

On the Design of Personal Finance Management Systems Based on Artificial Intelligence Within a Major French Retail Bank

How AI is redefining the user experience of digital services. An overview of my ongoing PhD thesis.



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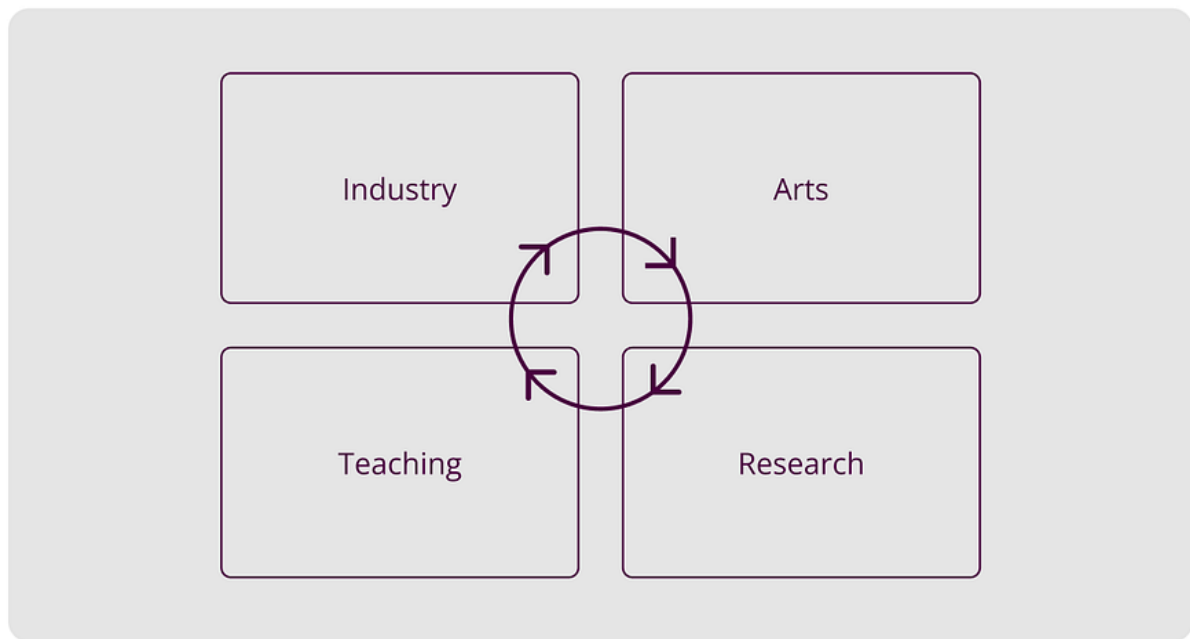
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My Professional Journey

I began designing digital user experiences in the early 2000s, following an initial scholarship in an industrial field and subsequently transitioning to the visual arts. This unconventional path was driven by the belief that my desire to make a tangible impact on human environment required a combination of skills and cultural references from fields often considered opposites, art and industry. Naturally, and from my very first professional experiences, the digital realm emerged for me as a promising new territory, capable of satisfying my curiosity and my taste for experimentation.

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The significant technological and usage disruptions in the digital sector since then have compelled me to acquire new knowledge to evolve my professional practice, my positioning, and to understand the potential of emerging technologies. This was the case in 2002 following the burst of the Internet bubble, with the massive development of online commerce; in 2006 during the emergence and expansion of social networks and the entry of media into the era of user-generated content; and in 2009 when mobile digital devices made digital access ubiquitous, transforming our relationship with the world and others.

Twenty-five years of experience have allowed me to grasp the transformations in design practices in response to technological evolutions and the increasing complexity of decisions designers face. Thus, my practice has evolved from an empirical creative approach to a tactical approach guided by user experience design methodologies, then towards a strategic approach that integrates an ecosystemic dimension into design.

For many years, research through design has been at the heart of my professional approach, reflected in my responsibilities within organizations such as SNCF, the PSA/Stellantis innovation center, AXA, and currently at the digital division of the BPCE Group, where I serve as Digital Design Director.

