the European Parliament and the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC, O.J. 2019, L 130/92.

3 Copyright Act of 1976, 17 U.S.C. § 107 (2012).

4 European Commission (2021) Proposal for a Regulation of the European Parliament and of the Council laying down Harmonised Rules on Artificial Intelligence and amending certain Union Legislative Acts (Artificial Intelligence Act), COM(2021) 206 (April 21, 2021), Article 52 "Transparency obligations for certain AI systems".

In this way, digital resurrection can give rise to various legal issues primarily centered on infringements of the deceased's rights. To better safeguard these concerns, as proposed in prior research, rules can be envisaged that only permit digital resurrection with the deceased's consent or that prohibit it if there's explicit dissent. Theoretically, rules allowing or prohibiting all forms of digital resurrection are also conceivable. The most appropriate default rule largely depends on how people consider the deceased's consent and dissent, not only from a legal standpoint but also considering ethical and other aspects. This is because the social benefits and costs of digital resurrection heavily depend on public evaluations.

2.2 Societal Perspectives: Bayesian Model of Information Processing

Next, we detail our theory and associated hypotheses. Our model is an application of the Bayesian information processing model (Bullock 2009). We hypothesize that an individual i holds a belief about the societal net benefit W_i of any given deceased person's digital resurrection, and W_i can be written using the function g as equation (1):

$$W_i = g(B_i, C_i; A_i, K_i). \quad (1)$$

Here, B_i and C_i respectively represent the beliefs individual i holds regarding the social benefits and costs of digital resurrection, both of which are random variables (see the beginning of Section 2 for examples of the social benefits and costs). Additionally, A_i is a random variable that captures individual i 's belief concerning the deceased's consent or dissent. The presence of consent or dissent affects the perceived social benefits and costs, B_i and C_i .

An individual possesses beliefs about B_i and C_i prior to knowing about the deceased's consent or dissent. However, upon becoming aware of the consent or dissent, their beliefs about B_i and C_i are updated, and as a result, the belief about W_i is updated. Regarding K_i , it is a vector of parameters representing individual i 's knowledge and attitudes toward AI, influencing the evaluations of B_i and C_i .

If, generally speaking, whether a deceased person has consented has a significant impact on the societal acceptability of their digital resurrection, then only a limited number of people should possess strong beliefs about societal acceptability regardless of the deceased's consent status. Many might have weak beliefs about societal acceptability when the deceased's consent is unknown.

If this holds true, most people, upon learning about the deceased's expressed consent, would likely update their attitudes in a positive direction regarding societal acceptability. Conversely, upon learning about the deceased's expressed dissent, they would likely update their attitudes in a negative direction.

To investigate this in a survey experiment, one could adopt a pre-post design: initially asking participants about their opinions on the societal acceptability of digital resurrection when the deceased's consent is unknown and later inquiring again after revealing the consent or dissent as a treatment. To elucidate the pure effect of consent or dissent, one would need to use a control group where the consent remains unknown. However, due to budgetary constraints in this research, we opt to compare scenarios where consent or dissent is made known. As highlighted earlier, most jurisdictions do not protect the deceased's rights, including privacy, likeness, and personality. Given this backdrop among others, we currently know little about whether the deceased's consent or dissent influences societal acceptability of digital resurrection. Thus, as a starting point, comparing these two scenarios is essential. We propose the following hypothesis.

Hypothesis 1: *The presence of explicit consent regarding digital resurrection from the deceased is associated with higher societal acceptability compared to the presence of explicit dissent.*

2.3 Personal Perspectives: Implications for Default Choices

While people's evaluations concerning the societal acceptability of digital resurrection can be informative in inferring its social net benefits, the way people perceive societal acceptability and whether they would personally consent to being digitally resurrected are not necessarily linked. Even if an individual perceives digital resurrection as socially acceptable, they may not personally agree to undergo such a process, and vice versa.

The information on how many people personally consent to their own digital resurrection can be valuable in designing default rules. Even if the net benefit of digital resurrection is positive and digital resurrection is deemed acceptable, the societal welfare could vary depending on the default rule in place. Prior research suggests two types of rules: the opt-in rule, which allows digital resurrection only when there is explicit consent, and the opt-out rule, which prohibits digital resurrection only when there is explicit dissent. In this context, the opt-in rule sets the prohibition of digital resurrection as the default and recognizes exceptions when there is a consent statement, whereas the opt-out rule sets digital resurrection as the default and recognizes exceptions when there is a dissenting statement.

Let us consider this point using a simple model. The purpose of this model is entirely different from that of the model in Section 2.2, and it should be noted that the notations used in these two models have no relation to each other.

Suppose every individual in society is homogeneous. Let us denote the expected personal *net* benefit an individual receives from their own digital resurrection as b . This benefit b has a cumulative distribution function $F(\cdot)$ on the full support $(-\infty, \infty)$. This can be interpreted as representing the distribution of personal net benefits in society. Let us also denote the average net benefit a relative or loved one receives from any individual's digital resurrection as b_f . In reality, b_f might vary across relatives, but for simplification, we assume each relative receives the same benefit. While b and b_f might actually be correlated, we ignore this correlation. Let us further define the cost for an individual to express their consent or dissent regarding digital resurrection, possibly through a will or another method, as e , and assume it is the same for everyone. The costs of expressing consent and dissent might actually differ, but we assume there is no difference. Other externalities in digital resurrection are not considered here. We present this simple model as a benchmark.

