HUMANS AT THE CENTER OF TECHNOLOGY DESIGN AND DEVELOPMENT

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Introduction

From human-centric experience to technology for good.

Putting humans at the center of design and development involves progressive, adaptive, and natural interfaces to technology systems. These "total experience" systems predict intent and satisfy diverse user profiles. They understand what humans are really looking for. They foster emotional connection and provide what-next recommendations by factoring in possible frustrations and fears of humans when communicating with technology. Data collected to optimize these user journeys can be safely guarded in the cloud, ensuring the data is private, and only used for the intended purpose. These systems can also be built for diverse populations, removing biases and prejudices in the development stage. In this way, technology creates a continuously evolving, multi-variate, live

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>
> *Being human-centric means that empathy, accountability, and trust are the cornerstones of technological developments. If nudging people to buy a new health product or take out a life insurance policy is based on behavioral breadcrumbs we leave behind, then we who use these systems should be richly aware of what those breadcrumbs are.*
>
> **Nandan Nilekani**
> *Chairman, Infosys*
> "

Figure 1. Practicing human-centric product creation

	Design	Development
Human-centric experience	Is the solution designed to delight the user by providing a seamless and inclusive experience?	Is there an active product owner involved who acts as the "voice of the customer"?
Human empowerment	How can we design the experience to empower people to fulfil their place in society and make better decisions?	Is the solution built with an emphasis on data privacy, explainability, and security?
Human effectiveness/ sentience	How can the solution be designed so that it's easy to use and sentient to each user's specific needs and behaviors?	Are sentient product features prioritized in the solution roadmap?
Human virtue	What design elements meet users' needs in terms of cost, time, and social good?	Are solutions developed in such a way that they meet stringent organizational ESG goals?

Source: Infosys

experience with humans at the core. This practice also ensures that technology is inherently "good", giving firms the ability to link value creation with ESG outcomes.

Stages on the way to build human-centric systems

Before building and developing human-centric solutions, firms should evaluate the following parameters:

- **Human-centric experience:** Is the solution design compatible with human wants and needs?
- **Human empowerment:** Does the solution reduce anxiety around safety, transparency, privacy, security, and sustainability?
- **Human effectiveness/sentience:** Is the solution easy to use and predictive while delivering good human outcomes?
- **Human virtue:** Is the solution low-cost and time-sensitive to humans while benefiting the demands of society and the planet?

Regardless of industry, region, or customer sentiment, these questions can be extended across a product's lifecycle (design, development, testing, deployment, maintenance, value realization, and modernization) (see Figure 1).

Testing	Deployment	Maintenance	Value realization	Modernization
Is the experience solving users' problems or adding to their work?	Can the solution be fine-tuned in production based on new user insights?	Does the solution continue to meet users' experiential goals in production?	Do users adopt, and engage frequently with the solution?	How can the user become more enthusiastic about the solution?
Are users comfortable using the solution? If not, which elements are causing the discomfort?	Does the solution make good use of data and models in production?	Does the solution continue to meet ethical standards after deployment, and do teams have the requisite skills to make any changes to the solution?	Do users feel good about the solution?	How can the user become more empowered when using the solution?
How easy is the product to use? Were some features left out that should be included to meet design criteria?	Is the solution easy to use while scaling across multiple users?	Does the solution continue to work as originally intended?	Does the solution enable users to get things done more quickly and easily?	How can the solution become more effective for the user?
Is there a discrepancy between design and build in terms of how cheap, efficient, or humane the solution is?	Is the solution "good" even as it scales?	Is the solution cheap and efficient even when maintained for long durations?	Does the solution meet a firm's ESG goals?	How can the solution become cheaper and more efficient?

Case study

Pharmaceutical e-labeling application — the framework in action

Pharma companies usually use physical labels (mostly paper-based) for products. These labels, according to national requirements, should provide accurate information about drugs to patients and health care professionals. However, revisions to these approved labels take time to circulate, which is a potential risk to the patient's safety. Other constraints: 1) any updates on drugs have to wait until the next product release, 2) label removal is tedious in case of a product recall, 3) time to reach market can vary due to region-specific regulations, 4) labels involve high cost, and 5) labels have impaired readability due to cramped font size. All this is pushing the pharmaceutical industry to e-labeling. Let's understand the capability of e-labeling through a case study.

A pharmaceutical company wanted to build an e-label for a new brand of acetaminophen.

The **design** team realized that practitioners and patients wanted personalized information (medical history, etc.), something only an e-label mobile app can solve. Systems thinking suggested that patients wanted medicinal alerts. In the **development** phase, the team used natural language processing (NLP) to translate the labels into hundreds of languages and computational design schemas for a user-friendly experience. The development team worked closely with the design team to create a content management system to reduce cycle times and deliver faster label updates.

In the **testing** phase, the product owner discovered that users feared their data was being shared with health providers indiscriminately. A button was then added to the app to take a privacy-first approach. A note was also sent to the build team to introduce an exhaustive list of side effects for certain conditions, including a search function, to the next release. DevSecOps practices enabled a faster **deployment** of the app. It was further tested with a select few users before a wider rollout. Quick software updates with minimal impact on the end-user experience were challenging at this point.

Three months after the app launch, the **maintenance team** reported that the product worked as intended. However, a high net promoter score (NPS) disguised that some customers were reverting to paper labels.

Then, aggressive marketing campaigns were run to advise how to download the app and use the QR code, highlighting how most users are now less anxious about taking their medicines. During **value realization**, data analytics discovered that some doctors question whether the app's information is completely accurate and voiced concerns as to how the NLP system works.