It is also illustrated by my repeated forays into the academic and research worlds. In the Interactive Multimedia Master's program, where I designed, with a team of students, an interactive device to teach middle schoolers about image analysis, or within a research laboratory at the École Nationale Supérieure des Arts Décoratifs, where I explored the transformations in communication tool usage through mobile technologies for two years before contributing to a European project on multimodal mobility, and finally through lectures at design schools introducing artificial intelligence.

The acceleration of progress in artificial intelligence technologies and their rapid adoption by the general public is one of the most significant transformations in the recent history of technology. It marks a turning point in the development of digital media and heralds a profound shift that will redefine many sectors and transform numerous professional practices. By altering interaction modes between humans and technology, AI raises ethical, economic, and societal questions. This transformation requires designers to adapt quickly and raises questions about their responsibility and role in the face of machines' increased capabilities.

Thus, I decided in 2024 to embark on a doctoral project focused on designing interactive devices based on artificial intelligence. This project officially began after my company's agreement and the confirmation of my thesis registration at the ETIS laboratory of CY Cergy Paris University in March 2025.

Context of the research

The stakes

The term “artificial intelligence” (AI) remains a subject of debate today. However, for the purposes of this thesis, it is necessary to adopt a definition. We will use the one most commonly accepted by the general public, industry and official institutions one, which consists in describing AI as a technology designed to perform intellectual tasks usually carried out by humans (HM Government, 2021).

This neologism was conceived and used for the first time by scientists in the context of an academic project aimed at studying the possibility of simulating human reasoning abilities with machines (McCarthy et al., 1955). Among these abilities are the main characteristics of the current generative AI systems: language manipulation, an architecture based on neural networks, and a capacity for self-improvement or learning (machine learning, deep learning) based on massive volumes of data.

Favored over other terms like “machine intelligence,” this oxymoron combining the worlds of machines and humans through the strong connotation of intelligence has helped catalyze a powerful imagination around this new field of computer technology (Gentes, 2017).

The democratization of devices leveraging AI technologies naturally raises questions about their evolving usage and impact on society. These are issues identified even before the first public generative AI services were released (UNESCO, 2020), whose criticality became evident with services like ChatGPT, made public in late November 2022. Reaching 100 million users in just two months, OpenAI's conversational interface and many others that followed were massively adopted, particularly by young users. By 2024, while a third of French people reported having used AI, 69% of 18–24-year-olds

and 37% of 12–17-year-olds had used it in their professional or educational lives (Arcep, Arcom, CGE, ANC, 2025).

AI risks are often discussed in the literature. Among them are the exacerbation of social inequalities, the reinforcement of existing biases, and detrimental effects on privacy and individual freedom. Additionally, there is a lack of transparency in AI design processes, their implementation, and difficulty for individuals to understand and control how this new technology affects their lives. However, a multidisciplinary approach, combining technologists, designers, sociologists, and legal experts, could contribute to developing AI that is more ethical, inclusive, and respectful of human rights (Crawford & Bury, 2022).

However, the harmful effects of AI could be counterbalanced by a user-centered design approach and an appropriate mediation to facilitate its adoption. Its beneficial effects could be reflected, for example, in increased inclusivity of the French government's digital services, which often prove complex for a significant number of citizens who struggle with even routine administrative tasks (Villani et al., 2018).

The same applies to many other services in the private sector as well, particularly banks, where organizational complexity, legal and security constraints, and the obsolescence of some technical infrastructures can lead to the exclusion of some clients, especially those facing digital illiteracy or possessing limited digital skills (INSEE, 2023). This has not, however, slowed the dematerialization of an increasing number of services provided by traditional French banks. Transfers to digital channels have even accelerated, in response to evolving client usage and as consequence of the COVID crisis (ACPR, 2022).

Yet, if the proportion of individuals facing difficulties with writing and math has been decreasing over the past ten years (INSEE, 2024) — as the alternatives to digital channels — financial institutions are still strongly advised by the Banque de France to implement initiatives aimed at fostering banking inclusion.

These initiatives however can be hindered by the business models of historic French retail banks, which rely on a dense network of physical branches and tend to favor affluent clients with whom close relationships are most profitable. Conversely, vulnerable groups, less profitable, are subjected to discouraging fees, restrictive eligibility criteria, and receive little in the way of services tailored to their specific needs, perpetuating their marginalization. This paradox lies at the heart of the French banking landscape, where, despite an inclusive regulatory framework, persistent financial exclusion of marginalized households remains (Pinos, 2019).

