

Transformation by Design

Planning Design Strategies and
Services for the Next Generation
Digital Challenges

Foreword

In the past decade, digital technology has changed the way we connect, run businesses, and deliver public services. With new uncertainties such as climate change, global pandemics, and social problems such as the imbalance of information or the invasion of privacy, the world is in the midst of chaos. In such times, what is important is to not react recklessly to threats and change, but instead to tackle them swiftly and securely by creating a democratic future where the possibilities of people and society blossom.

Fujitsu is transforming itself from an IT company to a digital transformation company and operating as an organization that generates social value. Fujitsu is moving away from delivering solutions that solve problems that lie before us. Instead, the company is committed to delivering transformations, which will at times overwrite the rules in the market or in society, to dramatically change user experience using digital technologies.

Our experiences since COVID-19 forced us to overwrite many existing norms in our lives and work, and these experiences may have been a factor in prompting this transition. Every day before this calamity, we packed into trains, went to designated offices for designated hours, and went home on another overcrowded train. COVID-19 upended that lifestyle. Every employee is now connected online with internal and external stakeholders and communicates and delivers remotely. Such an autonomous workstyle has become the new normal. Many of us today have welcomed these new ways of working. Ironically, it wasn't existing technological solutions that sparked such transformations and changes in norms and routines. Rather, it was a terrible, unwanted guest disguised in the form of a prehistoric infectious agent—a virus.

Such changes in prerequisites and preconceived notions are the imminent transformations in our society that leave lasting effects. Yet we are capable of bringing about this change without relying on another outbreak. Instead, we can turn to the power of design. Design is the avenue to realizing a sustainable society using the power of technology available to us. Design pushes us to envision a hopeful future from an individual and societal perspective and widens possibilities for actualizations without being limited to how society is today. Fujitsu's Human Centric Experience Design (HXD) has been crystallized from all of our design experience. It intelligibly democratizes the power of design and navigates us to scalable digital transformations for our society. Moving forward, I commit that such a structured design approach along with agile approaches will continue to materialize the scalable software and business sense befitting next

generation design.

I must emphasize that the purpose of design is not to superficially make over our products or services, nor is design a tool to produce eccentric ideas. Instead, design is a mindset that every individual should adopt to cultivate innovation and contemporary business literacy.

In the twenty-first century, there is an increasing demand for corporations to clearly define and articulate their purpose and role in society. People are interested in and paying attention to which organizations contribute to creating values for them. Corporate leaders also recognize that for companies to accomplish sustainable and long-lasting growth, it is extremely important for them to explicitly present the *why* of their companies and to fulfill their promises and obligations to people and society. We should no longer be trapped in customer needs of the past or old business concepts and routines. The transformational design mindset requires us to steer away from old constraints. It instead guides us to achieve important goals that people and society aspire to. Every organization should constantly foster and promote this design mindset, since it is the ultimate source of power and drive that shapes a better future.

This book was specially designed and edited to include materials that foster the growth of such a transformative design mindset and offer support and guidance for the process. These materials are based on the research outcomes and the philosophy of Fujitsu's strategic partner, Politecnico di Milano's design department, along with Fujitsu's know-how gained from our own practices. We believe this combination will provide you with tangible knowledge on how design has evolved across industries and various fields. My belief is that to bring about transformation at the required speed and scale, it would be vital for the act of design to become an organizational culture that rejects utter dependence on a handful of experts.

Mr. Takahito Tokita, Fujitsu's CEO and CDXO (Chief Digital Transformation Officer), proclaimed on the July 1 CEO bulletin that design is a crucial corporate management resource and must be applied to Fujitsu's strategies and philosophy in every aspect of the business process. We hope you, the reader of this book, will cultivate a design mindset and become a leader of design-driven transformation today, shoulder to shoulder with other transformation leaders who may not be part of the company, and we hope you share this path in realizing a more fulfilling society. By blending together the digital realm with the power of design, we look forward to creating a yet unfathomable but brilliant world.

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1

The Value of Design Today

The meaning of the word *design* has greatly evolved over time, as have the object that design is concerned with and the level at which design operates within companies. Design has acquired a more strategic position and design thinking has attracted attention in the business context, becoming a core innovation asset. Today, design is very much connected to the idea of designing for people, and human-centered design (HCD) plays a central role. This chapter presents a brief historical overview of design, documenting a transformation of the meaning of the word itself, its growing importance as an attitude, and its implications on people's mindsets.

1. The Meaning of Design

1.1

Defining design

Design is increasingly at the center of debate in the business context and beyond. It is challenging to come up with an exhaustive definition of design because it is a complex phenomenon, or rather, a problematic word. In fact, its meaning and attributes largely depend on the context to which it is referred.

From a linguistic standpoint, design could be a verb, as in *to design*, *to carry out a project*. This concept derives from the Latin *projectus*, which means *throwing forward* in reference to the goals one intends to pursue in the future. As a verb, *to design* thus means to create something for our future, or more generally, for a better future. Likewise, *design* can be used as a noun when it refers to project-related activities or skills, while it has more recently found new applications as an adjective (e.g., designer clothes, designer shoes, etc.), thus acquiring interesting promotional value. In this context, *design* refers to the stylistic qualities of the object, its creation process, and eventually its cost.

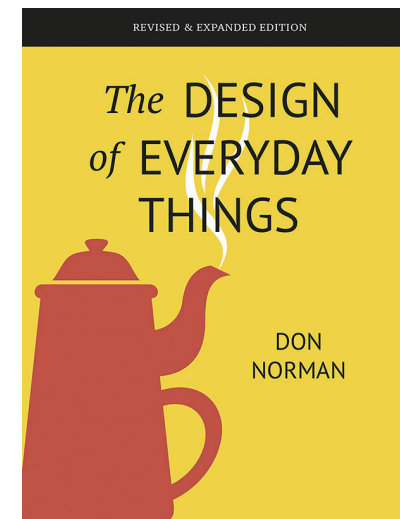
In his book *Design: A Very Short Introduction*, British writer and lecturer John Heskett (2002) comes to the conclusion that the word design has so many meanings that it becomes almost impossible to disentangle its complexity: "Design... as a word is common enough, but it is full of incongruities, has innumerable manifestations, and lacks boundaries that give clarity and definition.... Design has so many levels of meaning that it is in itself a source of confusion."

With this in mind, this introduction will try to bring together a variety of perspectives on the topic to show some of the most recent and interesting contributions to the definition of this complex field.

In his definition of *design* for the *Treccani Encyclopedia*, Italian architect and designer Andrea Branzi (2006) talks about design as a mass phenomenon:

Design has become a mass phenomenon. The use of the expression "mass" does not have a negative connotation, but points towards a new kind of social

1. John Heskett
2. Don Norman



activity undertaken by an ever-increasing number of actors, who are committed to designing innovation strategies and future scenarios that go way beyond the product. We can thus affirm that the era of the design masters, whose production revolved around individual objects (often true masterpieces), has come to an end and a new era has begun, one in which design is one of the main levers of the social economy.

In October 2015, during its twenty-ninth General Assembly, the World Design Organization (WDO and former ICSID, International Council of Societies of Industrial Design) has introduced one of the most effective and contemporary definitions of *design*:

Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences. Industrial Design bridges the gap between what is and what's possible. It is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, service, experience or a business, better. At its heart, Industrial Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business, and customers to provide new value and competitive advantage across economic, social, and environmental spheres.

Design is a process with high strategic value, a problem-solving tool, and an enabler of innovation that often leads to successful business outcomes. First and foremost, this definition frames what the domain of design is. Today, design isn't just about products anymore, but it is also applied to systems, services, and experiences. Second, this definition highlights its distinctive qualities. When a product, process, service, or experience is well designed and works well, it generates a tangible positive outcome. This outcome is expressed in the form of improvements to people's lives and the creation of new economic value.

Up to the beginning of the twenty-first century, design had mostly been applied to industrial products (hence the definition of *industrial design*). Thanks to the advent of digital technologies and the technological revolution this brought about, an extremely fast transition occurred, making design a particularly important asset for the creation of systems, services, and experiences. In fact, user experience has lately become the most important part of every business model.

In an article for the NN/g group American researcher, author, and professor Don Norman, known as the father of user experience, puts forth a provocation in which he declares that experience is everything: "User experience encompasses all aspects of the end-user's interaction with the company, its services, and its products." In this respect, design plays a maieutic and visionary role because, as the WDO's definition of design highlights, it fills the gap between what is and what is feasible or desirable.

1.2
Strategic design

Design is concerned with the future; from a methodological standpoint, this is reflected in the use of ethnographic methods, observation, interviews, and more generally the involvement of users in the design process. In this meaningful detail sits the magic of design and its most important characteristic: the ability to read innovation and give it purpose and value. Italian professor and researcher Francesco Zurlo gives a definition of this strategic action. In his book *Le strategie del design, disegnare il valore oltre il prodotto* (*Design Strategies, Designing Value beyond the Product*), he explicitly presents the three fundamental characteristics of design and designers: foreseeing, seeing, and making other see.

Likewise, there are several other authors, including Italian professor and researcher Roberto Verganti, who refer to the idea of *meaning innovation*. This innovation is expressed through products and services that create radical breakthroughs and disrupt the schemes of incremental innovation. It proposes new approaches and generates new opportunities to solve complex problems.

It is evident that innovation isn't exclusively about technology and that it can fully be defined as such only when it enters the market and makes an impact on society. To achieve this, any innovative component of any solution must be deemed worthy by users, and so innovation, research, technology, and business should

work together harmoniously to interpret or anticipate user needs in an appropriate way.

Example: The Nintendo Wii, a success of meaning innovation (2006)

As Roberto Verganti (2009) highlights in his book *Design-Driven Innovation*, the Nintendo Wii case study demonstrates how technology can play a central role as the enabler of a radical breakthrough. This groundbreaking innovation not only transforms a product and its functionalities, but it can also redefine the meaning of the action the user performs with it. In fact, the Nintendo Wii relies on a specific type of electronic component – MEMS (microelectromechanical system) accelerometers to allow users to interact with the games in a new and more active way, through gestures and movements in the real world.

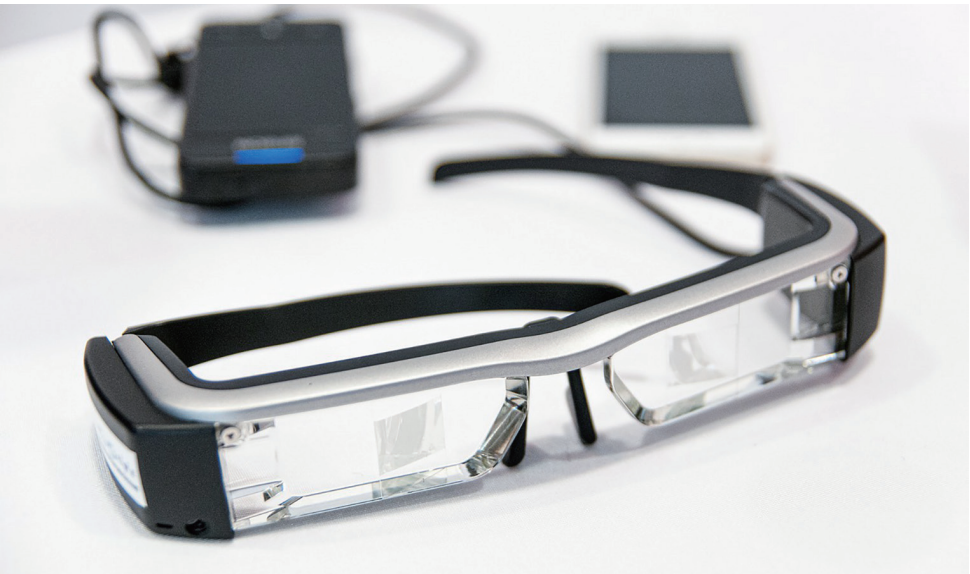
As Verganti says, the Wii transforms "the meaning of game consoles from a passive immersion in a virtual world into an active physical entertainment in the real world, through better socialization." In an approach quite different from those of their competitors, who were moving in the direction of more immersive experiences, Nintendo chose to simplify its games, interactions, and visual styles. As a result, the Nintendo Wii has quickly become popular across generations and has redefined the meaning of gaming, managing to appeal to new and unexpected markets.

- 1. Nintendo Wii
- 2. Nintendo Switch



1

2



Children, parents, and grandparents gather around the console; technology has been the main driver in the console's development, but this has resulted in a new purpose for users. The same interesting approach can be seen in the more recent Nintendo Switch console, which has once again redefined the concept of videogames, detaching it from a specific context (the user plays alone or with somebody else, in front of the TV or anywhere else) and allowing for new interactions through the creative Nintendo Labo kit.

Example: The Google Glass, a failure meaning innovation (2014)

On the contrary, the Google Glass experiment and its commercial failure testify a very different kind of situation, one in which innovation has been primarily driven by technology and has given birth to a product that feels distant from real user needs. From an engineering perspective, the Glass is truly avant-garde, as it allows users to perform complex tasks through a head-mounted display and to voice commands, completely hands free.

However, while the Glass had a significant impact on specific B2B contexts (e.g., medical and maintenance), it failed to create value for individual customers (its intended target). It also failed to clarify what need the product was solving and why people would want to buy it and use it. What this story illuminates is that when innovation is solely driven by technology, it rarely becomes a market

success. If it does succeed, it's because it has been given a form that makes such technology approachable and human centric.

As design becomes more strategically relevant, the role that designers play is evolving as well. In particular, designers today must be able to infuse responsibility and cultural awareness into the creation of products and services. Technology offers us endless opportunities, while design gives us the tools to imagine new products and services and transformative business opportunities through a user-centered approach. Thus design must act responsibly. This means, for instance, adopting an ethical approach towards big data and AI, but also curating the aesthetics and form of products, services, interfaces, and interactive artifacts, in order to make them coherent and understandable. Also, acting responsibly concerns taking into account the cultural implications of every project and finding ways to contain the loss of distinctive and unique cultural traits, also known as deculturation. Altogether, the concepts listed here represent the most prominent ethical concerns that designers should pay attention to.

1.3

Human-centered design

Design is inherently interested in people as users of products and services or as actors who interact with such artifacts in various ways. The interest of scholars and practitioners towards codifying the theories and methods of a human-centric approach isn't new. Already in 1937, as Hungarian artist László Moholy-Nagy was establishing the design school New Bauhaus, he affirmed that observing users and their behaviors to come up with solutions was already a consolidated practice for designers.

Later on, human-centered design made its appearance as a methodology that could help designers to come up with more usable machines or interactive systems. Particularly important in this sense is the manual written by American industrial designer Henry Dreyfuss in 1955, *Designing for People*. This application in engineering-related fields has proven its value to support the creation of tools with a predefined set of goals and tasks. However, the approach falls short in the case of more complex design problems or more open-ended and exploratory interactions performed by users.