Explainable AI (XAI) technology is touted for the next release, giving humans more insight into the output. Further **modernization**, enabled by a healthy dose to the R&D budget, could introduce natural language understanding (NLU) technology and semantics processes for better labeling accuracy.

In Figure 1, the design and development stages are completely human-focused. The value realization stage is a good marker for how successful the **human-centric experience** is and how **empowered** humans feel when using the solution. This same technology should also be predictive of human needs (**sentient**) and act as a candidate to help firms meet ever stringent ESG goals (**technology for good**).

By focusing on all areas of the framework, business leaders can pivot from a focus on shareholder primacy to an age where business works for a wider cast of actors, each of whom must be satisfied to ensure lasting corporate success.

Sub-theme 1:
# Human-centric experience

Contains:
- **Experience goals are the focus of big business**
- **The future of human-centric experience**
  - **Systems thinking**
  - **Gesture-based controls**
  - **Conversational intelligence**
  - **Immersive experience**
  - **Real-time human engagement**
  - **Sentiment analysis**
  - **AR/VR for equity and inclusion**

OpenAI can generate visuals of textbooks and use simple scripts to create photorealistic movies.[1] It can isolate unique characteristics of human speech and help robots master the art of touch. Systems will soon communicate with humans through facial movements and gestures. And then there's the extended reality (XR) paradigm being created by Meta and Microsoft through a metaverse. On the enterprise side, there can be more real-time human engagements through chatbots, AI companions, and personalized web and app experiences.

Experience goals are the focus of big business

The concept of total experience (TX) — the unification of systems touching the employee, the customer, and the user/partner — will also become more meaningful going ahead. In our Digital Radar 2022 research, we surveyed 2,700 digital transformation leaders from the U.S., Europe, and Asia and found that experience goals are now the focus of big business, beyond just gaining efficiencies and generating revenues (see Figure 2).

Figure 2. Experience goals are now the focus of big business
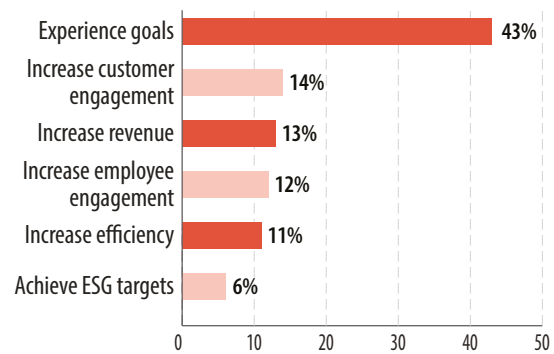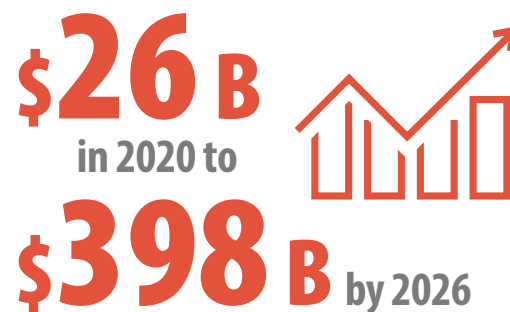

Source: Digital Radar 2022, IKI

> *Executives are looking to optimize business outcomes by focusing on overarching experience goals, beyond just efficiency and revenue generation.*
>
> **Ben Wiener**
> *Head of WONGDOODY*

The XR market
is set to grow from
$26 B
in 2020 to
$398 B by 2026

The future of human-centric experience

Further research[2] conducted in 2020 with Infosys practitioners and experts predicted that the next age of experience technology ("H3" in Infosys parlance) would use self-learning, adaptive, and natural interfaces for a hyperpersonalized, inclusive, immersive, and ambient experience (see Figure 3). And the numbers are proving that. Also, the XR market (combining augmented reality (AR), virtual reality (VR), and mixed reality) will grow exponentially. The XR market is set to grow from $26 billion in 2020 to $398 billion by 2026.[3]

Figure 3. More immersive human experience

H3
Progressive, Natural, Interface, Adaptive
Hyperpersonalized, Immersive, Ambient

KEY PATTERNS	CHARACTERISTICS
• System thinking	• Immersive
• Adaptive	• Natural user interface
• Natural experiences	• Gesture-based controls
• Progressive	• Smart speaker
• Lean UX	• 3D models
• In-place collaboration	• Animation

Source: Infosys TechCompass

So what do the key human experience patterns and characteristics in Figure 3 mean for big enterprises? What will enable more responsive, personalized, and enjoyable human-machine interactions?

Systems thinking

Firms will use systems thinking — a disciplined approach for examining problems completely and accurately before scaling a solution — to ensure experiences factor in the user's (whether employee, customer, or end user) wider social circle and all adjacent touchpoints. In this paradigm, design researchers will need to be more collaborative and embed as mentors with autonomous Agile teams. A data scientist skillset will be highly prized as data becomes the cornerstone of increasingly personalized, sentient experiences.

> A multinational educational startup wanted to bring a technology shift to the education system. It gained a deeper understanding through several use cases of multicultural students, parents, faculty, and staff. It successfully developed a flexible data platform that fulfills the personalized requirements of students, staff, and parents. Notably, the team could have conceived a much more restrictive application in the absence of sufficient use cases.[4]

Gesture-based controls

Humans increasingly want touch-free control of devices. This means machines need to understand speech, gestures, and even facial expressions. With gesturing, signals from hand movements serve as inputs to the system, and the deep learning algorithm can accurately

anticipate what a human requires. For an easy-to-use and intuitive design, user interface (UI) experts must study different gestures at the micro level, and ensure intergenerational differences are accounted for in the training data.