Research field

This research takes place within the Digital Division, part of the Digital and Payments hub of the BPCE Group, where I serve as the design director in charge of the user experience design pole.

BPCE Group is the second-largest retail bank in France. Its main establishments are the networks of Caisses d'Épargne and Banques Populaires. As of December 2023, the group had 35 million clients, and its broad range of banking services covered nearly all the needs of individual banking clients of the “natural person” type.

The Digital Division of the BPCE Group is responsible for the design and orchestration of the development of banking applications aimed at individual and professional clients of most of the group's establishments (Caisses d'Épargne, Banques Populaires, etc.). The work conducted over the past decade on remote banking devices by the division, within the context of a digital transformation ambition, has highlighted the significant complexity of the issues related to the use of banking services.

Among these devices, the BPCE Group has been offering Personal Finance Management (PFM) services for several years, aimed at simplifying expense control, budget construction, and tracking for its clients.

Research conducted on the users of these services as part of the design efforts has shown a great diversity of needs and usages in the field of personal financial management. This diversity is linked, on one hand, to the unique financial situations of each client, and on the other, to their individual characteristics, such as their level of financial education, personal history, preferences, or difficulties they may encounter in accessing the services the bank provides.

Some clients adopt a very structured approach to their budget management, seeking to anticipate the inflows and outflows of their bank accounts. Others are proactive, engaging in investment and optimization of their assets. Some do not seek a consolidated view of their finances and make frequent adjustments with day-to-day management. Many clients must regularly make tough trade-offs and prioritize their essential needs, while others are conversely very minimally involved and seek to delegate their financial management partially or even totally.

Moreover, beyond these individual constraints or preferences, there are also needs of another nature among users of these devices. Indeed, 10% of adults aged 18 to 64 in France experience difficulties in fundamental literacy areas, such as reading, writing, and understanding simple texts. Additionally, 12% of adults face challenges in calculations, affecting their ability to interpret numerical data (INSEE, 2024).

Literacy and numeracy skills are essential for understanding and interpreting the graphs that are now present in most PFMs. It is therefore likely that a significant portion of the French population may not be able to use PFM tools as they are currently designed.

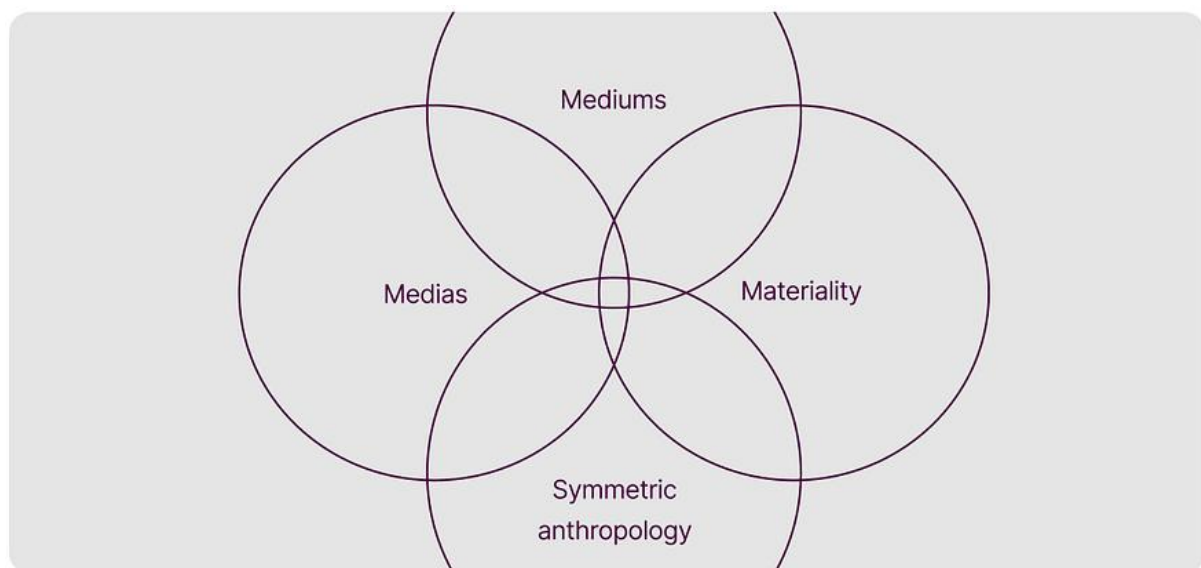
In fact, the use of PFMs offered by banks remains notoriously low. While a third of French people are aware of their existence, only 10% report using them regularly. The abandonment rates for these devices are very high, often occurring within less than 5 days after the first use (Score Advisor, 2020).