Thus, in more recent years, human-centered design has been redefined as a practice that looks at users in their contexts, to not only create usable solutions but also to identify areas of value and create relevant propositions. This has elevated the role of human-centered design

as a methodological approach that can help to inform strategic decisions.

The human-centered design pyramid (see image on the next page) defines very well this contemporary approach and suggests that we should look at humans from a number of different perspectives: biological, cognitive, emotional, sociological, and metaphysical. Similarly, in a brief video lecture, Donald Norman reminds practitioners that human problems are often multifaceted and interconnected and that designers should focus on the underlying causes rather than just on the symptoms of a given problem.

Human-centered design is concerned with taking the perspective of the user into account throughout the design process and always making sure that the decisions being made reflect the user's needs and address them intentionally. While it is always the designer's responsibility to act as a filter and shape the solution, failing to acknowledge the user's point of view could result in bad decisions. The following are some of the ways in which human-centered design can contribute to the design process:

Empathy and taking perspective: listening to users, observing them, and interacting with them to fully understand their context and needs.

Need definition: leveraging the gathered insights to define areas of need and opportunity. It is important

- 1. Moholy-Nagy
- 2. Artwork by Moholy-Nagy

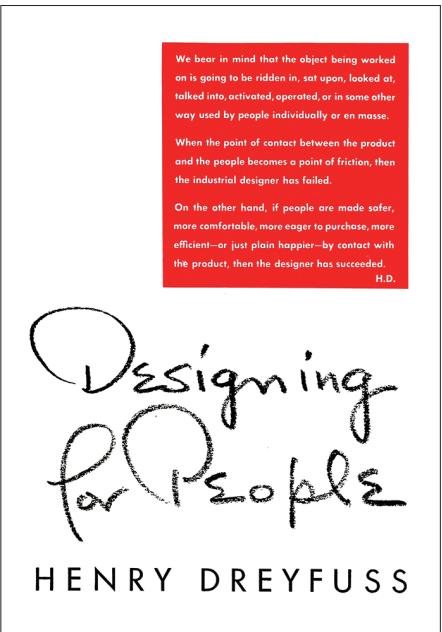


to stay anchored to user needs at this stage and avoid jumping to solutions too quickly. One should say "we need to help people better manage their finances and be more educated and in control" rather than "we need automated budget recommendations."

Idea generation and prioritization: leveraging the gathered insights to come up with possible solutions, and prioritizing them by taking into account the value for the user amongst other factors, such as feasibility, strategic fit, business potential, etc.

Solution validation: testing possible solutions with users to verify their fit in terms of value, usage, and usability.

Over time, the principles of human-centered design have been translated into a variety of templates, methods, and codified activities, sometimes taking the form of toolkits. Particularly notable are design consultancy IDEO's toolkit and field guide, which provide actionable insights and practical guidance to professionals seeking to adopt this approach.



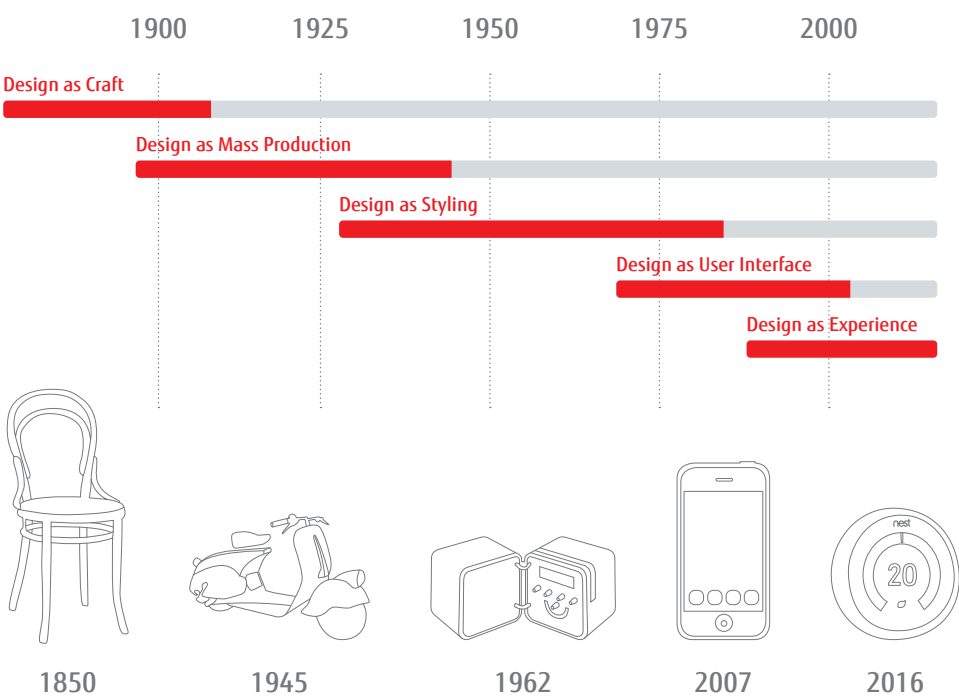
Designing for People



The HCD Pyramid

2. Design Evolution

Design evolution:
a brief overview



2.1

The origin of design

The origin of design can be set between the end of the nineteenth century and the beginning of the twentieth, following the advent of the second Industrial Revolution. The purpose of design in this historical moment can be easily defined through the concept of *Die gute Form* (Max Bill, 1949) or *Good Design*. This is opposed to the idea of design as style, diffused by various masters and ambassadors of design, who first adhered to the German art school Bauhaus and then to the Ulm School of Design. In its first applications, design was thus concerned with the idea of giving the appropriate form and quality to industrial products.

Before the advent of industrial design, design was considered on a par with craftsmanship. Anyone who was capable of producing an object could be called a *designer*, whether dedicated to the creation of unique self-produced pieces or small productions that relied on

craftsmen specialized in the use of a certain material. This is how objects were created prior to the Industrial Revolution. In *Capire il design* (that is, *Understanding Design*), Andrea Branzi claims that design was born million of years ago when hominids first started shaping stones and using them to slice meat or hunt.

Making stones sharp enough to be employed as hunting weapons required advanced skills. In particular, it required the ability to identify a need (getting food) and turn it into a solution (a tool) that, once tested, could be used by every member of the community. Several cave paintings testify the successful, widespread adoption of new hunting tools. This story highlights one of the most salient qualities of what we call design today: the ability to turn problems into opportunities through intelligence, which is a key prerogative of human beings.

The following paragraphs leverage a variety of case studies to present some key milestones in the history of design. A significant portion of these examples draws from the Italian history of design.

2.2

Design and mass production: new industrial processes and chair No. 14 by Thonet

As industrialization progressed and technology evolved, design began to be applied to mass production. An interesting example is the Thonet chair company's creation of chair No. 14, which is regarded as a watershed between classic artisanal and industrial production. Designed in 1859, prior to the Industrial Revolution, this chair embodies an archetype, the Viennese chair, and has sold over fifty million units over the course of forty years. This chair is tangible proof that, when design is well applied and discontinues a tradition by integrating new understandable and desirable elements, it can lead to significant positive business outcomes.

German-Austrian cabinet maker Michael Thonet patented his steam-bending process for wood, which was

a very promising technique but posed major productive constraints as well: wood could only be bent in one direction and there were limitations to the length of the pieces that could be processed. By turning these constraints into opportunities, Thonet created the first assembled chair in history that then went on to become an entire family of products.

Before Thonet, chairs used to be unique pieces, and the finest productions featured decorations or inlays. Overall, they were bulky and heavy. Thonet managed to simplify the form of the chair, offering a functional and rather minimal solution that defined a new paradigm for that era. His design choices had a knock-on effect on the distribution of the product as well, since the chairs were delivered completely disassembled to customers. Years and years before IKEA, the concept of the flat-pack was born with Thonet.



Chair No. 14

2.3

Postwar conversion and new opportunities for industrial production: the Vespa scooter

After World War II, several companies were on the lookout for new opportunities and seeking a viable alternative to war production. Like other companies, Italian company Piaggio produced military aircraft before making Vespa, and right after the war, they initially weren't planning on entering the sector of motorbikes.

In 1946, Italian entrepreneur Enrico Piaggio gave engineer Corradino D'Ascanio the task of designing a lightweight and economic scooter. D'Ascanio hated motorbikes; he deemed them uncomfortable, noisy, and difficult to maneuver on streets that were often unpaved, and he disliked how easy it was to get dirty while riding.

D'Ascanio was able to quickly flip the problem on its head and get the most out of these issues by defining a new archetype for mobility on two wheels. By simply moving the engine and the tank under the seat, he freed the central *tunnel*. By employing a load-bearing frame that served both an aesthetic and a functional purpose, he eliminated the need for an additional frame. Thus, he managed to limit assembly costs and simplify the overall

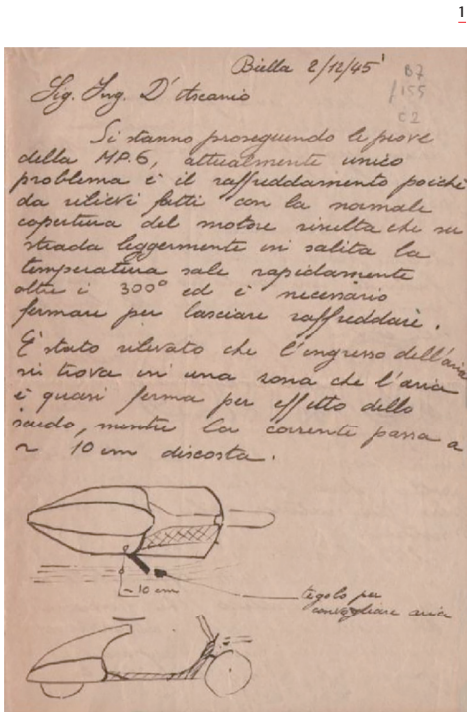
assembly process.

This was made possible because Piaggio owned large industrial presses that served in the production of aircraft. Not only did the solution have a great technical impact, but it also made it possible to guarantee a comfortable seat and driving position. The needs of the user (in this case, the designer himself) were the driving force in a quest for smart solutions that didn't require heavy investment. For example, the engine was designed based on the starter motor of a plane, and the suspensions took inspiration from plane trolleys. In fact, most of the components of the new scooter could be produced with technologies that the company already owned.

The most innovative aspect of the Vespa scooter lies in what today we would call its *user experience*: instead of having to ride it like a motorbike, the rider can simply sit on it and drive it effortlessly. The Vespa scooter has become an icon of Italian design, and just like Thonet's chair, it created a new archetype: everybody thinks of a Vespa when somebody says "scooter." Its long-lasting impact, however, goes beyond the iconicity of the product and its commercial success; it is related to the way the Vespa has been designed, looking at user needs and turning those insights into effective solutions.

1. Vespa Project by D'Ascanio

2. Vespa 50



2.4

The advent of polymers and a new generation of products

Continuing our journey through the history of design and its evolution, we now move from mechanical to electrical and electronic products. The 1960s represented a key turning point in that respect. Televisions had made their first appearance in Italy in 1954. Both radios and TVs were commonplace in living rooms; they were encased in wood and, in a way, had become the center of the modern house. Later, plastic materials began to be employed in the production of appliances and electrical equipment. Italian engineer Giulio Natta, who would later be awarded the Nobel Prize in Chemistry, invented the Moplen (more commonly known as isotactic polypropylene) at Politecnico di Milano in the 1950s. This plastic is still one of the most widely used polymers today.

In this historical moment, industrial designers Marco Zanuso and Richard Sapper worked for Brionvega, a renowned Italian electronics company. They used plastic to give new life to the radio, turning a rather static object into a portable and colorful device, characterized by a minimalistic but sophisticated form. The project leveraged a set of technologies that were new and emerging at the time, with the plastic material on one side and electronic

components on the other. These components made this project possible thanks to their miniaturized size.

Radio Cubo (TS522 radio) by Marco Zanuso is made of two hinges that allow the cables to go through (with the electronic boards) the controls and transistors on one side and the speaker on the other side. The radio features a clean, streamlined, and highly innovative design, accompanied by plastic elements, functional metallic components, an antenna, a comfortable handle, and a magnetic frame that made it easy to close the radio.

Radio Cubo embodies the perfect proposition for a generation of consumers that was changing its habits and had begun to wonder: "Why can't I listen to the radio when I'm not home?" The 1960s, with its many plastic products that transformed our domestic lives, constituted a radical style revolution. Similar examples of products that favored a radical transformation of simple daily experiences can be observed in other countries too, as the Walkman designed by Sony in Japan can very well testify.



Brionvega Radio Cubo

2.5

2007: The smartphone is born

Taking a quantum leap past the era of computers and human-computer interaction and its innovative contributions, we mark a new milestone in 2007. It feels relatively far away in the past, but 2007 is the year in which smartphones were born, with the release of the first iPhone. Once again, from a product design standpoint, the iPhone didn't rely on any new or ad-hoc technology. It was based on a proprietary ecosystem made of a dedicated OS and its service platform, iTunes. This platform had already proved its innovative potential with the iPod, both in terms of user experience and business model.

Other telephone companies were investing in incremental innovations for their products: Nokia was releasing its interchangeable covers, Motorola offered small pocket-size phones, RIM/Blackberry had developed a proprietary OS and was known for its QWERTY keyboard targeted to businesspeople. At the same time, Apple tried to imagine how the world of communication would evolve in the future, choosing to enter a business they didn't know. This was possible because Apple readily picked up weak signals and leveraged them to make strategic decisions. Network speed was increasing while costs for

data usage were decreasing, content exchanged through mobile devices were becoming multimedia, and the latest technological developments had made it possible to unite several functionalities into one single object.

The output of this first innovation was a hybrid and slightly monolithic device: partly camera, partly music player, partly navigator, partly phone, and more. In fact, the most significant output has been turning the phone into a new service platform that, thanks to the advent of mobile applications, has seen an exponential and uncontrolled rise in offerings and has turned the smartphone into an indispensable object.

From a product design perspective, the iPhone relied on a number of existing components: an aluminum case with a touchscreen, produced by one of Apple's direct competitors, made suitable for the new purpose thanks to an extremely intuitive interface and haptic feedback. Steve Jobs' words in his famous 2007 keynote sound like a prophecy that Apple's numbers can very well prove. A piece of technology acquired from direct competitors and a company without a production line that decided to trust international manufacturers while claiming that their product was "designed by Apple in California": design is no longer just a trademark or a label, but it is instead the core strategic asset of a company.

2.6

A new generation of smart products: artificial intelligence (AI) and the Nest thermostat

Up until this point, design was concerned with objects which either addressed or anticipated certain user needs but had clear and recognizable functionalities, regulated by direct user input and interactions (e.g., the user presses a button and the radio turns on). However, today we are confronted with a new set of challenges posed by a generation of so-called thinking or smart objects. They derive their name from their incorporation of artificial intelligence. These objects no longer require the user to be an active subject all the time, and they rely on new forms of interaction and dialogue, presenting us with a whole new array of opportunities, including some dystopian ones.