Conversational intelligence

Natural user interfaces need conversational intelligence (CI), using AI such as NLP and NLU. CI gives voice or text commands in natural language to systems. CI finds applications in many segments, including knowledge mining, customer service, cross-sell and upsell marketing, and transactions across digital channels. The CI market is poised to grow at a 31% CAGR over 2021-2028 to reach $46 billion.[5] The most advanced solutions, including those from Infosys Nia, IBM Watson, and Microsoft Cortana, throw away the critique that robots have no personality. These systems exhibit profound knowledge of many subject areas (trained as they are on a wide corpus of data), and scripting errors are mitigated through continuous self-learning capabilities. CI systems will become even more immersive and personalized to provide an "immersive experience" going ahead.

Immersive experience

Immersive experiences bridge the gap between physical and digital worlds, leading to multimodal, multidimensional experiences. While much of the fanfare is for the XR experience in games (especially Roblox and Fortnite), it can also help in field engineering (a maintenance person can receive real-time instructions from experts globally) and in setting high-tech design meetings for employees.

> Infosys' flagship sales leadership event, "Connect 2021," was conducted virtually on Infosys' EPOC Platform. EPOC is a state-of-the-art collaboration platform that helps conduct online events and supports immersive experiences. Connect 2021 was powered by 3D booths, a 360-degree immersive tour of Living Labs with over 20 showcases, and an immersive navigation console. EPOC is powered by WebVR and XR technologies.

Real-time human engagement

Business content must be tailored to unique individuals to support rich experiences across the whole customer/employee journey. Therefore, personalization at scale

requires a data platform layer that stitches together human/customer identities, collects omnichannel human behavior, and analyzes and acts on this information instantly. These real-time capabilities work on the premise of a customer genome, a fingerprint of customer behavior across all touchpoints, both now and in the past. Infosys Genome and Adobe Experience Platform are two such systems making this technology possible. The Infosys Genome solution powered a hyperpersonalized multichannel experience at a large sportswear manufacturer. Via precision marketing and innovative e-commerce campaigns, the system resulted in a 35% repeat buyer rate, a 67% improvement in NPS, and a customer reach of over 95 million.

Sentiment analysis

Sentiment analysis is a subset of NLP. Trained on vast language databases, these algorithms break down the text and score it for sentiment and emotion based on the words and phrases it contains.

The technology can be used to flag abusive or upsetting speech, steering conversations in real time toward positive human-to-human interactions. It can also flag and block content that draws minors into harmful social media rabbit holes. However, the technology should be used with caution. Especially in the case of mediating interactions, written communication can become more robotic and less carefree, detracting from the human element.

> Infosys Text Analytics Platform offers a suite of API-based services, including semantic search, skill knowledge graph, sentiment or subjectivity analysis, rule extraction from legal documents, document classification or categorization, email or chat-based automation, log comparison, and automated data-labeling. The platform supports product hyperpersonalization by providing deeper insights to reduce churn and increase cross-selling.

AR/VR for equity and inclusion

AR/VR is entering the mainstream but still lagging somewhat in the enterprise. As devices and applications become more advanced, user-friendly, and more affordable, they will have a wide-reaching, transformative impact on work, learning, and communication. To ignite development, firms should consider a wider variety of user needs from the outset. Inclusive applications will give individuals more choice

in portraying themselves in virtual environments and enable ecosystem participants to deploy the technology across a diverse user base. Flagging safety and security concerns in the early product and policy development lifecycle will also be helpful. Policymakers can mitigate regulatory uncertainty by clarifying how and when existing accessibility, anti-discrimination, and privacy laws apply to AR/VR solutions. Businesses should invest in R&D labs to spur equity and inclusion innovations. These immersive environments can deliver individualized experiences that meet users' unique accessibility, privacy, and safety needs. However, with all this talk of AR/VR doing good, there is one caveat; poor populations who can't afford the hefty price tag of AR/VR may actually be excluded, exacerbating poverty and cultural divides.

Sub-theme 2:

Data empowerment and protection

Contains:
- **Data users in control**
- **Data empowerment at enterprise scale**
  - **Confidential computing: Building data empowerment into technology systems**
  - **Federated learning**
- **Case study: Data spaces for telco data sovereignty and protection**
- **Data as a path toward prosperity**

Data users in control

Users should have control of what data they choose to share with a company. Transparency is also crucial. "All of us generate a lot of data in every transaction we carry out. And that data is collected by a few companies and then they monetize it. But that data is ours," says Nandan Nilekani, Infosys co-founder.[6] Satya Nadella, Microsoft's executive chair and CEO, also called for users to get more monetary value from their data at the Davos conference in 2020.[7]

Awareness around data empowerment, privacy, and monetization is at its peak, especially after big banks have been hacked and in the tailwinds of the Cambridge Analytica scandal. Books such as Shoshana Zuboff's "The Age of Surveillance Capitalism" underscore the need for big businesses to take data protection seriously. Data power asymmetries are growing, with users on one side and large technology companies on the other. Some research shows that no sector received a "trust rating of over 50%" regarding how they acquire and process data.[8]

Regulators have been listening. General Data Protection Regulation (GDPR), enacted in 2018, requires that data should only be used for the purpose intended. And data should also be portable, and we will return to this in our third theme — the enterprise metaverse.

No industry sector received a
trust rating
of over 50%
in how they acquire and process data

Data empowerment at enterprise scale

Firms are increasingly measured by how well they enable users to have control of their data. Some are hoping to take a leaf out of Estonia's playbook. The small country has set up blockchain systems for data lineage, enacted legislation through the Personal Data Protection Act, and increased transparency for security breaches. Citizens can access, correct, and manage their data virtually, together.[9]

With increased vision comes increased challenges. Some firms are sitting on siloed data stored in numerous data lakes and warehouses. There is no standard process for data removal or transfer. Firms should implement deep data discovery with "clean rooms" so that data transfer between data repositories is pervasive, and user information is identifiable across structured and unstructured data.