Hypotheses and interdisciplinarity

Our hypothesis is that artificial intelligence represents an opportunity to approach the design of these devices from a new perspective within a research-project framework (Findeli, 2004). This framework relies on the creation of artifacts and demonstrators aimed at evaluating the capability of new interactive devices to meet the needs of bank users in managing their personal finances, by empirically comparing their performance to existing solutions.

This hypothesis is located at the intersection of design sciences, as we are interested in service design practices in conjunction with AI, and information and communication sciences, as we aim to understand the forms and implications of the social, semiotic, and technical mediations produced and supported by these new interfaces facilitating interactions between the bank and its clients.

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Bibliographic research report

History of banking technologies

A primary aspect of our readings focuses on the history of the material cultures of financial institutions and how technology has transformed — and continues to transform — the relationships between users and the services they access daily. This thesis is situated within the dynamic transformation of the material cultures of money and finance. Indeed, there is currently a trend towards the systematic dematerialization

of the means of daily transactions. However, it is important to note that this is a relatively recent phenomenon in historical terms, brought about jointly by technical advances, economic logic, and political choices, such as the European Central Bank's project to create a digital euro or the recent call by Interior Minister Gérald Darmanin on May 22, 2025, before a Senate commission, to eliminate the use of cash to combat financial crime.

Since the very invention of accounting, money, capital, and commercial transactions have relied on tangible substrates. Livestock, an ancestral symbol of material wealth, is etymologically linked to the Latin term "pecus," which evolved into the adjective "pecuniary." Precious metals were transformed into jewelry and valued as currency in ancient Egypt or India. The architecture of banks at the beginning of the industrial era was inspired by ancient temples that served as depositories of value. Account books, seals, letters of exchange, and later, banknotes (Hoggson, 2007). The transition to immaterial flows thus marks a profound break with this millennia-long heritage of material supports.

However, banks have been among the pioneering industries in the development and adoption of computer technologies, particularly for optimizing their internal processes. Experiments using natural language processing technologies have been conducted since the 1990s, and improvements had already been identified in the context of interactions with complex software systems (Harris, 1992). Nonetheless, due to the limited computing capacity of the systems at the time, natural language was little exploited in user interfaces until the concepts of artificial neurons and deep learning resurfaced, partly due to advancements in image recognition demonstrated during the ImageNet competition in 2012 (Yann Le Cun, 2019).

Building on recent advances in language models enabled notably by the algorithmic architecture of transformers (Vaswani et al., 2017), new experiments are currently being conducted in the banking sector on client-facing devices. These algorithms make it possible to evaluate interactive systems that were out of reach for most consumer service designers a few years ago, enabling, for example, the generation of personalized financial management advice (Schlosky et al., 2024). The utility of these has been demonstrated. However, the advice remains — using the generations of models employed in this experimentation — quite generic, and responses are still partial. Most importantly, these systems still struggle to establish a relevant hierarchy among proposed solutions according to the user's specific situation.

Design studies et materiality

Design will be approached as design practices that allow for the emergence of new forms both from materials and an understanding of the field and the issues encountered by users (Gentès, 2022). Here, the materiality is a significant aspect,

whether it involves the raw material serving as the basis for operations leading to its transformation into an object resulting from the design action, or in its definitive form as a cultural entity. This holds true regardless of its nature, since any communication medium produced by humans acquires, through the intervention of its creator and receiver, a form of cultural existence (Jeanneret, 2008).

In this thesis, we aim to consider AI not as a simple technological module added after the fact, but as a medium, a raw material shaped to produce new and desirable experiences (Simon, 1988).