The social welfare W_I under the opt-in rule can be expressed by the following equation (2):

$$W_I = \int_e^{\infty} (b + b_f) dF(b) - \int_e^{\infty} e dF(b). \quad (2)$$

Under the opt-in rule, only individuals receiving an expected net benefit b that exceeds the expression cost e will consent to digital resurrection. The first term in equation (2) represents the social benefit obtained from the potential digital resurrection of individuals, which includes the net benefits of both the individuals themselves and their relatives. The second term denotes the social cost arising from the expression cost borne by individuals consenting to digital resurrection.

In contrast, the social welfare W_O under the opt-out rule can be expressed as shown in equation (3):

$$W_O = \int_{-e}^{\infty} (b + b_f) dF(b) - \int_{-\infty}^{-e} e dF(b). \quad (3)$$

The first term of equation (3) represents the social benefit composed of the net benefits from potential digital resurrections for individuals and their relatives, similar to equation (2). However, in the opt-out rule, the threshold for expressing intent changes to $-e$. For individuals whose personal net benefit from digital resurrection falls between $-e$ and e , it is more advantageous to remain in the default state rather than bear the cost e for opting out. In other words, under the opt-out rule, some individuals who receive a negative net benefit from digital resurrection might still be potentially resurrected due to the presence of expression costs. The second term indicates the social cost composed of the expression costs borne by individuals who express their dissent to digital resurrection.

The difference between W_I and W_O , $\Delta W = W_I - W_O$, can be expressed as shown in equation (4):

$$\Delta W = - \int_{-e}^e (b + b_f) dF(b) - e \left(\int_e^{\infty} dF(b) - \int_{-\infty}^{-e} dF(b) \right). \quad (4)$$

If this value is positive, it means that the social welfare is higher under the opt-in rule than under the opt-out rule, making it advisable to adopt the opt-in rule. The first term represents the difference in social benefits, and the second term is the difference in social costs.

If a majority of people dissent from digital resurrection, adopting the opt-in rule may be socially preferable for the following reasons.

First, under the opt-in rule, individuals who would receive a negative net benefit from digital resurrection will not be resurrected, unlike under the opt-out rule. This effect is captured in the first term of equation (4). Even if an individual would receive a negative net benefit from digital resurrection, if their relatives or close ones receive a large positive net benefit, resurrecting these individuals could improve societal welfare. However, this scenario seems unrealistic. The net benefits b of the individual and b_f for their relatives or loved ones are typically expected to be positively correlated. If an individual does not desire digital resurrection, it's likely that b_f would be negative if those around them respect the individual's wishes. Furthermore, if a net benefit b for an individual is small and a net benefit b_f for those around them is high, these surrounding individuals could pay a compensation to get the individual's consent for digital resurrection, thus increasing b . Considering these facts, there seems to be no need to resurrect individuals who would receive a negative net benefit from digital resurrection.

Second, the opt-in rule can reduce the number of individuals expressing their wish, thereby saving social costs associated with such expressions, as indicated in the second term of equation (4). Although our model assumes, for simplicity, that expressing either consent or dissent costs the same amount e , in reality, the cost of expressing dissent may be higher than that of expressing consent. For instance, when expressing consent, one might bear the expression cost to realize a positive net benefit, whereas when expressing dissent, one bears this cost to avoid a negative net benefit. Recognizing the possibility of a negative outcome, and then taking steps to prevent it, can be more emotionally taxing and demanding than simply looking forward to a benefit. The latter might entail a higher psychological cost than the former. If this holds, in situations where a majority opposes digital resurrection, the cost-saving effect of the opt-in rule becomes even more pronounced.

Considering the above discussions, the starting point in determining the preferable rule is to first ascertain what proportion of individuals would not consent to digital resurrection.

When the majority of individuals have a low net benefit and only a minority have an extremely high net benefit, the distribution of b is right-skewed or positively skewed. This is likely representative of a real-world distribution. There are several pieces of evidence to suggest this. The company Eternime, which once offered a service to leave one's digital clone after death, could not attract a sufficient number of customers (Jee 2022). Furthermore, when Microsoft obtained a patent related to digital resurrection, it faced significant public backlash. This pushed the company to announce that they had no intentions of developing technology for digital resurrection (Harbinja, Edwards, and McVey 2023). These facts indicate that the majority of people might not support the idea of their digital resurrection.

In contrast, for actors and other celebrities, the possibility of their digital clones generating commercial profit might mean they are more likely to perceive a higher net benefit. In fact, many of these celebrities have begun creating digital scans of themselves during their lifetime for posthumous use (Roberts 2023). If there is a significant number of individuals in such a group, the distribution of the net benefit of digital resurrection b might be bimodal, having peaks in both the negative and positive areas. However, considering the overall population, celebrities comprise a tiny fraction, and the overwhelming majority may likely have a negative personal net benefit from digital resurrection. Based on the discussions above, we propose the following hypothesis:

Hypothesis 2: *The majority of individuals disagree with the idea of their own digital resurrection.*

In this study, as a starting point in exploring the default rules concerning digital resurrection, we use observational research to inquire about people's opinions on whether they would consent to their own digital resurrection. As a supplementary analysis, we also ask participants to hypothetically imagine having a child and then determine, from a parental standpoint, if they would consent to the digital resurrection of that child.