Infosys Enterprise Data Privacy Suite (iEDPS) can help here. It ensures that data in production environments is only for legitimate needs such as application development and testing. It also ensures firms are regulatory compliant, and all personally identifiable information is protected.[10] A large U.S. bank used iEDPS to build a secure data exchange data protection service. This created a boundaryless organization for its partners, employees, and customers globally and improved its data sanitization productivity efforts by 40% across multiple data sources and more than 1,500 applications. A major health care provider in the U.S. used the solution to comply with the Health Insurance Portability and Accountability Act (HIPAA) and mask multiple consumer data sources and electronic data interchange (EDI) files. The solution not only reduced the total ownership cost by 40% but also significantly improved the time to market.

Confidential computing: Building data empowerment into technology systems

The Data Empowerment and Protection Architecture framework in India builds data empowerment and protection into the technology architecture. It introduces privacy and empowerment as the default case in processes and IT systems across the entire information lifecycle. With most of the Indian populace generating personal data histories for the first time, the framework aligns policy, regulation, institutions, and technology architecture — balancing the rights of the individual with those of the state.

But it can't prevent rogue organizations from using and processing data in a way not originally imagined by the populace. To become an end-to-end data empowerment and protection vehicle, "use limitation" will need to be encoded into the technology. For this, advances in confidential computing are crucial. Companies like Microsoft and Google are using confidential computing in their clouds to ensure data is safe and never leaves the execution environment. This provides real humans with guarantees that their data is being used only for the intended purpose. Firms can deposit data in these safe environments; in so doing, they empower users, comply with stringent regulations, and ensure that their user's data is not open to phishing and malware.

Federated learning

Another privacy-enhancing technique is federated learning (FL). This is a machine learning (ML) capability to train models across multiple decentralized servers without centralizing training data. With the growing regulation around third-party cookies, browsers like Brave are using FL to authorize ad targeting only by user "opt in." In return, users are rewarded with cryptocurrency. The Brave browser can achieve an ad hit ratio of up to 70% while achieving almost perfect privacy preservation.[11]

Another technique is federated learning of cohorts (FLoC). Google began using this in Chrome in the middle of 2021. Put simply, FLoC eliminates the need to provide personal data to third-party advertisers by grouping users into cohorts with similar browsing histories without ever centralizing these histories in the cloud. Google clients then only access data about these cohorts, not individual users, increasing user data empowerment. The solution is almost 95% as effective as cookie-based advertising, though some companies are blocking the technology, as it still shares cohort information by default. A testing sign of the ambivalence of Google's approach is that they're not testing FLoC in the EU and the U.K. for fear it might be illegal.[12] One argument against the method is that it may actually exacerbate many of the worst non-privacy problems with behavioral ads, including discrimination and predatory targeting.

Case study

Data spaces for telco data sovereignty and protection

Communication service providers (CSPs) need automated mechanisms for trusted, dynamic, and transparent data sharing. Infosys, with its expertise in certified data infrastructure, has worked with companies such as Orange, Vodafone, and Ikanotis Partners to create a proof-of-concept Telco Data Space, borrowing from the work of the Gaia-X European project. Gaia-X capabilities and requirements include:

- Sovereign secure exchange and processing of data in a trusted, decentralized telco ecosystem
- Data usage guidelines for each CSP
- Data governance and data control
- Certified applications to collect, manage, and process data within a trusted distributed environment.

In the Telco Data Space, all participants can share and process data using a special federated connector among different clouds, ensuring that protection and sovereignty of data are in place. There is also a way of identifying commercially sensitive data, flows, and usage restrictions to ensure trust is installed in the business and technology layers.

The data space will enable CSPs to form new business opportunities with partners and provide services to customers in multiple markets. Data can be aggregated from different players so that CSPs can offer value-added services to their customers, including roaming and profile/context information from both domestic and external networks. This all works to increase customer experience while increasing cross-data analytics among firms, dynamic end-to-end service assurance, cost reduction and greater efficiencies through native automation. Further, the solution enables CSPs with multiple factories in different countries to offer multisite services and capabilities.

Data as a path toward prosperity

Companies from Brave to Apple, who are themselves making strides with AI-based privacy-on-device, have realized that personal data can be a force for good when used appropriately. Innovations such as the e-labeling app (discussed earlier) are only possible when personal data is shared discriminately, with privacy and security safeguards. And data can also be a path toward prosperity. With the right technology infrastructure, along with policies that accelerate human and societal development, people can buy, share, and trade their data in a common marketplace. For this, a new ecosystem will have to evolve, with easily accessible and usable data management tools at the disposal of people globally.

This is the vision of the enterprise metaverse, explored in the last theme of this report.

Sub-theme 3:

Sentient experiences

Contains:

- **The business need for sentient systems**
- **How sentient experiences work**
- **Key sentient principles**
- **Sentience as scaled empathy**
- **Use case: Toward sentience — The Infosys Customer Intelligence Platform**

The business need for sentient systems

According to the U.S. Chamber of Commerce, 67% of customers switch brands, not for improved product features or lower price, but due to a lack of personalized engagement.[16] Personalization cannot be an afterthought, and the very best systems should use inference for a seamless user journey. With proper safeguards, AI systems should seek to understand the users' emotional state and contextualize the experience to make it useful for human requirements at any given time.