Artificial intelligence isn't just about self-driving cars and extremely complex intelligent systems. Nest, which is now a property of Google, is a small domestic thermostat, equipped with artificial intelligence capabilities and developed by two former Apple employees, Tony Fadell and Matt Roger. Nest is a smart object: it isn't just an interface, but rather an intelligent device which learns from and adapts its behavior to the user's usage patterns. Users don't necessarily have to interact with it, since once activated, Nest is fully autonomous. First, the device is

The first iPhone



The Nest thermostat

installed and the desired temperature for the room is set on the dial.

Then, after just seven days, thanks to a few environmental sensors and a Wi-Fi connection that makes it possible to detect any presence in the house, the device itself is capable of managing the temperature. It proposes an ideal program to the user, taking into account the user's comfort and wellbeing, but also helping to save money on heating. Compared to old thermostats that feature dozens of buttons, levers, and extremely technical user manuals, this sleek, round touchscreen device exceeds the expectations of users. As a matter of fact, it changes their relationship with the house. People don't need to worry about programming the thermostat; all they have to do is enjoy the experience of being in a house that, thanks to AI, can acknowledge their needs and adapt.

Nest's story is almost unsettling. It may easily draw our attention towards the ethical issues that may come with it, especially in relation to data security and the unwanted consequences of data misuse. However, if seen under a more positive light and with a pinch of trust in technology, a system like Nest offers a way to enjoy one's freedom more fully. It gives users more time for the things they truly love and potentially the benefit of a reduced impact on the environment. Future designers will need to face these challenges when designing smart objects and will need to ensure an appropriate amount

of security, desirability, and ease of use.

2.7

Conclusions

If we look back at the diagram that opens section 2 of this chapter (see page 12), we can see how design evolves in relation to the context. In our journey through history, we moved from pure product design (Thonet's chair) to design for mass production (the Vespa scooter) and design of domestic and electronic objects, interfaces, and computers. We eventually reached an era that is dominated by attention to user experience and by technologies that enable objects to learn and think. If we look around, our lives are permeated by tools and services that embody new technologies to assist us in accomplishing tasks and make our daily experiences more exciting. Chapter 5 dives deeper into the design of services and experiences and offers several case studies from the digital era. In summary, designers today must acquire skills that allow them to deal with the various domains of design, but most importantly, they need to be able to evolve with the context.

3. A New Role of Design

3.1 From design to design thinking and the evolution of the design discourse

Over time, design has significantly changed its role. Until 2002, innovation manuals regarded design as a technical activity in service of R&D departments. However, in 2005 *Oslo Manual* (published by the Organization for Economic Co-operation and Development [OECD] and Eurostat) acknowledged it as a specific type of innovation in itself, and in 2015 it was defined as a strategic activity. This is acknowledged in the definition provided by the International Council of Societies of Industrial Design (ICSID), which can be found at the beginning of this chapter.

In recent years, design thinking has gained significant attention in the business context and has become a central innovation asset for many firms. Thanks to the work of many authors and thinkers including Tim Brown (British designer and CEO of innovation consultancy IDEO), Tom Kelley (American author and partner at IDEO), and Roger Martin (American professor and author), design and design thinking in particular have permanently been recognized as business-oriented activities.

Politecnico di Milano is one of the contexts in which the design discourse has been deeply investigated and developed. In particular, some of the most relevant contributions include the following:

The design-driven innovation theory, formulated by Roberto Verganti, who was the first to codify a design-based innovation model by analyzing the history and evolution of several Italian firms that embody the *made in Italy* label (and some international companies, as well).

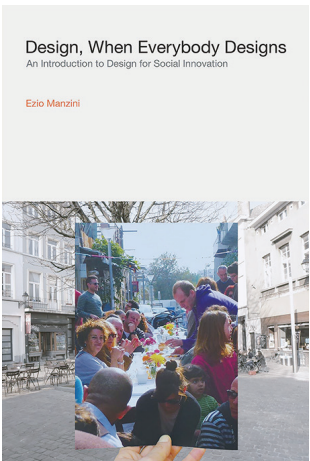
The strategic design approach, formulated by Francesco Zurlo, which introduces elements that bring value beyond the product, including the service and communication layer and the overall product system.

The design for social innovation approach, formulated by Ezio Manzini in his book *Design, When Everybody Designs*, which presents design as a democratic process that serves every individual but still requires professional design skills and culture to be actuated.

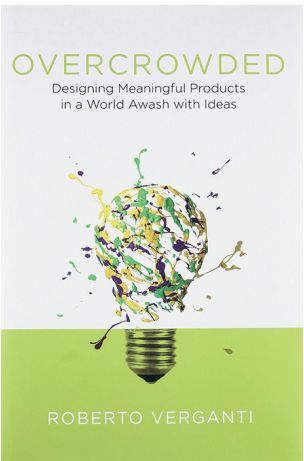
The meaning innovation theory, formulated by Roberto Verganti in his book *Overcrowded*, which reflects upon the value of design in a world overflowing with objects and ideas.



1



2



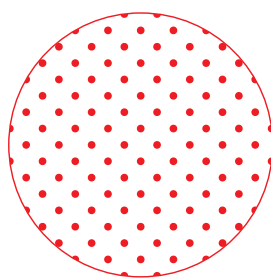
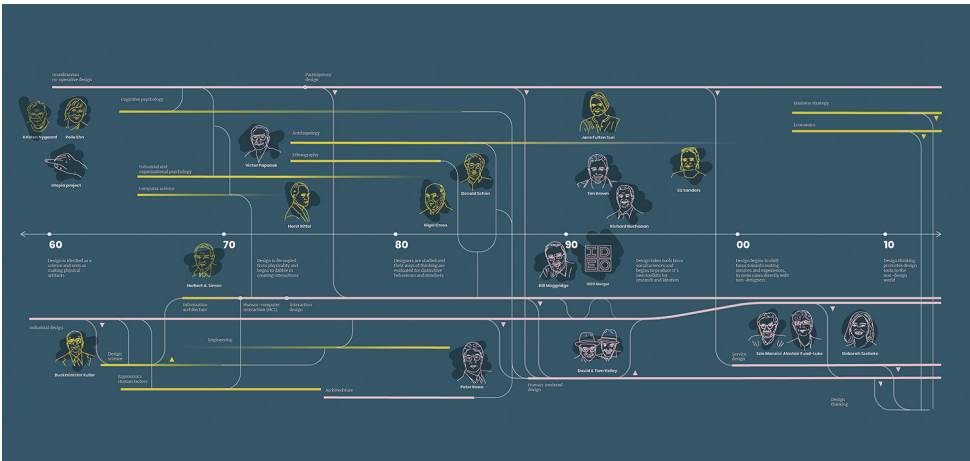
3

- 1. *Strategie del Design*
- 2. *Design, When Everybody Designs*
- 3. *Overcrowded*

3.2 John Maeda and three types of design

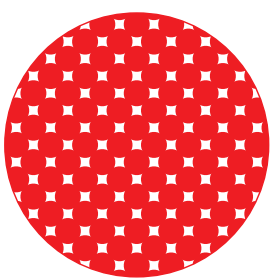
Within the contemporary debate on design, American executive and technologist John Maeda, author of the book *The Laws of Simplicity* and curator of the blog *Design in Tech Report*, is one of the most interesting voices. In *Design in Tech Report 2019*, he reflects upon how technology, business, and design are lately part of an overall ecosystem. More specifically, his report contains a schematic reflection that presents three different types of design.

Design-Driven Innovation



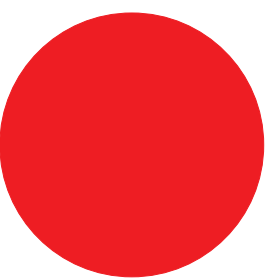
Classical Design

Driver / the Industrial Revolution, and prior to that at least a few millennia of ferment.



Design Thinking

Driver / the need to innovate in relation to individual customer needs requires empathy.

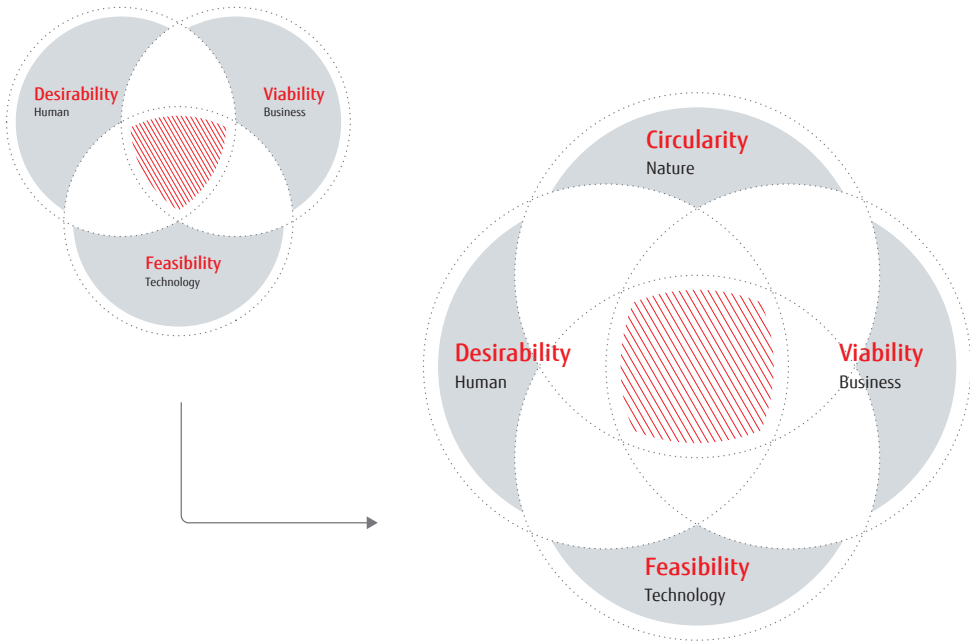


Computational Design

Driver / the impact of Moore's Law, mobile computing, and the latest tech paradigms.

John Maeda's three kinds of design

From design thinking to circular design



According to Maeda, design today means bringing different competencies together:

Classical design, the design that we inherited from the Industrial Revolution and is concerned with industrial products. This kind of design deals with finite objects, some of which have become milestones in the history of design and still have great value today. These are the objects that Dieter Rams would classify under the category "as little design as possible," to quote the title of the namesake book that he published in 2001. These objects are pure and archetypical tools in which design focuses on the details, the functional aspects, and the industrial processes that make their creation possible, thus giving birth to timeless products.

Design thinking, the more business-oriented vision of design that takes user needs into account and builds viable products and services, often leveraging new business models.

Computational design, a type of design that is being applied to a new generation of objects, which as previously discussed, have essentially become super-interfaces. These objects have a wide outreach and are adopted by millions of users and need frequent updates, both in terms of data and software. In fact, since they often exist across physical and

digital dimensions, they suffer from a new kind of obsolescence, which seems to progress much faster than the physical kind. In this context, the focus of the design activity isn't obtaining a finished product, as in the case of classical design, but rather the design process is continuous and more similar to what perpetual beta is for programming—that is, the continuous and ongoing implementation of new features blurs the line between the test and final version of a product.

What is interesting is that Maeda identifies four particularly important aspects of computational design, which attest to the need for design practitioners to evolve their mindset.

Understands computation. It is increasingly important for designers to know the fundamentals of programming in order to effectively define what can be easily implemented versus what has a higher degree of complexity. At the same time, designers aren't required to program directly, but should constantly interact with engineers and programmers, exchanging knowledge and expertise.

Thinks critically about technology. A computational designer should also be a *humanist technologist* who, while being enthusiastic about technology, can correctly interpret its value and the meaning of each

design decision and can distinguish between what can be done and what makes sense.

Uses all three kinds of designs. This type of designer should be able to apply all the three types of design presented in the previous paragraph, having an open-minded and multi-disciplinary approach.

Actively learning AI and the new. Finally, this professional should be curious and interested in learning about AI and other new technologies. They should also be visionaries capable of bringing value and an interesting cultural approach to the creation of new scenarios.

A successful designer today must possess a mix of competencies as well as a solid design foundation, a strong grasp of managerial and design thinking culture, and a well-rounded understanding of technology.

Tim Brown himself, one of the main contributors if not the creator of design thinking, speaks about circular design. This kind of design doesn't just concern the user, technology, and market; it also holds the potential to achieve more systemic impact by fostering sustainability and a system based on the principles of the circular economy.

There is one core idea reinforced by all of these different perspectives: the idea that design is never done, which is increasingly true in the world we live in.

3.3
The many faces of design:
how different companies leverage design to innovate

If it is true that design has acquired strategic value and more often permeates a company's culture, it is also true that different companies have approached design in different ways, often developing tailored proprietary methodological frameworks that inform their innovation processes. Although the approaches presented here all stem from technology companies and share an intention to codify a design methodology, they do not always look at the design problem from the same perspective. In fact, it is interesting to note their unique viewpoint and set of principles.

Design thinking – SAP

SAP is an example of how a large technology corporation went from a more traditional approach to one inspired by design thinking and building empathy for customers to solve their problems.

SAP first took an interest in design thinking in 2004, when Hasso Plattner, one of SAP's founders, contributed to the creation of the first Stanford d.school with David Kelley, founder of IDEO. Over time, design thinking began to spread within SAP and gained strategic relevance. By 2012, it had become core to their way of helping customers innovate their businesses.

At a glance Design Develop Deliver [Watch the SAP Fiori 3 UX intro video](#)

Design. Develop. Deliver. A modern UX for every device. And every user.

SAP Fiori is the UX of the Intelligent Enterprise that changes the way you work. It equips designers and developers with a set of tools and guidelines to create apps for any platform faster than ever – providing a consistent, innovative experience for both creators and users. SAP Fiori enables you to turn new ideas into great apps as quickly as the market demands.

Design with SAP Fiori

Use the UI resources of our award-winning user experience for designing great enterprise software. We are constantly evolving it to make sure your users keep getting the best enterprise UX in the industry.

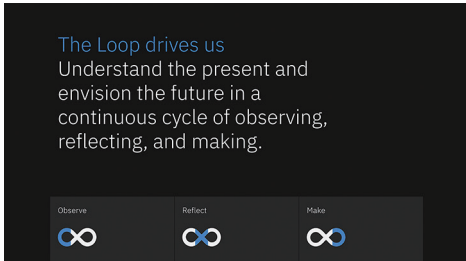
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SAP Fiori

SAP combines design thinking practices (specifically, observing users and learning about their needs to design meaningful solutions) with business thinking and more traditional business research in order to deliver truly innovative output. In more recent years, they have developed SAP Fiori, a language system focused on the needs of enterprise users and thought to speed up, guide, and streamline the design of meaningful experiences.