2.4 Parental Consent

In many countries, there are accepted methods for parents or legal guardians to represent an individual's wishes in situations where the person is unable to appropriately express their preferences or die before doing so. For instance, surrogate decisions are permitted when minors or certain adults face medical decisions or other crucial choices. The question of whether parents or legal guardians should be permitted to indicate a preference on behalf of the deceased concerning digital

resurrection, especially when the deceased did not or could not express agreement or disagreement while alive, emerges as a critical point of discussion. This study focuses on parental consent, examining its impact on the societal acceptance of digital resurrection.

When parents express a wish on behalf of the deceased, while there might be instances of potential conflicts of interest among the parents and the deceased, it is generally believed that parents are likely to make decisions that mirror the affectionate family relationship they had with the deceased when they were alive. Consequently, the presence of parental consent might enhance societal acceptance of digital resurrection. As described later, we will explore this point through a supplementary observational study. Hence, we propose the following hypothesis.

Hypothesis 3: *The presence of consent from the deceased's parents regarding digital resurrection is associated with higher societal acceptance compared to when the preference of the deceased is unknown.*

3 Methodology

3.1 Survey Material

The survey is composed of three sections: questions about knowledge and attitudes towards AI, vignettes and related questions, and demographic and background questions. The full text of the survey can be found in the Appendix.

3.1.1 Questions on Knowledge and Attitudes toward AI

The questions regarding knowledge and attitudes toward AI were based on a 5-point Likert scale and correspond to the parameters included in K_i of equation (1) from Section 2.2. Firstly, participants were asked about the frequency of use of AI technologies in daily life (Q1) and their knowledge about them (Q2). From the average scores of these questions, a scale measuring engagement with AI (AI engagement) was constructed. Next, participants were asked about the potential of market competition to eliminate socially harmful AI products or services (Q3), and from this, a scale measuring trust in market functions regarding AI (Market trust) was established. Furthermore, participants were asked about the predictability of potential harm from using AI (Q4), and a scale measuring the predictability of such harm (Harm predictability) was created.

3.1.2 Vignettes

For the vignettes, participants were first presented with the following scenario. “Imagine Catherine, a young woman in her twenties, tragically dies in a car accident. Her friends, devastated by grief, come across a company’s advertisement about a service that uses artificial intelligence (AI) to resurrect the deceased as a virtual android. This service recreates the deceased’s manner of thinking and appearance, based on their leftover texts, audio, and visual data. In the hope of easing their sadness, Catherine’s friends are considering using this service. However, they are unaware of Catherine’s personal opinion about using her leftover information to recreate her through AI after her death.”

3.1.3 Evaluation of Social Acceptability before the Treatments

Taking into account major concerns such as ethics and privacy when the wishes of the deceased are unknown, participants were asked to rate on a 5-point Likert scale the extent to which it would be socially acceptable for her friends to digitally resurrect her (1. Unacceptable – 3. Neither unacceptable nor acceptable – 5. Acceptable). This question (Q6) aims for participants to evaluate W_i while considering factors B_i and C_i from equation (1).

3.1.4 Parental Consent

Then, an additional assumption was introduced: The deceased’s parents, overwhelmed by the grief of losing their daughter, have sought some solace by agreeing to resurrect her as a virtual android through the service. With the parental consent in place, participants were asked, using a 5-point Likert scale, how socially acceptable it would be for her friends to digitally resurrect her. This question (Q7) is designed to investigate the relationship between parental consent and the social acceptability of digital resurrection and serves to test Hypothesis 3.

3.1.5 Personal Perspectives

Participants were probed about their personal viewpoints from two different dimensions (Q8, Q9). Firstly, they were asked to envision themselves as the deceased individual described in the vignette. Assuming they had a chance to express their preferences before the accident, participants used a 5-point Likert scale to indicate to what extent they would agree with their friends digitally resurrecting them (1. Disagree – 3. Neither disagree nor agree – 5. Agree). Secondly, participants were prompted to step into the shoes of the deceased’s parents. From this perspective, they

were asked how agreeable they would be if their daughter's friends chose to digitally resurrect her, again employing the same 5-point scale.

3.1.6 Treatments

After asking participants about both societal and personal perspectives of digital resurrection when the deceased's wishes are unknown, they were presented with the following treatment statements. "Later on, it was discovered that Catherine had expressed her [agreement/disagreement] during her life for her friends and family to use her left-behind texts, audio, and visual data to recreate her through AI after her death." There were two versions, one of agreement and one of disagreement, and participants were randomly assigned to one. As previously described, this study mainly uses two treatments due to budget constraints, without employing a control group.

3.1.7 Evaluation of Social Acceptability after the Treatment

With this new information about the deceased's expressed wish in mind, participants were again asked, using a 5-point Likert scale, about the social acceptability of digital resurrection. This question (Q11) seeks to observe how participants would adjust their evaluation of W_i when condition A_i from equation (1) changes.