67%
of customers switch brands
due to a lack of personalized engagement, U.S. Chamber of Commerce research found

> As we build more personalized and perceptive experiences, it's important to implement privacy and security by design upfront, to earn the trust of human and system users.
>
> **Rafee Tarafdar**
> *CTO, Infosys*
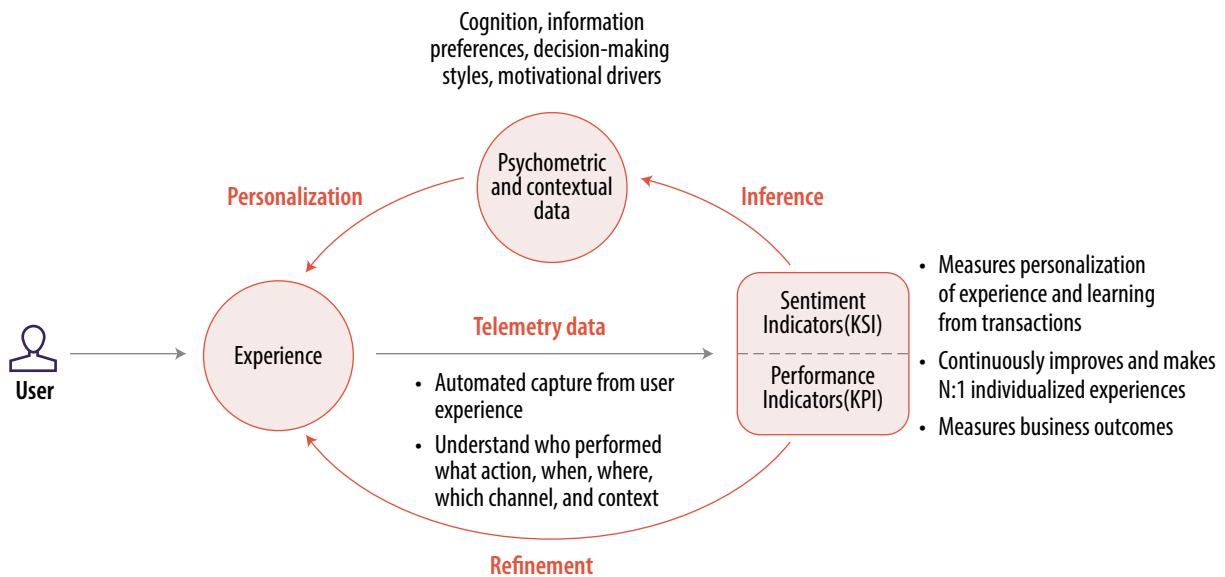
How sentient experiences work

Sentience goes beyond the classic personalization story, a paradigm once characterized by applying simple business rules to optimize the relevance of various system parameters. In this older landscape, personalization was based on simple, explicitly expressed user preferences, such as more Kindle recommendations on Amazon or action movies on Netflix. However, the experience itself predominantly stayed static, with each user generally seeing the same thing. Instead, sentience goes a step further, applying AI to emotionally engage and delight very specific and unique individuals.

How do sentient experiences really work, then? True sentience is created by a "digital brain" that combines each person's behavioral data into an experiential map, at the individual level. This is done over long periods of time. The behavioral data is combined with other data sources, and various permutations of the experience are simulated. The overall system learns how real humans react to the experience, which is continuously optimizing (see Figure 7). This enables each person's experience to be unique, and via Key Sentience Indicators (KSIs), a business can measure the software aspect of the person's engagement, including motivational and psychometric drivers, decision making style, and cognitive preferences.

As underlying processes are redesigned with human aspirations in mind, telemetry, or the current data state of the system, can be captured across all interactions and be used to continuously improve the underlying experience through prediction and refinement.

Imagine a sentient experience that learns from a person's engagement with it, recognizes that they use the experience differently than others, and optimizes it for their specific workflow. It also realizes that they're not engaging with it as regularly as expected, and sends them nudges designed to motivate, gently gamifying the overall experience. Over time, the sentient experience tries out different ways to display data, from textual, to visual, to diagrammatic — and learns how the user engages best with the information to take an action.

Figure 7. How systems become sentient

Cognition, information
preferences, decision-making
styles, motivational drivers

Personalization

Inference

Psychometric
and contextual
data

Experience

User

Telemetry data

- Automated capture from user experience
- Understand who performed what action, when, where, which channel, and context

Sentiment
Indicators(KSI)

Performance
Indicators(KPI)

- Measures personalization of experience and learning from transactions
- Continuously improves and makes N:1 individualized experiences
- Measures business outcomes

Refinement

Source: The Live Enterprise: Create a Continuously Evolving and Learning Organization

We believe this is the next level of human experiences, powered by sentience and data. In this way, advanced technology is making human experiences more personal and emotionally engaging.

> *Sentient experiences are not just personalised, but emotionally engage based on each person's specific motivational drivers, decision making style, and cognition preferences. We believe this is the next level of human experience. In a way, you could say that technology makes our human experiences more personal and emotionally engaging.*
>
> **Ralf Gehrig**
> *Chief Experience Officer, WONGDOODY*

Key sentient principles

Any such system would need to learn and evolve in real time to be truly user-friendly and personalized. Infosys has used the below five sentient principles for its journey toward a live enterprise.

1. **Proximity to the source:** Provide all information to users at the time of decision-making.

2. **Zero latency:** Enable human needs to be met without multiple steps and approvals. This is known as "straight-through processing."

3. **Instant simulation:** Enable users to evaluate alternatives at the point of decision-making. What-if scenarios are run by the system to predict potential failure.

4. **Micro feedback:** Recommend routine decisions and actions to users and enable users to give feedback. This enables the system to learn friction points, which can be used to optimize the ease of moving through the customer journey.