IBM Enterprise Design Thinking approach



IBM Enterprise Design Thinking – IBM

IBM’s Enterprise Design Thinking has been one of the first design thinking approaches in the technology world to become a standard and a major reference for the industry. IBM's approach focuses on achieving a customer-centric company culture and aims in particular at building an effective model for large corporations, one enabled to move fast and scale quickly.

The proposed methodology is modeled on a classic user-centric design thinking framework. It is described as a loop, composed of three main phases: observe, reflect, and make. Moreover, IBM's framework focuses on providing guidance around team collaboration and increasing effectiveness to achieve impact at scale. Some of the most important aspects of the approach include the following:

- Fostering diversity within teams to create fertile ground for more radical breakthroughs that can emerge from the integration of different viewpoints.
- Composing teams in such a way that they can be fully autonomous in making all of the most important decisions, thus streamlining innovation.
- Providing guidance on team processes—in particular, IBM teams rely on three core activities: formalizing intent (hills), involving stakeholders into the process (playbacks) and making users a regular part of the design process (sponsor users).

1. Material Design language system

Material Design – Google

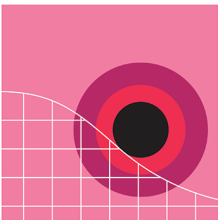
Material Design was created by Google in 2014 with the codename Quantum Paper. It is a cross-platform visual language and design system, envisioned with the objective to create easy-to-use and universally clear digital experiences.

In fact, Material Design takes inspiration from the laws of the physical world to design the hierarchy and the relationships between interface components. Google's vice president Matias Duarte explains that Material Design uses visual cues such as edges and shadow to provide meaning and affordances while leveraging the endless possibilities of the digital world. This helps to provide a consistent experience, removing culture-bound elements and symbols. The bold and linear graphics help to create visual hierarchy, and motion always conveys meaning and follows nature's laws (e.g., gravity).

Material Design is used by Google consistently across their applications, but it has also been made available to the broader community of designers and developers and provides flexibility for brand customization. This is where the real strength of its approach lies: not only are the elements of the design language systems made



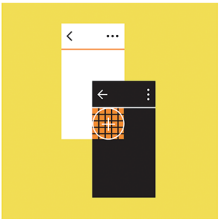
Bold, graphic, intentional
Material Design is guided by print design methods — typography, grids, space, scale, color, and imagery — to create hierarchy, meaning, and focus that immerse viewers in the experience.



Motion provides meaning
Motion focuses attention and maintains continuity, through subtle feedback and coherent transitions. As elements appear on screen, they transform and reorganize the environment, with interactions generating new transformations.

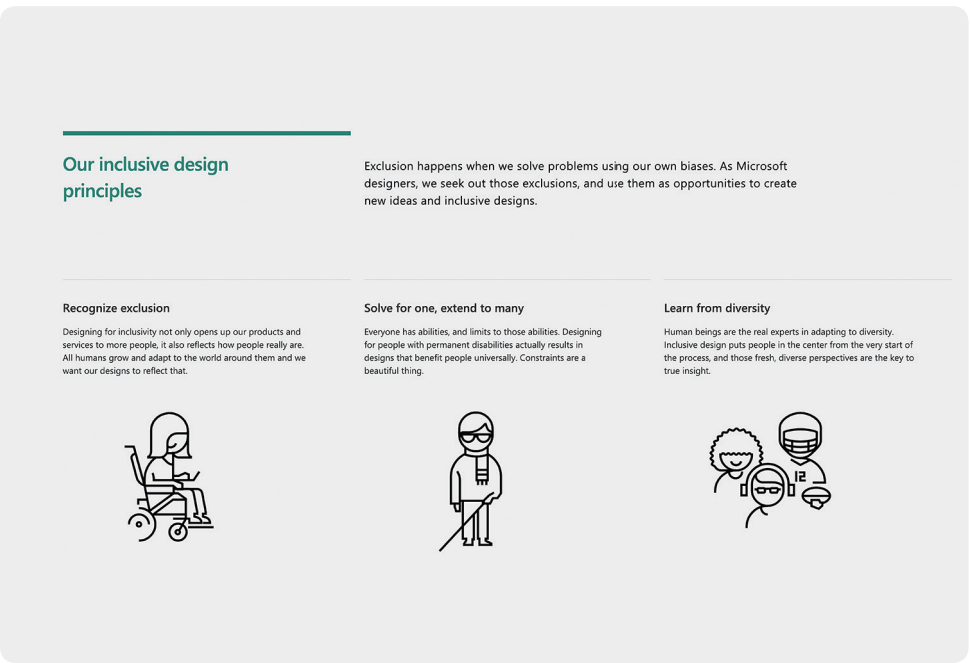


Flexible foundation
The Material Design system is designed to enable brand expression. It's integrated with a custom code base that allows the seamless implementation of components, plug-ins, and design elements.



Cross-platform
Material Design maintains the same UI across platforms, using shared components across Android, iOS, Flutter, and the web.

Microsoft's inclusive design approach



available, but they are accompanied by clear principles and thorough explanations and usage guidelines that can enable every practitioner to craft truly, universally usable systems.

Inclusive design – Microsoft

In recent years, thanks to the strong vision of CEO Satya Nadella, Microsoft has increased its focus on inclusivity, with the intention of maximizing the accessibility of all their products and services for people with all kinds of abilities. Microsoft's inclusive design approach focuses on diversity and overcoming the problems that arise when we are unaware of our biases and let them lead our design decisions. Starting from the assumption that constraints can help creativity and that designing for diversity can actually benefit any user, Microsoft has created and made available a comprehensive guide and set of tools and principles for practitioners to read, use, and integrate in their processes.

An important distinction they highlight in the introduction to the methodology is the one between *accessibility* and *inclusive design*: while the former is mostly concerned with meeting industry standards and regulations, the latter is concerned with taking user needs into account and designing for people. As Microsoft states in its Inclusive 101 Toolkit.

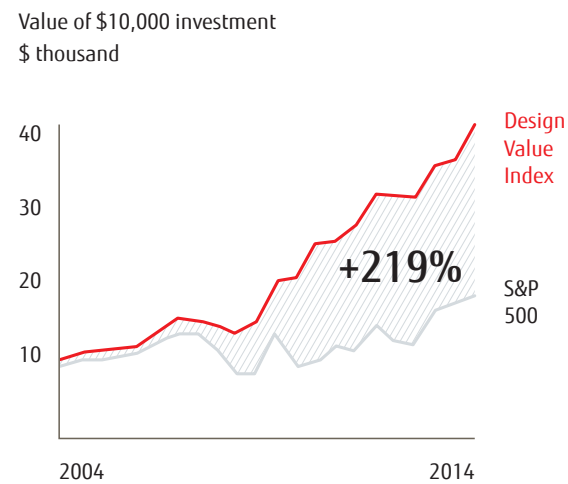
An important distinction is that accessibility is an attribute, while inclusive design is a method. And while practicing inclusive design should make your products more accessible, it's not a process for meeting all accessibility standards. Ideally, accessibility and inclusive design work together to make experiences that are not only compliant with standards, but truly usable and open to all.

Human Centric Experience Design (HXD) – Fujitsu

Fujitsu has long sought to create solutions that truly cater to user needs and put them at the center of the design process. Their approach has evolved alongside major technological developments since the 1980s. Over time, the value delivered by design became greater than the creation of effective software and hardware design, as designers aimed to make an impact at the intersection of user, business, and societal needs. Today, Fujitsu applies a methodology called Human Centric Experience Design (HXD), which brings together user experience design and design thinking. Fujitsu's unique approach is presented in detail in section 4 at the end of chapter 2, Design Thinking and Its Evolution, after a thorough overview of the evolution of design thinking in general.

4. The Value of Design

The value of design:
design pays



4.1

Design generates tangible returns

It has become evident that, when design is applied in an intelligent way and leveraged as a core company asset, firms can greatly benefit from it. Research studies have confirmed this hypothesis and have contributed to the definition of the intrinsic economic value of design.

The Design Management Institute has compared the economic value of the Standard and Poor (S&P) 500 companies with design-oriented companies to extract the so-called Design Value Index, which measures the value of publicly traded companies. Data shows the margin of the latter group is 219% of the former cluster in relation to the same volume of investments.

These findings help to make the value of design more tangible and underline how investing in design is relatively cheaper than investing in technology alone and more profitable by comparison. These numbers also show that design can be measured: what was originally limited to the analysis of intangible elements connected to the brand or the style can now be linked to explicit metrics that allow companies to measure the efficacy of design and innovation efforts. This practice empowers leaders and the management level in general, and it equips them with solid arguments for their choices. Design is a cross-functional talent: companies should stop thinking about design as an isolated and siloed activity if they want to

achieve tangible results. This is particularly true for high-tech companies, in which design should permeate all the different organizational layers.

4.2

Design as a strategic asset: role and evolution of design functions within organizations

In 1997, American researchers Julie H. Hertenstein and Marjorie B. Platt wrote a paper called "Developing a Strategic Design Culture," in which they analyzed several US firms. They focused on the role that industrial design played within the company and observed the company's design processes, hierarchical structure, and measurement frameworks for the performance of design.

The authors emphasize the importance of nurturing a strategic design culture. Design can offer insights to help the company shape its strategic direction when design and strategy work side by side. In this two-way relationship, the company's strategy provides input to inform design activities. This elevation of the role of design, compared to more traditional paradigms, often goes hand in hand with organizational changes and a new position acquired by design within the company's structure. In fact, the paper documents a trend that sees industrial design functions often shifting from engineering to marketing departments and design directors actively contributing

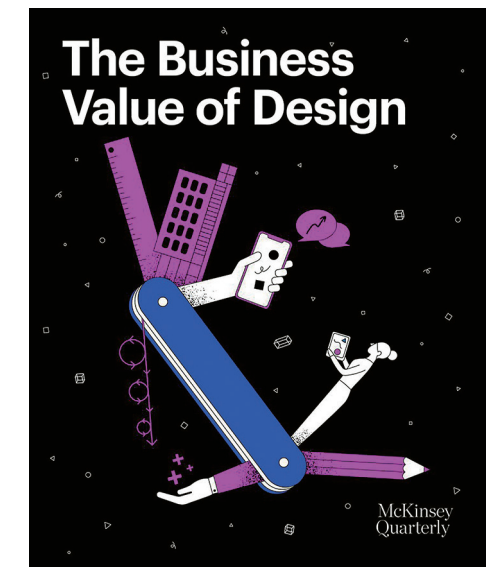
to the definition of the company's strategic direction.

This is increasingly true in modern product and service companies. Furthermore, design is currently important in every single phase of product or service creation and development. Design isn't just connected with the product but also with the user experience, and the product brings value only if it shares the same logic and overall purpose of the experience. The way design has been presented in this chapter shows that it isn't simply an activity or phase of the creative process but rather a continuous iteration.

In their paper "Design for Management: New Ways for Decision Making," professors and researchers Cabirio Cautela and Francesco Zurlo take these reflections on the role of design one step further. In fact, they analyze design-driven decision-making processes in relation to more traditional managerial processes and reflect on how the former can complement, strengthen, and even influence the latter.

Design typically receives input from management through project briefs. Over time, the design practice creates and codifies a set of qualitative methods that play a central role in helping teams define boundaries for intervention and reframe problems. Such methods include trend analysis, context inquiry, scenario building, rapid ethnography, blue-sky research, and character portraits. Design brings a new kind of output to the table, often based on visual stimuli and capable of picking up weak signals and emerging trends. Thus, design offers new perspectives that can help management go beyond known schemes and avoid an undifferentiated output.

These insights demonstrate that embracing design does not mean assigning design tasks to only some parts of the organization. Instead, it implies a true mindset shift and the creation of new collaboration models.



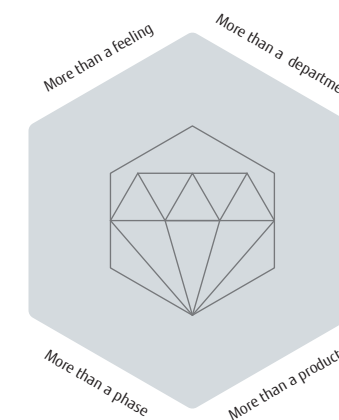
The Business Value of Design

It's analytical leadership

Measure and drive design performance with the same rigor as revenues and costs.

It's continuous iteration

De-risk development by continually listening, testing, and iterating with end-users.



It's cross-functional talent

Make user-centric design everyone's responsibility, not a siloed function.

It's user experience

Break down internal walls between physical, digital, and service design.

The Business Value of Design, factors

A recent report published by McKinsey & Company named *The Business Value of Design* tries to outline the fundamental elements that allow companies to integrate design in an effective way and reach a sufficient degree of maturity from this perspective. In particular, they identify four main elements:

- Strong **analytical leadership** that includes a design perspective at the C-level and adopts metrics to evaluate the value of design
- Presence of **cross-functional talent** and an infrastructure that can empower cross-functional collaboration
- Favorable attitude towards **continuous iteration** and the integration of different methods and perspectives
- Primary focus on **user experience**

Regarding this last point, we can reference British interaction designer Gillian Crampton Smith, who has long claimed that users are not seeking products, but experiences. She is a prominent figure in the international design landscape and has contributed to the creation of important educational programs in design. In particular,

she founded the Interaction Design Institute Ivrea in Italy in 2001, the first Italian school entirely dedicated to interaction design and a particularly interesting educational experiment focused on enhancing the way people interact with technologies.

We can find further support for Gillian Crampton Smith’s reflections on the importance of experiences by looking at one of the most common objects of our contemporary lives: the smartphone. With regard to the design of the physical products, the differences between smartphones are not necessarily great, and it is relatively common for different brands to share product components. On the other hand, what sets products apart is the user experience, differentiated through applications, gestures, interactions, shortcuts, wallpapers, ringtones, and so on.

These are the aspects that interest users the most, because they enable them to communicate with others and perform other actions in the most intuitive way possible. In summary, we can say that the concept of user experience isn't new, but it is a way to re-define and re-aggregate the competences that designers once applied to industrial products. Today, design expertise are applied to new digital products that have broader perspectives and a renewed cultural outlook.

Key Takeaways

1. The Meaning of Design

- Design is a multifaceted word, inherently linked to the idea of **looking at the future**. It can be used to indicate the action of creating something for our future, as well as the plan, activities, and skills involved in this process.
- In recent definitions, the word design has acquired increasingly **strategic connotations**, indicating an activity that is essential for companies to innovate and thrive. Likewise, **design's outreach goes well beyond the product and encompasses systems, services, and experiences**.
- Design is a strategic action that requires a range of methodologies including **ethnographic methods, observations, interviews**, and more.
- Human-centered design (HCD) is a consolidated methodological approach that puts users at the center of the design process.
- HCD plays an important role at different stages of the design process and is based on a set of different activities and best practices: conducting research with users to build empathy and illuminate human problems, leveraging research insights to define the project challenge from a user perspective, envisioning meaningful solutions, and testing solutions with users to gather feedback and improve output.