3.1.8 Demographic and Background Questions

Lastly, participants answered demographic questions about gender, age, education, income, marital status, and presence of children. They were also asked about the importance of religion in their daily life using a 5-point Likert scale (Religiousness), as the views on life and death of each individual could influence opinions about digital resurrection.

3.2 Data

In survey experiments, the frequent use of the post-only design, where a dependent variable is measured only after treatments, often stems from concerns about demand effects and consistency pressures when measuring dependent variables repeatedly. However, these concerns aren't necessarily underpinned by empirical evidence (Mummolo and Peterson 2019). On the contrary, the post-only design can compromise the statistical precision of treatment effect estimates (Clifford, Sheagley, and Piston 2021). In this study, to probe the predictions of our theoretical model, we

find it imperative to gather participants' perspectives on the social acceptability of digital resurrection in two distinct contexts: when the deceased's preferences regarding digital resurrection are ambiguous and when there has been a clear expression of the deceased's consent or dissent. Given these nuances, this research employs a pre-post design, which measures a dependent variable before and after an intervention.

Power analysis suggested that to achieve 80 % power with an assumed small to medium effect size, a sample size of around 200 would be adequate.

Data were collected in August 2023 using Prime Panels from CloudResearch, a widely recognized online crowdsourcing platform in the social sciences (Chandler et al. 2019). This yielded a sample of 222 adult U.S. residents. The average time it took respondents to complete the survey was 5 min. The survey included two comprehension questions (Q5, Q10), and those who answered them incorrectly were excluded from the sample. The proportion of those who passed all comprehension questions was 65 %. Prime Panels amalgamates several general online survey panels. Participants agree to some form of compensation before registering with each panel, and the amount of compensation varies by panel.

3.3 Regression Models

To analyze the impact of deceased individuals' consent and dissent on the social acceptability of digital resurrection, while taking into account other independent variables, we employ regression analysis. The regression equation for social acceptability before the intervention is as follows:

$$PRE_i = \alpha + \gamma'x_i + \delta'z_i + \varepsilon_i. \quad (5)$$

Here, the dependent variable PRE_i represents the assessment of individual i regarding the social acceptability of digital resurrection (Q6). The symbol x_i is a vector of independent variables comprising the scales for AI engagement, Market trust, Harm predictability, and Religiousness (Q1–Q4, Q18). The symbol z_i is a vector of control variables that includes gender, age, education, income, marital status, and presence of children (Q12–Q17). The symbol ε_i represents the error term.

Next, the regression equations for social acceptability after the intervention are as follows:

$$DIF_i = \alpha + \beta_1 TRE_i + \gamma'x_i + \delta'z_i + \varepsilon_i. \quad (6)$$

$$DIF_i = \alpha + \beta_1 TRE_i^u + \beta_2 TRE_i^n + \beta_3 TRE_i^a + \gamma'x_i + \delta'z_i + \varepsilon_i. \quad (7)$$

The dependent variable DIF_i in equation (6) represents the difference in participants' evaluations of the social acceptability between post-intervention and pre-intervention. The symbol TRE_i is a dummy variable that takes on a value of 0 if the vignette of expressed dissent is assigned, and a value of 1 if the vignette of expressed consent is assigned. This essentially represents the relative treatment effect of consent compared to dissent.

The estimation equation (6) is used to estimate the treatment effect based on the overall sample. In contrast, equation (7) estimates the treatment effects by categorizing the entire sample into subgroups based on the pre-intervention evaluations (PRE_i), which can be Unacceptable (1,2), Neutral (3), or Acceptable (4,5). The symbols TRE_i^u , TRE_i^n and TRE_i^a are dummy variables representing the treatment effects for the respective subgroups.

4 Results

We first look at the demographic data of the participants (Table 1). Of all participants, 52.7 % were women, 47.3 % were aged 50 and above, 38.3 % had a bachelor's degree or higher, 44.7 % had a household income of \$60,000 or more, 61.3 % had marital experience (Married/Widowed/Divorced/Separated), and 60.4 % had one or more children.

Table 2 reports the summary statistics for the dependent and independent variables. The four independent variables – AI engagement, Market trust, Harm predictability, and Religiousness – are all based on a 5-point Likert scale, with their means being close to 3. The AI engagement scale is composed of two measurement items (Q1, Q2), and its Spearman–Brown Coefficient is 0.731, indicating acceptable reliability.

Let us now turn to the main results. Table 3 reports the estimation results for regression equations (5)–(7). Please recall that the dependent variable, social acceptability of digital resurrection, is based on a 5-point scale: 1. Unacceptable – 3. Neutral – 5. Acceptable. Looking at the pre-intervention regression equation (5), the coefficients for AI engagement and Market trust were 0.152 and 0.129, respectively. This suggests that as the degree of AI engagement increased, or as trust in the market increased by one point, there was a slight increase in the evaluation of social acceptability of digital resurrection. These coefficients were statistically significant at the 5 % level. The coefficients for Harm predictability and Religiousness were close to 0, indicating they had minimal impact on social acceptability.

Looking at the post-intervention regression equation (6), the relative treatment effect of consent versus dissent stood at 2.101, indicating a substantially large effect

Table 1: Demographic characteristics of participants (*N* = 222).