5. **Guided practice:** Provide the user a well-defined pathway to complete a specific activity, which is essential to drive human behavioral change. Users then learn how to use the system in the process.

Sentience as scaled empathy

Firms should create digital experiences that are not just efficient and easy to use, but that connect and engage people on an emotional level. In customer-facing experiences, e-commerce, and digital marketing, this is already the case. But are these experiences really sentient and do they really connect as strongly as they could? And what about employee and partner-facing experiences? Here, there is a huge opportunity for sentient experiences, given the amount of time employees spend at their workstations. Any incremental improvement in employee experience can have a huge effect on motivation levels and overall happiness. Finding the right visualization that fits an individual's cognition style will have a huge impact on the organization. In this sense, creating empathy through sentience is the next frontier in human experience design, a practice spearheaded by WONGDOODY. In this paradigm, firms are led on their journey towards a truly evolving and empathic live enterprise, directed by a designer but amplified through technology.

Use case

Toward sentience — The Infosys Customer Intelligence Platform

Regardless of industry, a **sentient customer experience** can provide significant brand impact.

In insurance, for example, an ecosystem of partners works together to provide information on investments, mortgages, and auto insurance products. The customer journey must be one step ahead and align all stakeholders at every touchpoint. Any effort at establishing sentient customer experiences must factor in consistency of service and omnichannel capabilities. Automated personalization across mundane touchpoints, reminders, recommendations, recurring events, and pattern recognition is expected. Data vulnerabilities and privacy intrusion must be factored into the design.

The Infosys Customer Intelligence Platform takes these factors into account. Based on Infosys

AI intellectual property, the platform provides "hypercontextual" sentience, anticipating human needs and acting on them with real-time recommendations. Based on historical interactions, events, and other data, it can sense, respond to, and automate routine business decisions.

The system comprises three main functions (see Figure 5).

The platform also builds psychographic profiles of customers based on activities, opinions, and lifestyle choices. The platform can also identify emotional responses; motivations; moral, ethical, and political values; and the inherent attitudes, biases, and prejudices that sometimes drive consumer behavior. Here, the system uses the intelligence layer to provide just-in-time interactions. For instance, with native automation (discussed in Theme 2), a fully automated store could use the system for inventory tracking and with chatbots that converse engagingly with busy individuals.

Figure 5. The three functions of the sentient customer experience

Modernize
- Senses signals in real time: Gathers "phygital" (physical + digital) data during the event.
- Unified semantics: Accesses and senses data from core systems through unified semantics and ontology.
- Co-relate and mind map: Identifies hypercontextual physical and digital data about an event, such as an accident or emergency request.

Intelligence
- Digital brain: Combines data, algorithms, and learning to drive intuitive decisions.
- Knowledge graph: Builds a graph database to map the many-to-many relationships between the entity and other entities. Entities include the user, business, and product
- AI services: Analyzes data, images, documents, and unstructured information through microbots, influencing decisions.

Experience orchestration
- Sentient experience configurator: Anticipates and surfaces the most needed feature based on real-time customer needs
- Personalized campaigns and nudges: Creates mobile, web, email subject, email content, social media, offers, conversation, and video.
- Automates business processes: This enables adaptive supply chains, promotions, and channel monetization.

Sub-theme 4:

Technology for good

Contains:

- **"Good" technology impacts the bottom line**
- **What does "good" technology look like?**
  - **Quantifying pain using data-driven tools**
  - **Crowdsourced low-power Wi-Fi for energy-efficient networks**
  - **Discovering new antibiotics using AI**
  - **Speedier recovery from natural disasters using computer vision**

"Good" technology impacts the bottom line

Humanizing the design and development of technology boosts profits, as Digital Radar 2022 proves. But what about society as a whole? How can technology be used to thwart some of the biggest ongoing social (and health) issues?

Many new startups and enterprise research divisions have increased their beneficent R&D budget in recent years. Amazon spent more on doing good in 2020 than many large EU countries, with an increase of 19% in R&D on-year.[14] This sort of work has a tangible impact on the bottom line. The top 500 global asset managers place a premium on the "sustainability nexus" that links purpose, diversity, equity, inclusion, and ESG principles.[15]

What does "good" technology look like?

From better ways to produce indigo for jean coloring to synthetic data generation for reduced human labor to measuring bias for more inclusive health research outcomes, technology is increasingly making planet Earth a better place. Below are a few such examples:

Quantifying pain using data-driven tools

Each year, chronic pain costs $560 billion in the U.S. alone, which comprises health care costs and lost productivity.[16] But the accuracy of data is debatable. A data-driven, patient-centric approach is needed. Bringing together neuroscience and AI, researchers are analyzing data from at-home assessments to calculate long-term pain dynamics and predict the treatment that will lead to pain relief. This technique calculates discrepancies among self-reported pain measures and predicts and quantifies placebo responses. "In this way, pain management becomes more accessible, personalized, and trusted, for patients across diverse socioeconomic backgrounds," says Sara Berger of IBM Research.[17] Further measures are underway to ensure fair and unbiased pain treatments.

Crowd-sourced low-power Wi-Fi for energy-efficient networks

Bringing together the Internet of Things (IoT), AI, and blockchain is bearing fruit. Helium, a decentralized network, has made internet access possible in far-flung regions globally. This network operates on low-power, long-range, unlicensed sub-gigahertz spectrum and uses a novel algorithm that rewards users for verifying coverage. Users buy a router and set it up in their home, forming one node on the network. They can then earn over $20 a day in cryptocurrency tokens. In the future, billions of IoT devices will be connected on this blockchain in an energy-efficient manner, reducing the need for 5G antennas and fiber optic cables. A counter argument to the technology is that it sucks unsavvy people into the crypto ecosystem while allowing Helium itself to avoid paying "real" money in return for users becoming a node on the network. As some experts say, twenty dollars a day in essentially valueless tokens that are difficult to trade might not be a good thing.