2. Design Evolution

- Design has been used to **transform problems into opportunities** and is seen as key prerogative of human beings. In an attempt to outline a brief history of design, some key milestones are drawn from history of design:
 - Thonet’s chair No.14** (1859): Michael Thonet transformed a chair into a light-weight object that can be disassembled, marking the turning point between classic artisanal and industrial mass production.
 - The Vespa Scooter** (1946): Corradino D'Ascanio designed a scooter that prioritized the user's comfort and made clever use of the available components and technologies, creating a highly-functional, new archetype for mobility on two wheels.
 - Radio Cubo** (1964): The incorporation of plastic materials in products gave rise to a variety of new products found in households. One of them being a portable radio with a minimalistic and sleek design that appealed to a new generation of consumers that was beginning to perceive entertainment as a mobile experience that could take place anywhere.
 - The first iPhone** (2007): Apple released their first iPhone that would over time turn mobile phones into an intelligence service platform. As evident from Apple, design is no longer just a trademark or a label, but it is instead the core strategic asset of a company.
 - Nest thermostat** (2011): This smart thermostat is an example of how artificial intelligence (AI) can be embedded into products to relieve users of mundane tasks and empower them to achieve better results.

3. A New Role of Design

In “Design in Tech Report 2019,” John Maeda outlines three kinds of design, emphasizing the importance that designers of today possess cross-disciplinary competences: Classical design, Design thinking, and Computational design.

There are many approaches to design, and some technological companies have codified their methods to present a unique viewpoint and set of principals: **Design thinking by SAP, IBM Enterprise Design Thinking by IBM, Material Design by Google, Inclusive design by Microsoft, and Human Centric Experience Design (HxD) by Fujitsu.**

4. The Value of Design

Data shows companies that apply design consistently and intentionally tend to have better financial results, with much higher returns on investments. Therefore, it is evident that design generates tangible returns.

Companies that embrace design successfully tend to have different internal processes and organizational structure. This can include aspects like **design functions being found at the C-level, value generated by design being measured through dedicated metrics, design contributing to strategic decisions, promoting a design culture throughout the organization, and favoring an attitude of continuous iteration.**

Glossary

Design

Design is a multifaceted word, inherently linked to the idea of looking at the future. It can be used to indicate the action of creating something, as well as the plan, activities, and skills involved in this process. As an adjective (e.g., designer clothes) it points out the stylistic qualities of an object. In recent years, it has acquired more strategic connotations, and it often indicates an attitude rather than a specific discipline.

Strategic design

Strategic design is the project activity co-opted in the formulation and development of an organization’s strategy. Its objective is to give shape to the strategy, which is meant mainly as a system-product. A system-product is the organic and coherent set of various media (product, service, communication) with which an enterprise builds its identity, positions itself on the market, and defines its mission in society.

Design thinking

Design thinking is the more business-oriented vision of design that takes user needs into account and builds viable products and services, often leveraging new business models. It is a very broad term that has become particularly popular in the business context and has given rise to the creation of unique and proprietary design methodologies, including Fujitsu’s HxD approach. From a theoretical and academic perspective, design thinking is a multi-layered concept that can be defined through four models: creative problem solving, sprint execution, creative confidence, and innovation of meaning.

Human-centered design (HCD)

Human-centered design (HCD) is a methodological approach that puts users at the center of the design process. HCD looks at people not just from the perspective of their biological characteristics and how they interact with products and services, but also the context they are immersed in, their preferences, goals, and life aspirations.

Futures studies

The discipline of futures studies is concerned with maintaining or improving the welfare of humankind and the life-sustaining capacities of Earth itself. It does this by systematically exploring alternative futures and using prospective thinking. It is a broad discipline that encompasses numerous different methodologies, including SCENARIO BUILDING, an approach that focuses on interpreting current and upcoming trends to generate plausible and internally consistent scenarios that are built on a clear rationale and retraceable logic. Scenario building leverages BACKCASTING: this describes the process of back-tracking the steps from a desired end-state to the present moment to define what actions and decisions are needed today to get to a desired future.

Service design

Service design is the orchestration of all the different layers of a service: its value proposition and offering, the customer-facing (frontstage) experiences and interactions, and the backstage processes. Service design must take place at the intersection of design, technology, and business to maximize its value.

User experience design (UX design)

User experience design is very much interlinked with the design of services or systems and is one of its core components. It focuses on the creation of meaningful experiences and on the way users (whether end-customers or company users) interact with solutions.

2

Design Thinking and Its Evolution

As discussed in chapter 1, design has acquired a new meaning and design thinking has received great attention in the past two decades, being increasingly recognized as a source of competitive advantage. However, design thinking does not indicate a single approach. In fact, four different models can be identified and are presented in this chapter with examples of their purpose, methodology, and application. The four models are creative problem solving, sprint execution, creative confidence, and innovation of meaning. Design thinking has been applied by companies and professionals in different ways. After a theoretical overview, this chapter provides a detailed presentation of Fujitsu's unique design thinking approach, Human Centric Experience Design (HXD), and of its impact as a methodology and mindset.

1. The Design Thinking Approach: It's Birth and Rise

Design thinking is an approach to innovation that was born between the end of the 1990s and the early 2000s. It has spread across industries and has been applied for different managerial purposes. Over the last ten years, the level of interest in design thinking has grown exponentially: numerous academic journals dedicated special issues to design thinking, and it became a central topic not only in the professional world but also in the journalistic world. As tangible proof of this growing interest, different kinds of companies started to acquire firms related to the design field between 2011 and 2015. In particular, there has been a boom in the acquisition of design consultancies.

Digital companies like Google, Facebook, and Global Experience understood that user experience was fundamental and that it was key in their businesses. It is possible to observe an increase in interest towards user experience and user interfaces beginning in 2010. All these phenomena are part of a second revolution in the digital world that started in 2010.

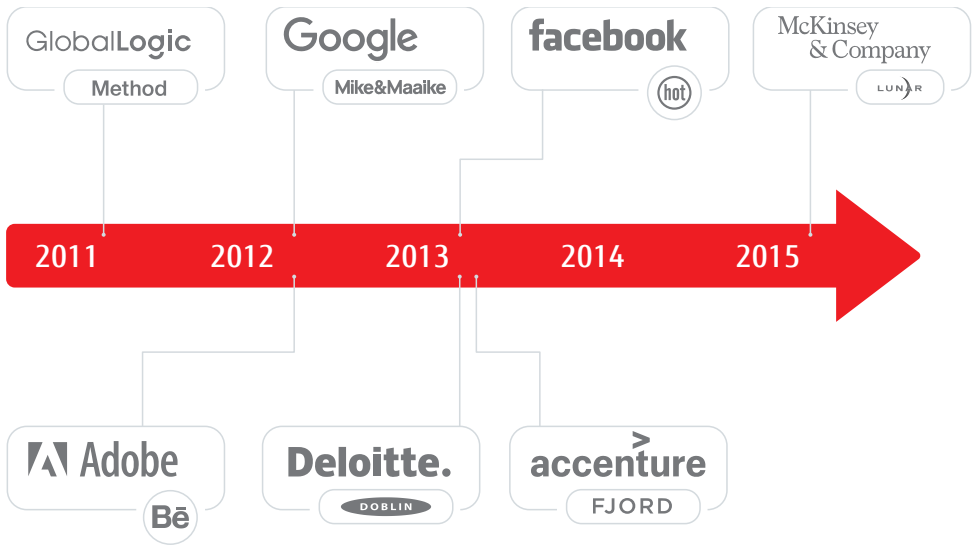
There is another reason for the success of design thinking, mostly linked to commoditization of consultancy services. In the past, many consultancy companies put

strategic plans in the hands of their clients. These documents offered new directions and outlined new opportunities for their customers, but consultancies were not necessarily helping them to define tangible steps on how to implement these new strategies.

At a certain point, it became obvious this was an incomplete value proposition. The company was needed to support the client's needs. Design represented the perfect answer because, by nature, design prioritizes execution and implementation. Traditional consultancies started to acquire design companies, both to differentiate and to offer more tangible strategic plans to their clients. Such companies were then able to shift their focus from strategy to execution and from vision to value delivery.

With regard to innovation, it is important to discuss one of concepts that contributed most to the evolution of the design field in recent years: design thinking. One of the most common visual metaphors associated with innovation is a light bulb. As a process, however, it is much more complex than turning on a light, and creativity is necessary for generating innovative ideas. In fields like psychology, sociology, and management, creativity is described as the art of generating new ideas. All

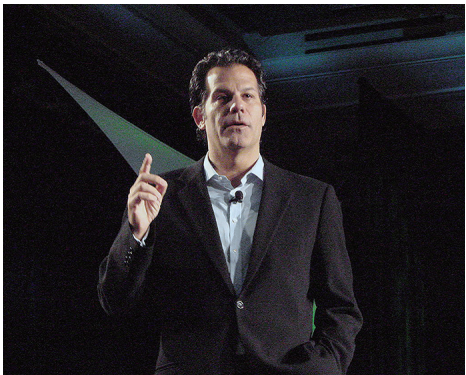
Design company acquisitions



definitions describe managing and pushing creativity as solving problems with new ideas and leveraging innovative perspectives.

Two trends related to creativity gathered traction:

The rise of the creative class: This is a theory (and a famous book) by Richard Florida, which documents a study about upcoming professions and new creative cultures. In big cities like London, Paris, and Tokyo, different kinds of social factors have supported substantial growth of the creative class. The role of Richard Florida's research was to understand the connection between these new creative cities and the growing class of creatives. He explains that according to some social factors—like the presence of women in various disciplines and the number of universities involved in the arts and humanities—a clear, cause-effect relationship can be drawn: the more investment in these social factors, the more the creative class is encouraged to grow.



Richard Florida

Open innovation: Economic models of the past have endured a shift. Innovation was once a closed process that took place within the company; companies had an in-house approach to innovation and managed all the necessary resources. Today, companies innovate outside their boundaries. There are different kinds of expertise that both provide innovative ideas and stimulate new processes. Therefore, innovation is linked with external expertise. In such a case, design produces a competitive advantage to support the innovation process.

The term design thinking was spread by faculties at Stanford University d.school and IDEO, a design firm in Palo Alto, California.

Today, the digital world is spurring the real world toward change. Likewise, design thinking is changing, and four different models have been identified to describe it and document its evolution and integration into varying contexts. It has gone from being a way to create new solutions based on the users' needs, to a tool that enables digital companies to move quickly to prototyping, a model for engaging employees in company processes, and finally a way to create radical new meanings for products and services.



Open innovation

2. Design Thinking Evolution: Four Different Models

2.1 Design thinking as creative problem solving (CPS)

The first model of design thinking is associated with design thinking as creative problem solving. It is the most widespread and famous interpretation of the design thinking concept. It was first introduced by Tim Brown, in his book *Change by Design*.

Tim Brown stated that design gets associated with consumerism because it is possible to observe growth in the number of products facing a reduced life cycle. In the past, products were created so they could be fixed, but it is now less convenient to repair them than it is to replace them.

However, he suggests that design should be associated with broader paradigms more closely linked with its cultural roots and that are associated with thinking in a holistic way and tackling big societal issues. Design is holistic because it puts users at the center of the problem analysis but looks all around them: from a

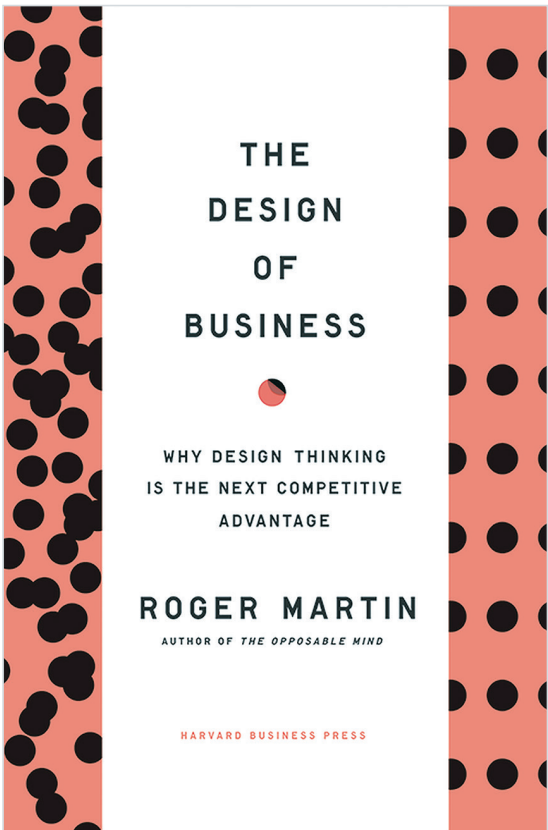
design perspective, it is important to take into account the entire ecosystem rather than fragmenting problems into smaller challenges, as classic managerial approaches often do.

Another important definition of design thinking was given by Roger Martin in his book *The Design of the Business*.

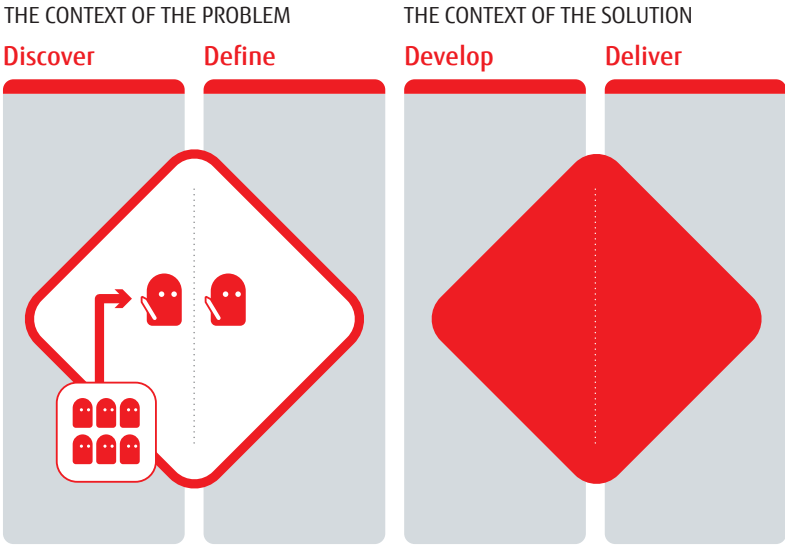
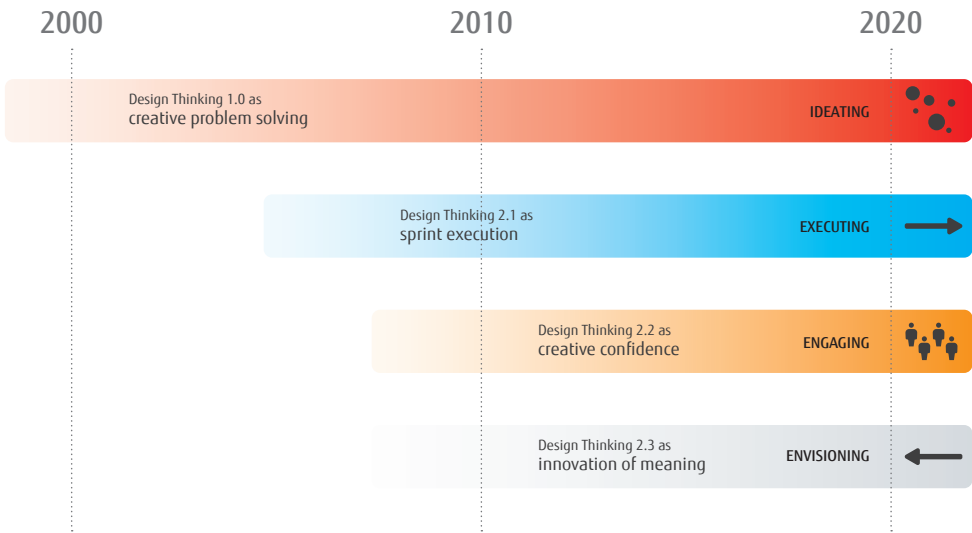
He stated that designers are fundamental in companies and in designing business strategies because they are able to combine intuitive thinking with analytical thinking, applying what he called *integrative thinking*. According to Martin, to be successful, managers of tomorrow must combine the two parts of the brain, possibly through adoption of integrative thinking.