	<i>N</i>	%
<i>Gender</i>		
Woman	117	52.7
Man	104	46.8
Other	1	0.5
<i>Age</i>		
18 – 29	29	13.1
30 – 39	41	18.5
40 – 49	47	21.2
50 – 59	42	18.9
60 – 69	27	12.2
70 or more	36	16.2
<i>Education</i>		
High school diploma	51	23.0
Some college/No degree	61	27.5
Associate’s degree	25	11.3
Bachelor’s degree	53	23.9
Master’s, doctoral, or professional	32	14.4
<i>Household income</i>		
Less than \$30,000	56	25.2
\$30,000 – \$39,999	20	9.0
\$40,000 – \$49,999	21	9.5
\$50,000 – \$59,999	26	11.7
\$60,000 – \$69,999	15	6.8
\$70,000 – \$79,999	20	9.0
\$80,000 – \$89,999	14	6.3
\$90,000 – \$99,999	7	3.2
\$100,000 – \$149,999	23	10.4
\$150,000 or more	20	9.0
<i>Marital status</i>		
Married	93	41.9
Widowed	14	6.3
Divorced/Separated	29	13.1
Never married	53	23.9
Partner in an unmarried couple	33	14.9
<i>Having one or more children</i>		
Yes	134	60.4
No	88	39.6

size. This suggests that, when consent was expressed, the social acceptability was two points higher on a 5-point scale compared to when dissent was expressed. This coefficient was statistically significant at the 1 % level. Thus, the presence of consent

Table 2: Summary statistics (*N* = 222).

	Mean	SD
PRE	1.806	1.090
DIF	0.604	1.646
Treatment: overall	0.514	0.501
Treatment: unacceptable	0.374	0.485
Treatment: neutral	0.081	0.274
Treatment: acceptable	0.059	0.235
AI engagement	2.973	1.144
Market trust	2.595	1.191
Harm predictability	3.167	1.167
Religiousness	3.162	1.584

Table 3: Regression results.

Equation number	Dependent variable		
	PRE	DIF	
	(5)	(6)	(7)
Treatment: overall		2.101** (0.177)	
Treatment: unacceptable			2.579** (0.189)
Treatment: neutral			1.211** (0.261)
Treatment: acceptable			0.591* (0.264)
AI engagement	0.152* (0.067)	−0.105 (0.081)	−0.039 (0.078)
Market trust	0.129* (0.064)	−0.112 (0.077)	−0.074 (0.076)
Harm predictability	−0.001 (0.065)	0.067 (0.081)	0.074 (0.077)
Religiousness	−0.045 (0.053)	0.030 (0.060)	−0.012 (0.057)
Constant	1.429** (0.496)	−0.257 (0.611)	−0.382 (0.543)
Control variables	Yes	Yes	Yes
Observations	222	222	222
Adjusted R2	0.028	0.378	0.476

Note: **p* < 0.05, ***p* < 0.01. Robust standard errors are in parentheses.

was associated with a higher level of social acceptability compared to the presence of dissent, and this result is consistent with Hypothesis 1. This finding implies that many individuals might have weak beliefs about the social acceptability of digital resurrection before knowing the deceased’s wish, and that the presence of consent or dissent can significantly change their beliefs.

Looking at the post-intervention regression equation (7), we find that the treatment effect was largest for the subgroup that responded as “unacceptable” towards digital resurrection before the intervention, with a value of 2.579. The treatment effect for the neutral subgroup was 1.211, and for those who responded as “acceptable,” it was 0.591. Several reasons might explain why the coefficient for the neutral group was lower than that of the unacceptable group. The neutral group might maintain their stance for reasons other than the deceased’s expressed intent, or they could find it challenging to evaluate digital resurrection, leading them to adopt a neutral position. The lower coefficient for the “acceptable” subgroup could be because those who already deemed digital resurrection as socially acceptable – even without knowing the deceased’s wishes – might have assigned less importance to an individual’s expressed consent or dissent. As a result, unveiling such wish did not lead to significant shifts in their attitudes. Additionally, the presence of an upper limit to the acceptability scale, specifically a score of 5, seemed to restrict the extent of possible attitude changes.

Figure 1 displays error bars representing the 95 % confidence intervals of treatment effects for both the overall sample and the subgroups. This visualization emphasizes that the overall treatment effect was notably large and the precision of its estimation was high. Additionally, the “unacceptable” subgroup demonstrated a substantially larger treatment effect compared to the other two subgroups. Upon

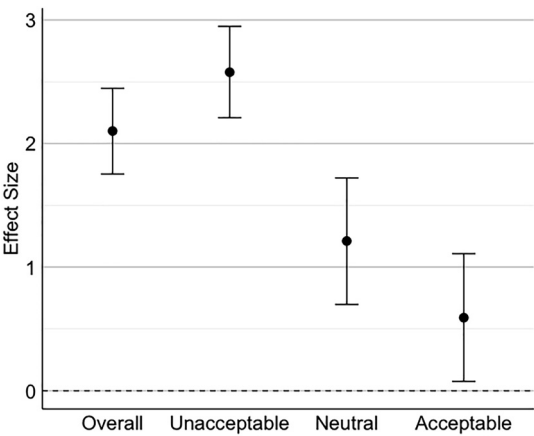


Figure 1: Comparison of confidence intervals: overall and subgroups.

conducting statistical tests, we rejected the null hypothesis at the 1 % significance level that the difference between the treatment effect coefficient of the “unacceptable” subgroup and that of each of the other two subgroups is zero.