As a participant in its own transformation, AI material presents techno-semiotic properties that we need to better understand. Our research will therefore focus on its specific agency (Gentès, 2022). We will explore the experiential characteristics produced by AI systems that rely on agents, meaning partially autonomous devices equipped with a certain capacity for action.

This design approach marks a shift in the relationship between users and digital media, which until recently were perceived as executors of human transformation procedures and projects (Jeanneret, 2011).

With artificial intelligence, digital media could take on an active role as a mediator between individuals and organizations like banks. It would do so through interfaces capable not only of translating users' requests into administrative and technical language but also of generating personalized responses and guiding individuals to appropriate services (Villani et al., 2018). Thus, AI would no longer merely transmit or make information accessible: it would transform it and optimize its intelligibility and relevance based on the user's profile and context. This transition from media to mediator heralds new forms of delegation in which AI plays an active role in translation, support, and personalization.

The decision design within the field of the financial inclusion

The study of personal finance management by individuals involves moving beyond stereotypes, particularly those surrounding financially vulnerable households. Implementing strategies and systems that genuinely promote financial inclusion requires understanding their daily lives and observing complex life contexts and trajectories to avoid stereotypes. Poverty often comes with limited access to information and inaccurate beliefs, making decisions more challenging as the margins for error are narrow (Banerjee & Duflo, 2014).

Decisions can also be biased due to incomplete information, cognitive limits, and the recurrent use of judgment heuristics that may introduce systematic errors. Here, "libertarian paternalism" can provide justification for designers of products and

services to guide individuals' choices towards decisions that benefit them, without resorting to coercion or abolishing freedom (Thaler & Sunstein, 2003).

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However, the question of legitimacy and the risks of influencing individual users' choices becomes even more pertinent today, as large language models (LLMs) like ChatGPT possess argumentative capabilities that could surpass those of humans. This is particularly the case when they have access to sociodemographic data, even limited, about their human interlocutors, such as age, gender, or education level (Salvi et al., 2025).

HMI and AI : The challenges

Since the public launch of ChatGPT and numerous services leveraging LLM technology, many interactive devices based on natural language have been the subject of research in academic and/or industrial settings. This was the case at the insurer Alan, which evaluated a conversational agent dedicated to health-related queries. In a context marked by increasing difficulty in securing medical appointments, the AI agent partially replaces human advisors to address policyholders' questions. Comparative tests showed that users favored interaction with the machine, whose responses were perceived as clearer and, notably, almost instantaneous compared to those of experts. This unprecedented responsiveness transforms the dynamics of the exchange. The conversation becomes more fluid, encouraging patients to ask more questions and receive more information in return (Lizée et al., 2024). This experience challenges the assumption of a preference for human interactions, as interaction with AI can, under certain conditions, foster engagement that a traditional arrangement might not always achieve.

Artificial intelligence also poses challenges to its own designers. There is an asymmetry between AI's nature and the anthropomorphism that determines how we spontaneously perceive it. From the very first experiments with language-based computer interfaces, a tendency among human users has been observed to presume the presence of thinking and intentions in responses generated by algorithms, even when they operate on relatively simple symbolic logic bases without understanding the context or content. This effect is still referred to today as the "Eliza effect," named after the computer program developed in the late 1960s by Joseph Weizenbaum at MIT, which simulated natural language conversation based on preprogrammed scripts.

Such perceptions can also arise in interactions between designers and their material, especially when it involves an AI-based agent. While computers can achieve or even

surpass human capabilities in symbolic computation and language production, they remain less adept at certain tasks deemed trivial. This can be particularly counterintuitive for both users and designers of AI-based interactive systems (Moravec, 2009).