The Double Diamond contains the first representation of design thinking and is associated with the creative resolutions of problems. There are four main phases in it: discover, define, develop, and deliver. It is called *Double Diamond* because these phases are represented inside two diamond shapes, two in each of the two figures.

The Design of the Business



Design thinking models



CPS model representation

- Legend
- Designer
 - User

The model is intended to show how to solve various complex problems, called *wicked problems*, because they don't have a single obvious solution and often affect entire ecosystems. The second key characteristic of this model is associated with the importance of ideation. In this framework, the thinking activity is driven by the capability to produce a lot of ideas. To solve complex problems, it is important to generate different ideas and to also consider wide ideas. At the beginning, some ideas may seem strange but may prove to have the highest potential to create radical innovations. Furthermore, this process is outside-in, because the creative process starts outside the company, taking users and their needs into account. It is important to begin by exploring the outside world to understand users' hidden preferences, habits, and behaviors.

- In the **discover** phase, insights are gathered. We have to approach the user context, zooming into the life of users, observing and shadowing them, with the goal to extract relevant information and uncover patterns. This is what makes the process outside-in; insights are brought inside the company from outside to fuel innovation.
- In the **define** phase, insights are leveraged to generate new frames. The objective is to envision new alternatives to solve the problem and to define new innovation trajectories.
- In the **develop** phase, ideas are generated. More specifically, the objective is to produce new ideas according to the previously defined trajectories. It is a diverging activity because many ideas are necessary to be generated to address the problem. Quantity holds the key to uniqueness and diversity.
- In the **deliver** phase, prototypes are created to test the chosen solution. The objective is to receive feedback from users about what was produced during this creative process.

This process is iterative. Following the entire path once won't necessarily yield the final solution that will be implemented. At the end of the first round, it is necessary to use the feedback obtained during the *deliver* phase as new insights that will fuel the *discover* phase of a second round. The objective is to arrive at a final product that can be taken to the market. It is important to address the problem creatively, and only when this process has been exploited to the fullest, is it recommended to focus on the design of the solution.

Here below there is a summary of the principles of Design Thinking as Creative Problem Solving:

Aim	Solve problems
Thinking	Ideating
Direction	Outside-in (users at the beginning of the process)

As already mentioned, the process begins with observing users to gather data, which can take the form of field notes, interview transcripts, photographs, videos, audio, and so on. To produce valuable insights, it is important to organize the obtained data effectively. Such organization may reflect different factors:

- Space:** the physical place or places
- Actors:** the people involved
- Activities:** a set of related acts people do
- Objects:** the physical things that are present
- Acts:** single actions that people perform
- Events:** a set of related activities that people carry out
- Time:** the sequencing that take place over time
- Goals:** the things people are trying to accomplish
- Feelings:** the emotions felt and expressed

To summarize, there are some proper ingredients that characterize CPS:

- Abductive reasoning:** Inside Design Thinking there is an integration of both intuitive thinking (knowing without reasoning) and analytical thinking (qualitative methodologies that are approached through deductive and inductive logical thinking to arrive at the conclusion). In this way, teams have the possibility to generate a large number of ideas.
- Divergence and Convergence:** Applying design thinking requires a flexible approach. It is necessary to diverge from both existing solutions and the given problem. Without a propensity to diverge, it will be impossible to innovate, while the ability to converge is necessary to reach a conclusion.


Main ingredients in CPS



Abductive Reasoning
(Brown, 2008; Fraser, 2009; Lockwood, 2009; Martin, 2009; Sato, 2009)



Divergence/Convergence
(Boland and Collopy, 2004; Drews, 2009; Sato et al., 2010)



Human Centered Design
(Brown, 2008; Holloway 2009; Ward et al., 2009)



Learning by Doing
(Boland and Collopy, 2004; Lockwood, 2009; Rylander, 2009)



Optimistic Mentality
(Brown, 2008; Fraser, 2009; Gloppen, 2009)



Framing and Reframing
(Boland and Collopy, 2004; Drews, 2009; Dorst, 2011)



Holistic Approach
(Dunne and Martin, 2006; Fraser, 2009; Sato, 2009)



Trial and Error Approach
(Brown, 2008; Fraser, 2009; Holloway, 2009)



Play with Ambiguity
(Boland and Collopy, 2004; Dew, 2007)



Visualization
(Carr et al., 2010; Drews, 2009; Ward et al., 2009)

- Human-centered design:** This is a branch of design that centers the user. In fact, design thinking starts from the assumption that the user is at the center of the whole process. We meet users at the beginning, as an initial source of inspiration and information, but also at the end, as enablers of an ongoing refinement of the solution.
- Learning by doing:** To obtain feedback, ideas must be transformed into tangible prototypes to be put in front of real users or in their real contexts of use.
- Optimistic mentality:** A must to avoid getting stuck in the face of difficulties. When dealing with complex design challenges, it is important to not lose momentum and to remain focused on the end-goal, which is reaching innovative solutions. Optimistic mentality is a prerequisite for being an innovator.
- Framing and reframing:** Ability to understand, define and prioritize complex problems. It is used when the problem is not clearly defined or even has not existed. Once the problem is clearly defined, reframing gives the possibility to come up with fresh and compelling solutions. It is considered a strategic skill.
- Holistic approach:** Problems must be examined in their entirety and for full understanding of their complexity.

- Trial and error approach:** There isn't a linear path in design thinking. Along the way, there will be different trials and different, related errors. The objective is to learn from mistakes. A common best practice is "fail fast to succeed sooner": this means it is normal and even necessary to experience initial failures and to learn from them to be achieve positive results sooner.
- Play with ambiguity:** In design thinking, problems aren't well defined. Ambiguity can't be eliminated; it is rather something that practitioners must learn to deal with.
- Visualization:** Communicating through images is often more effective than using words, and our minds tend to process images faster. Visualization is not just related to drawing or creating beautiful and artistic visual outputs. More generally, it means using a visual code to get straight to the point, and as such, it also includes the use of photographs, notes, and simple schemes.

2.2
Design thinking as sprint execution

Sprint execution refers to a model of design thinking that approaches a problem in a very confined timeframe (hence, sprint), and the name relates not only to the definition of new ideas but also to their development (execution). This is where the shift from conception (typical of design thinking as creative problem solving) to implementation takes place.

This second model is mostly applied in digital environments, for example in the creation of mobile and web apps and digital devices. The term was coined by Jake Knapp, a partner of GV (formerly Google Ventures).

In his book *Sprint*, Knapp theorizes that five days is enough time to ideate and test new digital products

and describes how to do it. The model is composed of three main activities: map and decide, build, and measure.

Map and decide is a converging activity. Matters of the interface or interaction model are decided during this phase by mapping different kinds of behavioral information. Then this information is clustered and used to better define the solution and its specifications.

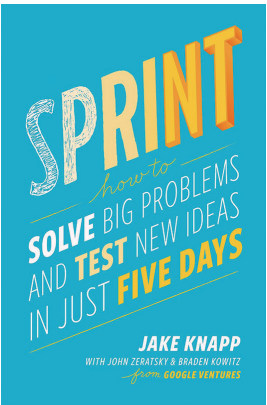
Build refers to the action of making ideas tangible for testing. It is important to avoid dwelling on abstract ideas; the focus should be on turning concepts into concrete product functionalities.

Measure is connected to the action of exposing ideas to the market to obtain data and measure results. In this phase, some KPIs are defined to clearly measure outcomes.

Here is a summary of the principles of design thinking as sprint execution:

Aim	Deliver products
Thinking	Building
Direction	Inside-out (users at the end)

In this second model of design thinking, the learning process takes place through the creation of a minimum viable product (MVP). An MVP is a way to test business



Sprint

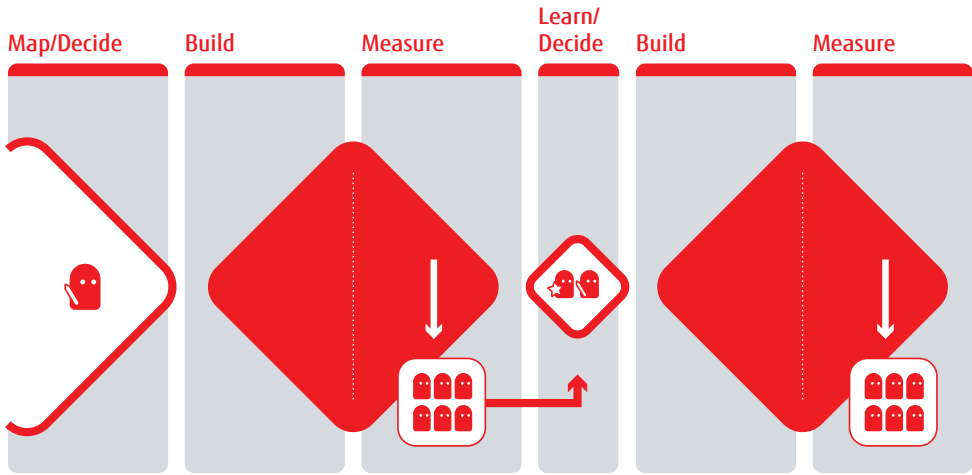
Sprint execution model representation

Legend

Designer

User

Expert



hypotheses and represents a rough hypothesis of what the final product could be.

Let's look at an example from the fast food sector: an MVP would be a classic burger, bread and meat only. This simple version of the burger can be used to understand if people might like this kind of product. Once the basic assumption has been tested, it is possible to create the final product. In our example, the final product would be a full burger menu with salad, cheese, and a wide selection of ingredients.

Adopting an MVP approach makes it possible to test the basic assumption of a new solution in an easier way, thus preventing the loss of both time and money. When applying this model, it is important to collaborate with experts from different departments in the company with expertise on digital products. They can offer valuable knowledge to support the development of new solutions.

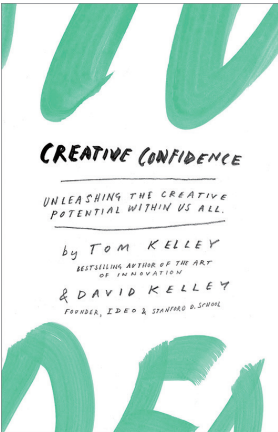
management and in nourishing the minds of people. Otherwise, modern organizations are doomed to fail.

Until recently, companies and individuals assumed that creativity and innovation were a prerogative of creative minds. The reality is that everyone has a creative contribution to offer, but the challenge is making it reach the surface and making it valuable for organizations.

It is necessary to empathize with people so they feel free to express themselves and they can open up their creative selves. The name of this model, creative confidence, derives from this concept. Confidence means having trust in one's own capabilities, possibilities, and mind. The process described in this model has a particularly important social component and is composed of four phases:

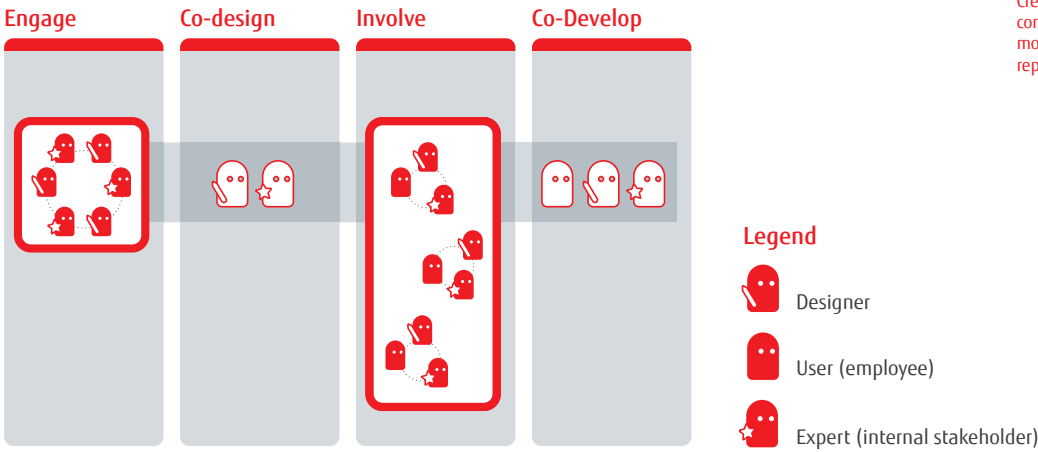
2.3
Design thinking as creative confidence

The third model associated with design thinking is creative confidence and it is related to organizations. It mainly focuses on a shift from organization to people. Until twenty years ago, an organization was regarded as a sort of complex and highly-engineered machine. All companies were based on processes. If the company needed to pursue an innovation effort, innovation processes would be activated. Nowadays, design thinking is used to put less attention on the process and more on the people. This is because people are considered the new, real value for organizations. It is necessary to invest in talented



Creative Confidence

Creative confidence model representation



Legend

Designer

User (employee)

Expert (internal stakeholder)

Engage, which is one of the most important keywords in modern managerial theories, refers to the challenge of offering some sort of reward to people who create something new for the organization. The likelihood of people achieving this reward depends highly on their motivation and how comfortable they feel in the organization environment, but also their relationships with other colleagues and with the mission of the organization. There are different levers to engage employees’ creativity. Engagement is about finding new ways to make people part of the innovation process and to increase their creative confidence.

Co-design entails the creation of moments in which people can share different ideas and different solutions to be developed in response to a challenge.

Involve concerns the details of the solutions identified in the previous phase.

Co-develop refers to closing the loop of the process and executing what has been agreed upon.