Table 4 reports the distribution of responses for each type of treatment. In the treatment where the deceased’s disagreement was expressed, an overwhelming 88.9 % believed that digital resurrection was not socially acceptable, and only 2.8 % thought it was acceptable. In contrast, in the treatment where agreement was expressed, 25.4 % responded that it was not socially acceptable, while the majority, at 57.9 %, found it acceptable. The proportion of respondents who considered it socially acceptable was nearly 20 times higher between the agreement and disagreement treatments.

While the above results come from the study using an experimental design, we now turn to the findings of our observational study. Table 5 reports descriptive

Table 4: Response distribution based on treatment type (%).

	Unacceptable	Neutral	Acceptable
Disagreement expressed	88.9	8.3	2.8
Agreement expressed	25.4	16.7	57.9

Table 5: Descriptive statistics for responses on societal and personal perspectives.

Panel A: mean, SD, and correlations					
	Mean	SD	1	2	3
1 Societal: consent unclear	1.81	1.090			
2 Societal: with parental consent	2.38	1.325	0.677**		
3 Personal: self	2.34	1.408	0.574**	0.621**	
4 Personal: as parents	2.09	1.179	0.731**	0.729**	0.691**
Panel B: response distribution (%)					
	Unacceptable	Neutral	Acceptable		
Societal: consent unclear	76.6	12.2	11.3		
Societal: with parental consent	56.8	16.2	27		
	Disagree	Neutral	Agree		
Personal: self	58.6	13.5	27.9		
Personal: as parents	66.2	17.1	16.7		

Note: ** $p < 0.01$.

statistics for responses regarding social acceptability (Q6, Q7) when the deceased's wish was unknown and when there was parental consent, as well as individual levels of agreement towards the digital resurrection of oneself and that of one's child (Q8, Q9). Recall that, for social acceptability, the scale is defined as: 1 (Unacceptable) – 3 (Neutral) – 5 (Acceptable). For personal consent, the scale reads: 1 (Disagree) – 3 (Neutral) – 5 (Agree).

Panel A reports the mean, standard deviation, and correlations for each variable. The correlations between the variables ranged approximately between 0.6 and 0.7, indicating a moderate correlation.

Panel B reports the distribution of responses. Only 11.3 % of participants responded that digital resurrection was acceptable when the deceased's consent was unknown. In contrast, when there was parental consent, the proportion of participants who found it acceptable was 27 %, showing an approximate 16 % difference. These results suggest that while most people believed the deceased's consent was crucial for the social acceptability of digital resurrection, a small proportion considered parental consent as a potential alternative to the deceased's consent.

Looking at the results of personal perspectives, in the vignette where participants imagined themselves as the deceased, 27.9 % of them indicated they would agree to their own digital resurrection, 13.5 % remained neutral, and 58.6 % stated they would disagree (Responses of 1 and 2 were categorized as "Disagree", 3 as "Neutral", and 4 and 5 as "Agree"). From a sample size of 222, the proportion of respondents who answered between 3 (Neither agree nor disagree) and 5 (Agree) was 0.414. This value, when subjected to a one-sample Wald test, was statistically significantly lower than 0.5 ($z = -2.589$, $p(\text{one-tailed}) = 0.005$). This result indicates that the majority disagreed, which is consistent with Hypothesis 2. In the vignette where participants imagined the deceased as their child, only 16.7 % expressed consent for the child's digital resurrection, a value about 11 % lower. These results suggest that most people did not endorse the idea of digital resurrection, and they exhibited a more cautious attitude toward the digital resurrection of their child compared to their own.

Table 6 reports the results of statistical tests examining whether the difference in means or medians of any two theoretically interesting combinations out of the four responses (two social perspectives and two personal perspectives) is zero. For the social perspectives, the mean or median of social acceptability for digital resurrection was higher when the deceased's parents gave consent compared to when the deceased's wish was unknown. This result is consistent with Hypothesis 3. For the personal perspectives, the level of agreement was lower when participants imagined giving consent for their child's digital resurrection than when they considered consenting to their own digital resurrection.

Table 6: Statistical tests for responses on societal and personal perspectives.

Panel A: paired <i>t</i> -tests for response differences				
	Mean	SD	<i>t</i> -value	<i>p</i> -value
Soc. unclear – Soc. parental	–0.572	0.994	–8.575	<0.001
Soc. unclear – Pers. self	–0.536	1.187	–6.730	<0.001
Pers. self – Pers. parents	0.257	1.039	3.684	<0.001
Soc. parental – Pers. parents	0.293	0.932	4.681	<0.001
Panel B: Wilcoxon signed-rank tests for response distributions				
	Test statistic	Standardized test statistic	<i>p</i> -value	
Soc. unclear – Soc. parental	311.000	–7.465	<0.001	
Soc. unclear – Pers. self	906.500	–6.212	<0.001	
Pers. self – Pers. parents	2692.500	3.387	<0.001	
Soc. parental – Pers. parents	3136.500	4.578	<0.001	

Note: 1. Abbreviations used as follows: [Soc. unclear] means societal: consent unclear. [Soc. parental] means societal: with parental consent. [Pers. self] means personal: self. [Pers. parents] means personal: as parents. 2. Only the pairs of interest are reported in the results; others not of primary concern are omitted for brevity.