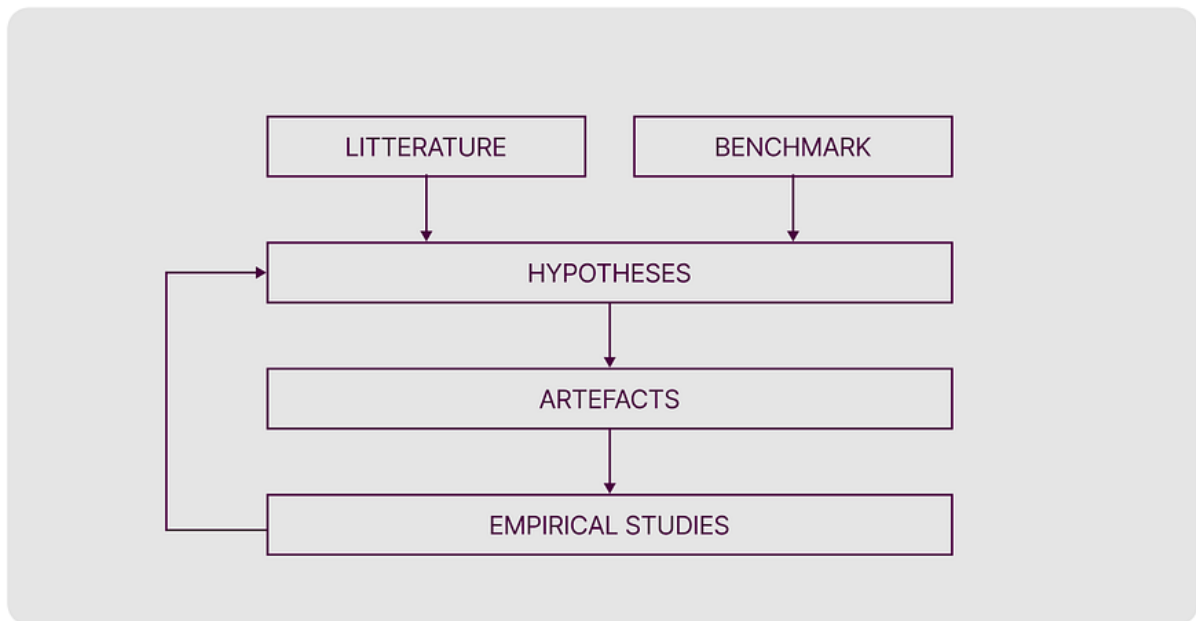
This asymmetry can blur designers' perceptions of the capabilities and limitations of artificial intelligence. It is challenging for them to grasp the potential of AI systems, as they are generally not well-trained in this technology and until very recently lacked tools to prototype interactions with AI. This has created a gap with the engineers who develop them (Dove et al., 2017).

Authors therefore call for better integration of designers into projects so they can be involved in steering them and defining user needs, then collaborate with expert data scientists to develop, train, or enhance the AI models they rely on. These contributions to product validation could make designers the guarantors of coherence between the algorithm's objective performance and its subjective utility value. Acquiring an understanding of machine learning logic and tools is a prerequisite for designers to ensure that design remains a driver of innovation by relying on methodologies adapted to the AI era (Colombo & Costa, 2021).

Objectives

In this thesis, we aim to explore four research questions that will lead us to examine the relationships between users, particularly the most vulnerable ones, and their banks, the strategies deployed by these organizations and the impact of their implementation, the contribution of artificial intelligence in the context of a design project, and the transformations in design practice resulting from the emergence of transformative technology.

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These questions are notably located at a convergence of the research on service design (Buchanan, 2015), systems design (Buchanan, 2019), and the transformations induced by the integration of computational technologies into innovation and creation processes (Gero, 2000).

1. First Question

How do financially vulnerable individuals or those experiencing digital illiteracy use existing retail banking services? What are the barriers that currently limit their autonomy, and how can modeling their needs contribute to the design of systems that promote their financial inclusion?

2. Second Question

What mechanisms do retail banks provide to their clients to facilitate daily money management? Who are these mechanisms aimed at? Do some aspire to contribute to financial inclusion? Are there guiding principles, such as explainable AI, to steer their design, and to what extent do they meet, or fail to meet — either partially or fully, the needs of their users?

3. Third Question

How can artificial intelligence systems enhance trust, understanding, and informed financial decision-making among bank clients, particularly the most vulnerable? What design principles and forms of explainability can help resolve the main tensions inherent in designing services based on AI agents capable of influencing crucial decisions for their users, and how can their impacts be measured?

4. Fourth Question

What tools, methods, principles, models, and user interface components can support the design of AI-based banking services throughout the design cycle to ensure human-centered experiences that comply with ethical and regulatory requirements, and how do they transform the practice of digital service design within such organizations?

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