Discovering new antibiotics using AI

According to the World Health Organization, resistance to antibiotics is one of the greatest threats to humanity.[18] Michigan University's drug discovery lab is building models to develop personalized therapies that work in synergy with a person's immune system and reduce resistance to antibiotics. These novel drugs reduce the chance of developing drug resistance, have enhanced potency, target different pathogen populations, and can be used for repurposing existing drugs into novel treatments. A hybrid approach, combining cutting-edge deep learning and traditional engineering, is created to tackle the development of fatal diseases (see Figure 6). For instance, one key disease that kills 1.3 million people annually is tuberculosis. The Michigan team has identified an antimalarial drug using ML, which can be repurposed for treating the disease while reducing treatment times.

Figure 6. A novel approach to drug discovery

Engineering models (Mechanistic) ⟷ AI models (Black box) → Clinical application
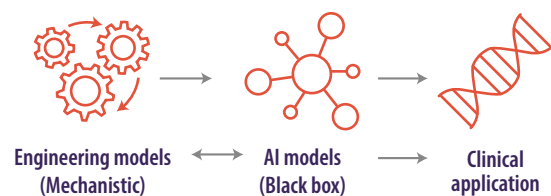
Source: University of Michigan

Figure 7. Property damage from natural disasters is getting worse
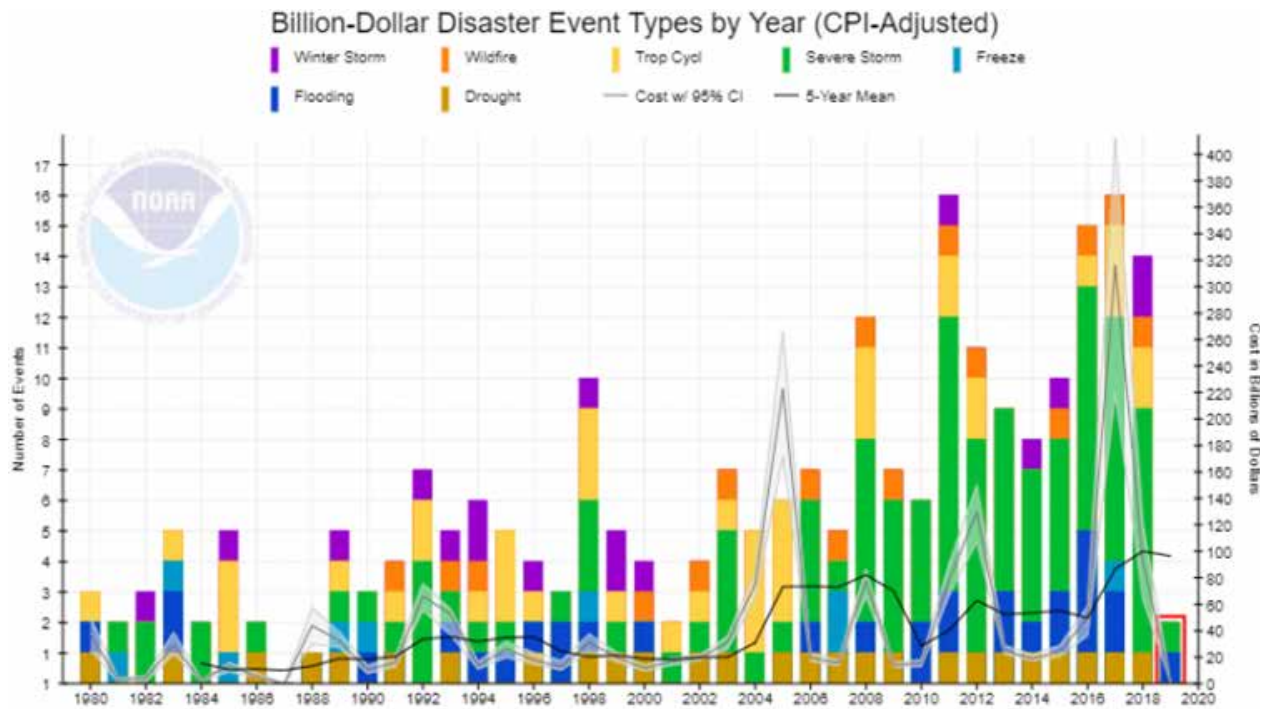
Source: Swiss Re Institute

Speedier recovery from natural disasters using computer vision

Climate change is increasing the severity of natural disasters. In 2020, $190 billion of damage was inflicted on homes, more than four times the amount in 1990. Further, the global population exposed to natural disasters will increase eight times in the next 60 years. A new AI-augmented system from the firm Tractable allows homeowners to take photos of their homes after a natural disaster (e.g., hurricanes) to predict repair costs and unlock insurance claim payouts months faster.[19] A leading Japanese insurer is already using this solution. The technology can help thousands of households recover from the effects of Typhoon Mindulle (projected to have inflicted $100 million in damage to 20,000 households). It can also accelerate recovery from floods and hailstorms and identify homes exposed to fire risk from nearby vegetation (see Figure 7).

Theme 1:
Our recommendations

We have identified nine steps that businesses can take for maximum benefit:

Strategic recommendations

- **Focus on human needs that align with a strategic vision:** Based on the business's strategic direction, leaders need to understand both employees and customers, and use systems thinking to solve their major pain points.

- **Understand your key use cases:** To ensure experiences are human-centric, leaders must understand the key uses cases and carry out focused research to understand those that are relevant to their business and return on investment.