Furthermore, when comparing the social perspective with the personal perspective, the personal acceptability for one’s own digital resurrection was higher than the social acceptability when an individual’s wish was unknown. Also, the personal acceptability for the digital resurrection of one’s child was lower than the social acceptability when the deceased’s parents gave consent.

It is important to note when interpreting these results that the differences between these paired responses were not substantial. As indicated by Table 5, the overall trend for all responses leaned heavily towards non-acceptance or disagreement with digital resurrection. On average, the score was around 2, or, in terms of percentages, the proportion of responses indicating non-acceptance or disagreement surpassed the halfway mark.

5 Conclusion and Policy Implications

We conducted the survey experiment to analyze the impact of a deceased individual’s consent or dissent on the public’s assessment of the social acceptability of digital resurrection, aiming to infer the role of such consent or dissent in evaluating the social net benefit of digital resurrection. Based on the Bayesian model of information processing, we constructed the theoretical hypothesis that the presence of explicit consent for digital resurrection from the deceased is associated with higher

social acceptability than the presence of explicit dissent. The results of the experiment showed a substantial relative treatment effect of consent versus dissent, amounting to a 2-point difference on a 5-point scale. When the deceased had given their consent, 58 % of respondents found digital resurrection to be socially acceptable, whereas the number was a mere 3 % when there was explicit dissent from the deceased. These findings suggest that the wishes of the deceased play a pivotal role in the evaluation of the societal net benefit of digital resurrection.

This study then set out to explore the optimal default rule using observational research, by surveying what proportion of the public would consent to their own digital resurrection under certain assumptions. Based on the theoretical model that considers the social net benefit of digital resurrection as a probability distribution and takes into account the costs associated with people expressing their wishes, we constructed the hypothesis that the majority of people are opposed to the idea of their own digital resurrection. From the survey results, it was found that 59 % of respondents were against the idea of their own digital resurrection. These findings suggest that the optimal default rule might be to prohibit digital resurrection, with exceptions allowing it only when there is explicit consent from the deceased. In other words, an opt-in rule might be preferable.

The limitations of this study are as follows. Firstly, our survey experiment was conducted without a control group and employed two treatments. As a result, we cannot analyze the pure effects of a deceased's consent or dissent when compared to a control group. Secondly, the findings of this study are based on the analysis of participants' responses to the vignettes with certain assumptions. Therefore, it is unclear how the results might change if different vignettes were used. Furthermore, the theoretical model we utilized to analyze the choice of default rules assumed, for simplicity, that individual preferences would not change due to the default rule. However, existing research, using examples like organ donation, has highlighted the possibility that default rules can indeed alter individual preferences. It also notes that factors like the message conveyed by a rule could potentially shift the socially desirable default rule (Johnson and Goldstein 2003). With these points in mind, it is essential to interpret the results of this study cautiously.

With the rapid advancements in deep learning technology, especially the significant evolution of large language models, there is a potential for the commercial services of digital resurrection to proliferate swiftly in the future. Consequently, the establishment of relevant laws is an urgent matter. Nevertheless, current legal regulations surrounding digital resurrection are in disarray, with a few existing studies merely suggesting opt-in or opt-out rules without empirical evidence. This study enhances our understanding of the topic by providing a foundational theoretical framework and preliminary evidence in favor of the opt-in rule.

Using this study as a starting point, we hope that more rigorous and refined research will be conducted in the future, further deepening the discussion on the optimal default rule. The distribution of individual net benefits regarding digital resurrection may be influenced by culture, and thus could vary by country. Exploring this aspect through international comparison might be considered. If the shape of the distribution changes, the optimal default rule might also change. Also, while we considered instances where parents consent to the resurrection of their children, it might also be valuable to examine scenarios where children consent to the resurrection of their parents or, more generally, where descendants consent to the resurrection of their ancestors.

Acknowledgements: The author is grateful to Haksoo Ko, Keun-Gwan Lee, Yijia Lu, Sangchul Park, and the participants of the 2023 SNU-KYU Joint Symposium for their comments, and to Qi Wang for her research assistance.

Research funding: This article was funded by the 2023 Research Fund of the Seoul National University Asia-Pacific Law Institute, donated by the Seoul National University Foundation.

Ethical Approval: This study was conducted in compliance with the ethical standards of the 1964 Declaration of Helsinki and Seoul National University.

Informed consent: Each participant voluntarily gave informed consent after being briefed on the study's nature, procedures, their rights, and any potential risks, ensuring their understanding and willingness to participate.

Conflicts of interest: The author has no conflicts of interest to disclose.

Data availability: The datasets generated during the current study are available from the corresponding author on reasonable request.

Appendix: Survey Material

Measurement Items for AI Engagement (Note: Headings for questions are not provided in the actual survey.)