Here is a summary of the principles of design thinking as creative confidence:

Aim	Nurture mindset
Thinking	Engaging
Direction	Co-design and co-develop

2.4
Design thinking as innovation of meaning

The fourth model entails a shift from a solution-oriented approach to a direction-oriented approach. Today, the world is full of many ideas, and companies are confronted with the problem of picking the right idea. The creator of this last model is Roberto Verganti. He states that the core of the design activity is related to creating new meanings for products and services.

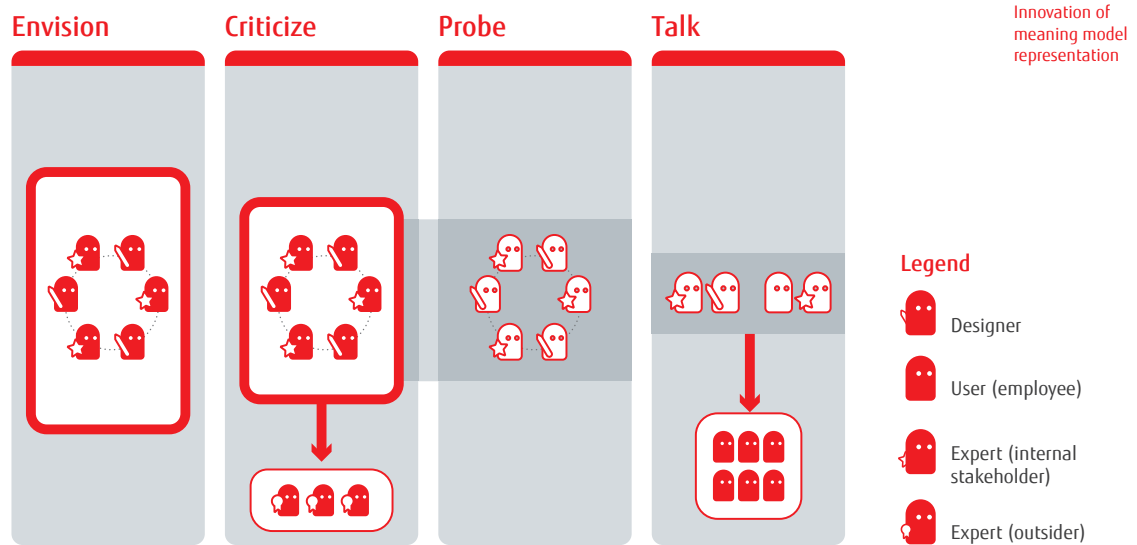
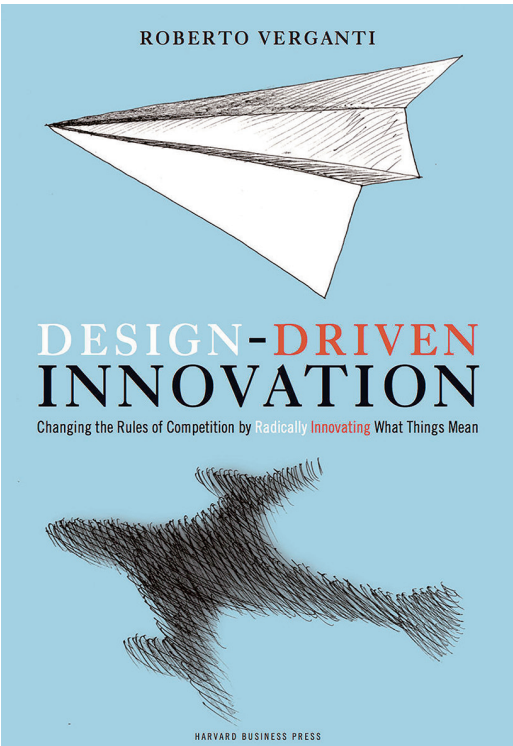
Meaning is why we buy products. In this model, what changes is not the *how*, because it is not a new way to design the solution. Instead, change occurs at the level of the *why*, the deep reason that brought the solution into existence.

The process of meaning innovation is very different from creative problem solving. While CPS adopts an outside-in process and starts from the user, meaning innovation follows the opposite path, an inside-out process based on the idea of giving people something that they don’t expect. The process starts inside the company, with the company trying to understand if there are emerging socio-cultural models.

Here is a summary of the principles of design thinking as innovation of meaning:

Aim	Envision directions
Thinking	Criticizing
Direction	Inside-out (users at the end)

Design-Driven
Innovation



Example:

Design thinking as creative problem solving

In the 1990s, Oil of Olay was the best-known skincare brand of Procter & Gamble (P&G). But the brand was struggling, perceived to be old fashioned and no longer relevant. P&G needed to dominate skincare to be a credible player in the beauty business. They decided to adopt a new approach: design thinking. The company started to run user observation sessions to better understand the needs of their customers. From those observations, they understood that they could not just focus on the issue of wrinkles alone and discovered that women had other concerns for their skin. They then started offering new products to meet the newly identified needs.

Example:

Design thinking as sprint execution

LEGO is a company that has made design sprints a core part of their approach. At one point, LEGO’s leadership even decided to stop the entire production process to invest time to appoint and train design sprint experts. The adoption of the model felt empowering and produced immediate results. Coordinating people for the sprint requires more effort than preparation for the sprint itself. It is fundamental to first create sprint briefs. LEGO created what they called the air traffic control tower, a group of five creative directors overseeing the process. They identified problems that needed solving, wrote the sprint briefs (using a one-pager template), and occasionally dropped in during sprints to make sure the team was on the right track. In the first week of the so-called Pause, LEGO was running ten design sprints, and the numbers kept growing because of the participating employees’ high excitement and motivation. This has made it possible for LEGO to design and prototype many new concepts that have come to be implemented while reducing risk and minimum invested time.

Example:

Design thinking as creative confidence

PepsiCo is one of the companies most recognized for effective use of design thinking. Indra Nooyi, former PepsiCo’s CEO, and Mauro Porcini, chief design officer at PepsiCo, conducted several experiments to adopt design in the company and use it as competitive leverage. One of their greatest successes is the adoption of the creative confidence method. At first, when employees heard about design, they associated the term with some necessary changes in the color of the boxes. Nooyi and Porcini began a series of initiatives within the company to make employees express themselves and raise their design awareness. At the end of the process, they were able to create a shared corporate culture where design was a strategic lever to be used and where everyone recognized its value.

Example:

Design thinking as innovation of meaning

Philips Design entered the market of medical devices, not with a primary focus on technology but instead on design thinking and leveraging the innovation of meaning model. Many different medical imaging exams are employed to perform diagnoses. Children are a challenging type of patient because they may struggle with the rules surrounding medical procedures. For instance, they may not understand that they should not move during examinations, or they may be unable to sit still. This can make the delivery of care more difficult and time consuming. To solve this problem, Philips Design created different kinds of environments where children spend time before tests or exams. In such environments, children have the opportunity to relax and watch cartoons or play with stuffed animals, so that they might adopt the right mindset and be better able to follow instructions they’re given later.

This case implies a shift of meaning that can be summarized as follows:

- From the use of a medical imaging system to achieve precise images through *the power of the device*
- To the use of a medical imaging system to achieve precise images through *a relaxing environment for patients and staff*

3. Meaning as a Source of Competitive Advantage

The meaning that products hold is related to the reason why people buy and love certain products. Meaning innovation offers companies the possibility of introducing new types of innovations, not only related to how, as the majority of firms did in the past. When companies deal with meaning innovation, they are dealing with a higher level of innovation.

To communicate the new meaning, it is important to change the language of the solution. In this sense, designers are vehicles of new languages.

A typical approach to finding new solutions is staying close to users to grasp both visible and hidden or latent needs and desires. On the contrary, meaning innovation does not start close to the user; it starts from a deep observation of new and emerging socio-cultural models and the entire society.

To produce an innovation of meaning, it is necessary to look at long-term trends and phenomena with a broader perspective. Looking at current user behaviors isn’t enough: a firm must adopt a vision about possible breakthroughs that may emerge in the future. To grasp those possible changes, it is also necessary to collaborate with external actors that can behave like *interpreters* of the evolution of future scenarios.

Nintendo’s use of intuition serves as one example. Nintendo was able to make a radical change based on some weak signals that were occurring at a socio-cultural level. At a societal level, a new problem was emerging: teenagers were leading more sedentary lives and facing health issues as a result of the significant amount of time they were spending in front of screens. These changes were already being recognized in some research studies, but they were not really being addressed. This is when Nintendo saw the need and opportunity to provoke a radical change in this area. The design of the Nintendo Wii made it possible for the player to move from a passive role to the role of an active protagonist, thus creating a radical change in the model that was inherent to the world of video games.

To propose a new meaning for a product using this approach—the goal of which is to delight customers and provide something unexpected—the company must first understand the product’s current meaning in the industry of interest and what is changing in terms of socio-cultural models. This gives the company an emotional edge in the solution, a relationship between the customer and the product.

The following are drivers worth examining to better understand favorable conditions for meaning innovation:

- People:** Look for misalignment between what people ask for and what companies are offering within a certain industry, or if there are no adequate solutions that are consistent with people’s lifestyles. It is important to ask “Are lifestyles changing? Are customers unaffectionate toward products in a particular industry, despite continuous innovations?”
- Competition:** Look for product differentiation failures, where all competitors offer the same performances or functionalities and share the same solution language. It is important to ask “When was the last time a new meaning emerged in this industry? For how long has the industry been competing on the same performance parameters?” Whenever it is possible to document that an industry is stuck on the same concepts, it is a good moment to create new meaning.
- Technology:** Look for new, emerging technology that is still simply substituting an old one and that may have improved performance but has not been fully exploited yet. It is important to ask “Is a new technology emerging?”
- Organization:** Look for an organization that has lost its purpose or offers too many different meanings. It is important to ask “What is the meaning of this product? How long ago was the meaning explicitly questioned? Have new, key people joined the organization?”

4.

Fujitsu Human Centric Experience Design (HXD): The Fujitsu Approach

As a global information communications technology (ICT) company, Fujitsu has continuously striven to provide technology (or tech) products, services, and solutions that serve people’s needs and improve their experience as end-users in society or the workplace. The company is purposefully evolving into a digital transformation company in response to changes in society, ensuring there is a human-centered philosophy underpinning all design processes and methodologies.

In this section, we discuss Fujitsu’s unique approach, Human Centric Experience Design (HXD), which is linked

to the lineage of design thinking examined in this chapter and to Fujitsu’s own design philosophy.

4.1
Fujitsu design philosophy

The scope, reach, and importance of design has greatly expanded to influence many aspects of our workstyles and home life. Part of this influence is linked to the increase in availability of and exposure to digital technology. The

Fujitsu design philosophy



Fujitsu design philosophy has been adapted to reflect the exponential growth and prevalence of digital products and services. A consistent and essential foundation of the philosophy is the desire to realize the vision of a Human Centric Intelligent Society—that is, the vision that shapes a harmonized experience between people, society, and ICT.

The philosophy is built around three pillars:

- 1. Innovate frontiers:** Create new experiential value through design that goes beyond customers’ and users’ expectations and expands the potential of technology
- 2. Co-create tomorrow:** Listen to customers and society to shape a shared vision making effective use of technology
- 3. Empower people:** Create the best solutions by respecting the diverse wants and needs of many people with the aim of expanding the potential for everyone

Behind the philosophy is a code of conduct that places the individual at the center of a Human Centric Intelligent Society, which works towards happiness and well-being. It comprises the core of the design process and methodology as well as the source of its concrete design activity. In the era of digital transformation, this philosophy plays a more important role than ever. It has informed the development of a dedicated design approach: Fujitsu’s Human Centric Experience Design.

4.2

Introducing Fujitsu Human Centric Experience Design (HXD) and its context

Fujitsu has a history of innovation, of successfully bringing new products and services to the market and designing solutions for specific customer organizations. The latter is increasingly important, as the growth of digital technology has had a number of interesting effects. It has seen the increased democratization of access to data-driven, connected, automated technologies.

These digital technologies, in addition to being scalable, are often highly configurable as well—i.e., they can be sized and built around specific requirements for a particular usage and organizational context. This opens up the role of design as a critical method for ensuring this emerging technology is developed and applied in a way that the benefits are more likely to be achieved. Benefits are typically achieved in part by ensuring the product or tool is successfully adopted by the target users

or consumers and used with ease. Adoption and ease of use is much more likely to be achieved when taking into account the needs of the user, citizen or consumer—in essence, when taking a human-centered design approach.

Fujitsu has a heritage in human-centered design that can be traced back to early computing in the 1980s and large IT infrastructure projects in late 1990s. This uncommon heritage for a human-centered approach has now been harnessed for the digital age and consolidated into a common language captured as Human Centric Experience Design (HXD). This has happened in three key ways.

Firstly, the approach has been compressed and accelerated. Organizations expect digital development to be agile and incremental and to include elements of trial and error. Secondly, the role of early-stage design has been opened up to include non-design experts. This is particularly evident when employing a culture of co-creation that demands a more diverse design team. Thirdly, Fujitsu has adapted this approach for all geographies outside of Japan. HXD uses many visual tools to provide a common language that bridges cultural differences. These three developments have seen HXD become a vital tool for addressing diverse business and societal challenges around the world. This versatility across geographies, cultures, industries, and sectors is vital as the role of digital technologies is increasingly essential in all aspects of life.

4.3
Five phases of Fujitsu HXD (the process)

Let’s take a closer look at the Fujitsu HXD core value and process as well as its uniqueness. The core value of HXD is to enable the rapid development of a human-centric solution linked to an overall strategy (customer business or societal) that delivers transformational value to customers, end users, or citizens.

It is delivered through **five main phases**:

Mindshift: Establish a common design space in which all parties can create new value using diverse and creative thinking in order to be open to new possibilities.

Vision: Align the immediate design target area or business challenge with the overall business or organizational goal in order to focus effort around a strategic imperative.

Proof of Concept (PoC): This is a quick and pragmatic manifestation of an outline concept that demonstrates the emerging solution is feasible and meets the vision.

Proof of Business (PoB): This is a rapid and practical means of testing and confirming that an early stage solution meets success criteria and works in the field.

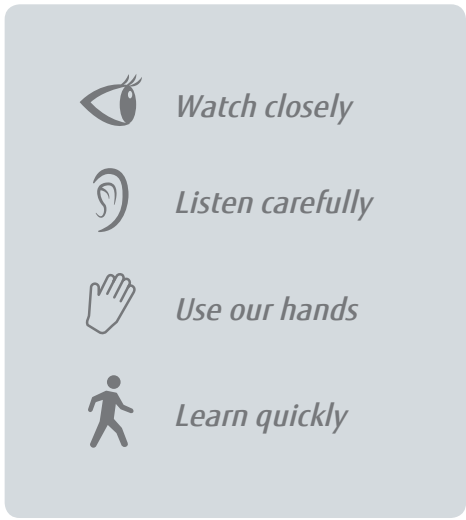
Scale: After being verified by the PoC and PoB, the designed solution is converted into concrete business-as-usual products and services that achieve the ambition of the vision and delivers transformation value.