- **Invest in security for life-critical systems:** Complex digital systems are vulnerable to cyberwarfare. Firms need to safeguard the reliability and safety of all software systems, particularly those posing direct life threats (such as medical devices and aerospace products).

- **Use external platforms in a tailored manner to drive enterprise sentience:** To get a head start on implementing sentience, firms can adopt platforms such as the Infosys Live Enterprise Suite. This offers tailored experiences, including Infosys Launchpad (to onboard new employees); InfyMe (for employee personal productivity, work productivity, and insights); and Lex (for educational and career development).

- **Be guided by the U.N.'s sustainable development goals:** The U.N. has laid out 17 goals in their 2030 Agenda, including thematic issues, such as water, energy, climate, oceans, urbanization, transport, science, and technology. Firms that commit to the goals will see a marked improvement in business excellence, along with a tangible impact on the bottom line.
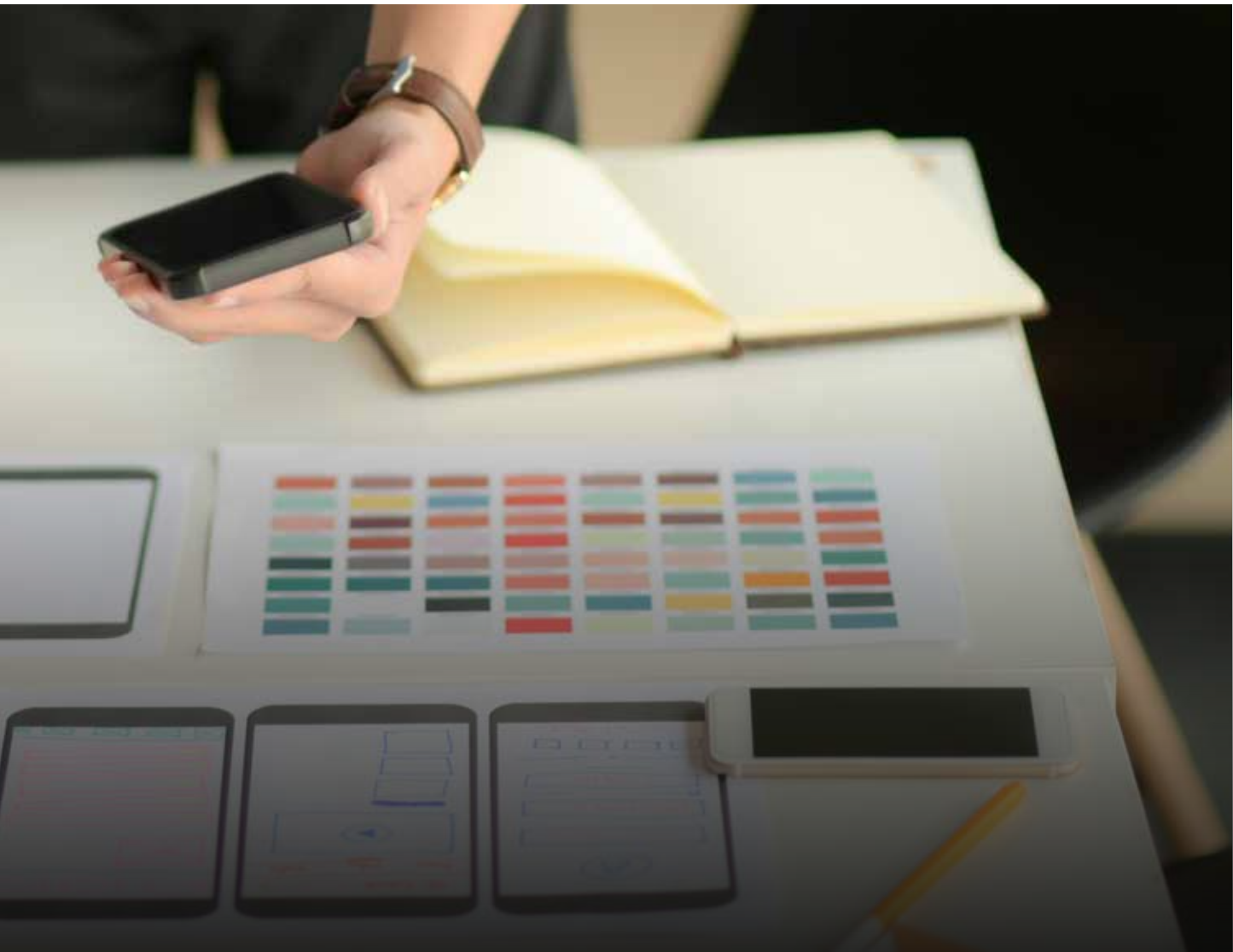
Tactical recommendations

- **Onboard creative designers with business insights:** Technology designers must be excellent storytellers with the ability to influence executives. They must address what is most important to human-centric development while keeping in mind strategic vision.

- **Follow inclusive design principles:** Following Microsoft and Apple, leaders must be guided by inclusive design principles for the 15% of people with some form of disability. The best firms are mindful of accessibility and will build on those principles for AR and VR to deliver the best experience.

- **Invert the design approach for even more inclusivity:** Rather than considering the under-represented as an afterthought, consider turning the standard approach on its head and start by focusing on underrepresented and vulnerable user groups before adapting the solution to fit a wider audience.

- **Use composable technologies for better results:** Overhauling the entire application landscape will set the business back in terms of cost and time. For symbiotic human-machine interfaces, micro frontends can be used. These are bite-size pieces of monolith applications and promise a future where developers can refactor existing web application packages with proven JavaScript frameworks, such as Angular and React.

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