Q1. How often do you interact with Artificial Intelligence (AI) technologies in your daily life? Examples include Siri, Google Assistant, Alexa, ChatGPT, AI chatbots, and image recognition in your smartphone's photo gallery.

1. Infrequently 2. Somewhat infrequently 3. Neutral 4. Somewhat frequently 5. Frequently

Q2. How would you rate your understanding of the AI technologies mentioned in Q1?

1. Low 2. Somewhat low 3. Neutral 4. Somewhat high 5. High

Measurement Items for Market Trust

Q3. In general, do you trust that the market competition will naturally eliminate providers of AI products or services that cause harm?

1. Disagree 2. Somewhat disagree 3. Neither disagree nor agree 4. Somewhat agree 5. Agree

Measurement Items for Harm Predictability

Q4. Do you believe that the potential harms arising from the use of AI are, or will be, predictable?

1. Disagree 2. Somewhat disagree 3. Neither disagree nor agree 4. Somewhat agree 5. Agree

Vignette

Please read the following scenario carefully and then answer the subsequent questions.

Imagine Catherine, a young woman in her twenties, tragically dies in a car accident. Her friends, devastated by grief, come across a company's advertisement about a service that uses artificial intelligence (AI) to resurrect the deceased as a virtual android. This service recreates the deceased's manner of thinking and appearance, based on their leftover texts, audio, and visual data.

In the hope of easing their sadness, Catherine's friends are considering using this service.

However, they are unaware of Catherine's personal opinion about using her leftover information to recreate her through AI after her death.

Q5. Which service are Catherine's friends considering using?

1. A service that resurrects deceased pets as virtual androids
2. A service that collects data such as text, audio, and visual data left by the deceased

3. A service that resurrects the deceased as a virtual android based on texts, audio, and visual data left by the deceased

Q6. Given that it's unclear whether Catherine gave her consent regarding the use of the AI resurrection service, and considering major concerns such as ethics and privacy, how acceptable do you find it, from a societal perspective, for Catherine's friends to use the service to revive her as a virtual android?

1. Unacceptable 2. Somewhat unacceptable 3. Neither unacceptable nor acceptable 4. Somewhat acceptable 5. Acceptable

Suppose that Catherine's parents, too, are heartbroken by the loss of their daughter and agree to have her resurrected as a virtual android through this service, hoping it will alleviate their sorrow.

Q7. Given that Catherine's parents have given their consent, considering major concerns such as ethics and privacy, how acceptable do you find it, from a societal perspective, for Catherine's friends to use the AI resurrection service to revive Catherine as a virtual android?

1. Unacceptable 2. Somewhat unacceptable 3. Neither unacceptable nor acceptable 4. Somewhat acceptable 5. Acceptable

Before moving on, consider how you would feel if you were in Catherine's position, or if you were one of her parents.

Q8. If you were Catherine and had the opportunity to express your preference before the accident, how much would you agree or disagree with allowing your friends to use the AI resurrection service to revive you as a virtual android?

1. Disagree 2. Somewhat disagree 3. Neither disagree nor agree 4. Somewhat agree 5. Agree

Q9. Assuming Catherine's wishes regarding the use of the AI resurrection service were unclear, if you were her parents, how much would you agree or disagree with her friends using the service to revive her as a virtual android?

1. Disagree 2. Somewhat disagree 3. Neither disagree nor agree 4. Somewhat agree 5. Agree

Later on, it was discovered that Catherine had expressed her [agreement/disagreement] during her life for her friends and family to use her left-behind texts, audio, and visual data to recreate her through AI after her death.

Q10. Which of the following statements accurately describes Catherine's wishes regarding the use of her left-behind texts, audio, and visual data by her friends and family to recreate her through AI after her death?

1. Catherine agreed to it.
2. Catherine disagreed with it.
3. Catherine was indifferent about it.

Q11. Given the new information about Catherine's expressed wishes, how acceptable do you find it, from a societal perspective, for Catherine's friends to use the AI resurrection service to revive Catherine as a virtual android?

1. Unacceptable
2. Somewhat unacceptable
3. Neither unacceptable nor acceptable
4. Somewhat acceptable
5. Acceptable

Demographic and Background Questions

Q12. What is your gender?

1. Woman
2. Man
3. Other

Q13. What is your age?

Q14. What is the highest level of education you have completed?

1. High school diploma or less
2. Some college/No degree
3. Associate's degree
4. Bachelor's degree
5. Master's degree
6. Doctoral or professional degree

Q15. What is your total household income?

1. Less than \$30,000
2. \$30,000 – \$39,999
3. \$40,000 – \$49,999
4. \$50,000 – \$59,999
5. \$60,000 – \$69,999
6. \$70,000 – \$79,999
7. \$80,000 – \$89,999
8. \$90,000 – \$99,999
9. \$100,000 – \$149,999
10. \$150,000 or more

Q16. Which status best describes you?

1. Married
2. Widowed
3. Divorced
4. Separated
5. Never married
6. Partner in an unmarried couple

Q17. Do you have one or more children?

1. Yes
2. No

Q18. How important is religion in your daily life?

1. Unimportant
2. Somewhat unimportant
3. Neither unimportant nor important
4. Somewhat important
5. Important

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