Many businesses and organizations recognize the need for digital transformation but have struggled to successfully achieve the wide-scale transformational impact they desire. Considering the pace of change in society, markets, and industries, emergence of an approach that can allow organizations to work quickly (thereby mitigating volatility) towards a key purpose (thereby avoiding misdirected investment) and that is focused on harnessing the value of digital technologies (thereby ensuring competitiveness) is to be welcomed. Furthermore, placing humans at the center of the design purpose ensures that the needs of workers, customers, and citizens are met and longer-term benefits are derived more reliably.

4.4
Mindset and method components

A carefully crafted combination of mindset and methods determine the quality of the outcome derived from each HXD phase. This section deconstructs the combination of elements that underpin each phase.

Four behaviors
act as a
foundation



Mindset:
Eight attitudes and four main behaviors
Fujitsu HXD is first about mindset. Why? Because it represents the core beliefs and thoughts that influence the way individuals perceive and address a given challenge; how they deal with potential constraints, unknowns, or setbacks; and how they appreciate and connect the insights and ideas that emerge. Therefore, it is important that a shared mindset is embraced by everyone involved and that it allows project members to be open-minded and focused at the same time.

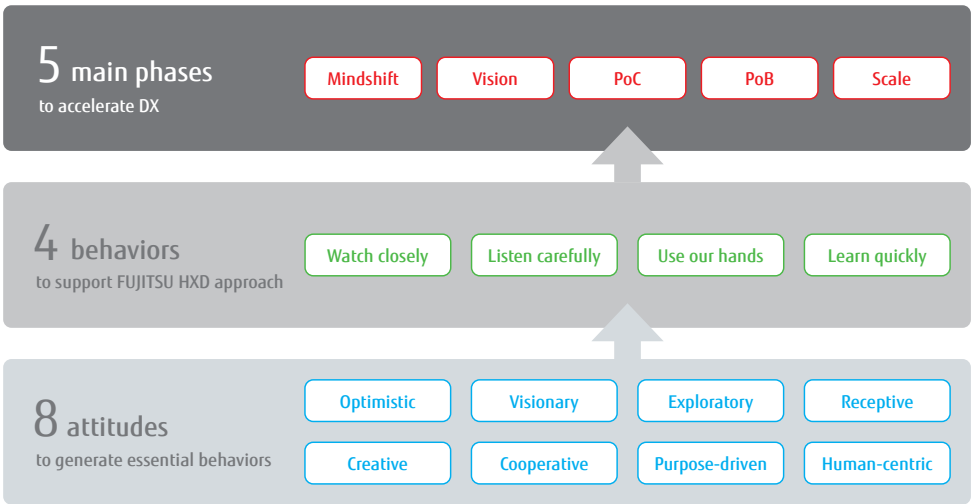
Fujitsu’s mindset is motivated by creating future-focused, design-led possibilities. It stems from an important set of attitudes and behaviors that shape the state of mind required to design purposefully with a human-centered focus.

The mindset is rooted in eight attitudes:

- Optimistic:** We see opportunities in the future and create positive images of the future. We embrace ambiguity to help us ask new questions and imagine different possibilities.
- Visionary:** We imagine the future beyond what we see and what we know, trusting our intuition and what we sense.
- Exploratory:** We wonder about things around us and how they may connect with each other in new ways. We search for new insights and opportunities. We try things out. The willingness to test by prototyping is important. This gives us the means to learn quickly and refine our ideas to create more effective solutions.
- Receptive:** We perceive and we integrate new perspectives and insights. We need to be prepared to understand that new insights can inform a new purpose.
- Creative:** We believe in our creative potential, i.e. that we create our own answers and solutions to achieve what we want, rather than leaving it to others; and we move from vision to realization. We also believe that we are able to create novel solutions from the unpredictable and irregular.
- Cooperative:** We work with others towards a shared goal with the confidence that it benefits us all.
- Purpose driven:** We articulate why we want to search for new answers and why it is important to us.
- Human-centric:** We empathize with the needs of other human beings and we use these insights to create

solutions. Sometimes these needs are not articulated or are hidden, which is why observation and listening for hidden meanings is essential. We believe that technology should serve human beings in a positive and responsible manner; we actively use our human potential as part of the process.

These attitudes are then expressed by **four main behaviors** that are essential in all HXD projects: Watch closely, Listen carefully, Use of our hands, Learn Quickly.



Core HXD
components

To establish a foundational mindset, it is useful now to identify essential and distinctive elements that Fujitsu has incorporated into the HXD approach. Design thinking in its generic form has been widely adopted across businesses, but to support the pursuit of more strategic outcomes that are integral to successful digital transformation, it is necessary to calibrate the design approach differently in order to more confidently deliver strategic value. These distinctive elements reflect a more transformational focus and Fujitsu’s own primary focus on designing technology-based solutions. The use of a refined design approach like HXD helps ensure technology solutions meet business objectives and user and end customer requirements. The distinctive elements are presented here as three highlights:

Highlight 1:
Designing with purpose
Adopting and integrating new digital solutions at corporate or public scale isn’t just about the technology. Digital solutions are an enabler for new business models, public services or working processes, and new users’ behaviors and experiences. For companies and public institutions, that means a tricky decision-making and implementation process. It involves keeping pace with

new technology trends, making financial investments that benefit the bottom line often only in the medium-term, integrating new solutions successfully within a legacy technology landscape, redesigning and integrating new processes, reskilling and communicating successfully with the various groups of people that are impacted, and last but not least, ensuring compliance with applicable laws and regulations. For ICT and digital transformation partners like Fujitsu, it means designing and delivering digital solutions that are unique to every organization.

Through the use of HXD, Fujitsu’s aim is that customers make technology investments they won’t regret in the future and that they take the transformation and innovation leap with reduced risk and increased confidence. The HXD process supports this ambition in critically distinctive ways.

Firstly, there is a systematic and ongoing reframing of the important business issue being addressed, not only from the perspective of the users or impacted stakeholders as in mainstream design thinking methods, but also critically within the context of the wider company strategy. This mitigates against designing a solution that only serves a singular tactical project purpose and helps ensure longer term benefits.

Secondly, leadership of the design activity is provided by a customer business sponsor that represents the wider business, not just the unit that supposedly owns the project. The design team is further supplemented with senior decision makers from across business lines and functions. Each brings intelligence from their own area of the business, which is augmented with industry-wide research often brought from external parties that can bring objectivity and more diverse considerations to bear. The collective insights inform business success criteria that will be used to assess the business feasibility of emerging solutions. This, in effect, signals the Proof of Concept phase.

Highlight 2:
Co-design by default

Co-design in practice means that Fujitsu design and create new concepts with and on behalf of customers, navigating through the stages of the HXD process as one team. The team will also be enriched with partners and specialist experts who can bring additional insights and value to serve the defined purpose.

In the same way that the ability to apply, configure, and even develop powerful technology has become accessible to non-technologists, so it is that design has become an activity no longer exclusive to the professional designer. The benefits of a more open and accessible application of design means that much larger communities can be involved in the design process, adding their own unique insights and skills and leading to more rounded, human-centered solutions. However, this underlines the importance of having a reliable design framework and

philosophy to provide guidance and structure to those who do not have professional training to underpin their practice. In addition, with many projects making use of agile teaming that sees people brought together for a specific, time-bound purpose, it is important that there is a common framework to help navigate the project. Likewise, where groups of people come together from different organizations to form a purpose-driven design team as called for by co-creation, they need a reliable and effective method to ensure successful outcomes are achieved.

Many aspects of the HXD toolset are made available to the team, particularly within the context of vision creation and early-stage concept development. This has helped to make collaboration with customers a unique, purposeful, and valuable engagement. In turn, the use of HXD in co-creation activities has brought new insight and learning, which has helped to ensure the approach has continued to be refined and updated, not just to address the growth in the use of design for digital transformation but also for reliable use across cultures, geographies, industries, and sectors. Accumulation of experience and knowledge act as a feedback loop to inform the continued development of tools and visualization techniques, which are essential ingredients to ensure the creativity and skills of the design team can be harnessed purposefully. When adopted by many people across the organization, it helps to successfully realize digital transformation with customers at scale.

A deeper look at co-creation, its role and benefits in the digital era is described in section 4.5.

Highlight 3:
Designing for digital transformation (DX)

Fujitsu is a service-oriented technology company with the expertise to leverage technology in order to create better value for people, whether in the context of business or society. It means that when using HXD, technology and the exploration of its potential naturally play an important role when designing new concepts with customers and partners. The added value brought by technology will be explored and integrated by taking into account two criteria: how it serves the set purpose, and how it creates a better experience and outcome for the human beings involved. When these considerations are combined with the possibilities made available through the use of digital technologies, then the design project is able to deliver more transformational outcomes.

To help people involved in the design process more easily, and to quickly understand and connect digital technology potential with human needs, Fujitsu uses bespoke tools in each phase of HXD to accelerate the design process while harnessing the possibilities that digital technologies can provide. For example, these possibilities are captured in specially created ideas cards. Each card features a potential technology solution within the context of a specific human activity or experience. An intuitive, distinctive visual style provides inspiration to the co-design team to help accelerate the ideation process. These Fujitsu Idea Cards, now amounting to approximately eight hundred items, have been continuously extended and updated based on learnings from numerous projects and an emerging range of new technologies. They are particularly effective in helping to quickly alert non-technologist members of the design team to the possibilities that technology can provide.

Field research and user testing require less generic tooling than typical design thinking approaches. HXD tools and templates are used to understand context (an environment in which a user may be operating), business processes (manual and automated), and experience (the worker, citizen, or customer expectations). Each of these aspects also require additional enquiry data, such as frequency and volume. The gathering, the understanding, and ultimately the insight derived from this information are particularly critical at Vision and Proof of Concept phases. The unique nature of these tools or instruments are particularly important to inform the design of digital solutions, where sometimes processes and experiences are not easy to observe (e.g., automation, data-related activity).

Other examples of an approach adapted specifically for technology based co-design includes the use of physical and virtual spaces created for the primary purpose of best supporting a diverse and informal team around a common digital transformation-based purpose. The

physical spaces include the use of intuitive touchscreen technology that are very effective in supporting visualization of ideas and concepts as well helping the design teams to work at pace. The same principle has been adopted for online working, whereby a design team composed of participants from many countries meet in an immersive virtual environment where each appear as an avatar. The extensive use of visualization tools (ideas cards, inspiration images, whiteboards, sticky notes, and video) in a virtual space encourages a more democratic working environment in which design team members can contribute in a style that best suits them.

4.5
Integrating co-creation into Fujitsu HXD

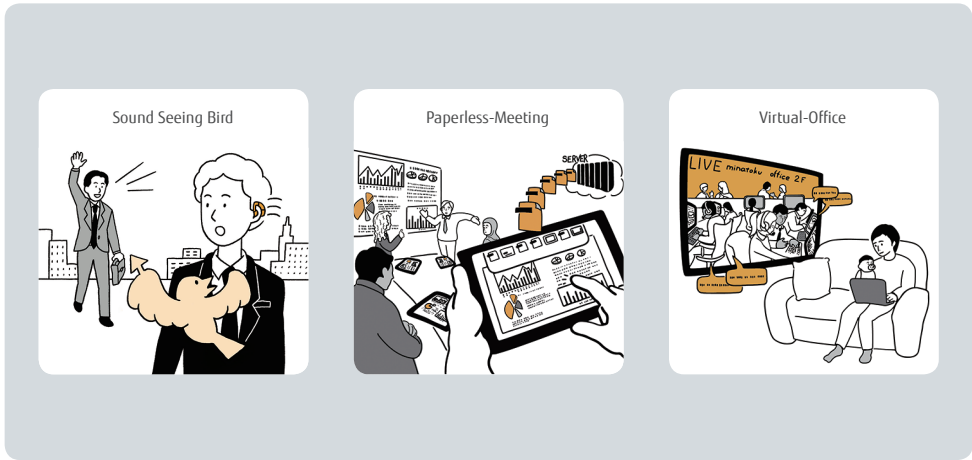
This section sets out the importance of co-creation and explains why Fujitsu integrates co-creation as part of its Fujitsu HXD process.

Many design-based projects are commissioned by a client to a designer or designing body, whether that is an internal capability within an organization or an external agency. The client will typically work closely with the agent in specifying requirements and, as we have seen, discuss strategic intent and overall organization vision. This is clearly important if a design project stands any chance of transformational impact. The extent to which it occurs within the context of overall organizational goals typically informs both the relevance of the project and the likelihood of success.

We also see that at different stages of the design process, other actors in the process are involved in the development of the solution, whether that is providing content and context in the research phase or later when emerging solutions are tested by customers and users. We can see that involvement of stakeholders in the design process has always been important.

Co-creation, though, takes this involvement to the next level and opens up new possibilities that help make design even more powerful in crafting strategic change and transformation. This is particularly true in the development of digital solutions. No longer is technology development the domain only of the programmer, coder, or network engineer. The user or consumer involved somewhere in the design process, working together with technologists, alongside people who really understand the business context in which the solution is planned for use, is likely to lead to far more rounded solutions. Where this joint involvement operates as an informal but trusted partnership throughout the design stages, we can consider this a foundation for successful co-creation. When most effective, the foundation has three essential factors that work in combination: diversity, connections, and insight.

Fujitsu Ideas
Cards for
inspiration



Diversity
Human creativity is usually bound by the limits of an individual's imagination. These limits are extended by the ideas and thoughts of others which then help to stretch creative thinking into new areas. There can be benefits where groups of people from similar backgrounds and skills work together, but the possibilities expand when new groups of people with more diverse characteristics come together for a common purpose. Diversity can be achieved as a result of groups with a mix of background, geography, professional skills, personality, and so on.

New connections
Working with new people throws up the opportunity to create connections that previously might not have been considered. There is much to be learned from making non-intuitive connections. In design thinking, sometimes analogies are used to break the existing paradigm. Co-creation whereby people with experience from different businesses, sectors, and industries are connected is a more effective and authentic way of opening up the design space to new possibilities. This doesn't happen by accident and is achieved by successfully considering more oblique connections that will help inform a more transformative project.

Insight
Successful design is informed by making sense from observations and information gathered from a range of different sources. Typically, this is understood to be insight linked to people involved in some way with the design target. For example, we might consider drawing insight from data and information gathered relating to consumers involved in a particular buying process, or workers involved in producing a particular product or service. However, there is an additional source of insight that is often overlooked. This source is the design team itself. A diverse team will be able to draw on many elements of their collective experience to help derive some new understanding and insight of the design project at the heart of their collaboration.

It is a truism that asking the same people the same question is likely to lead to the same answers. Therefore, when we bring these three elements together in a premeditated way, we can break this cycle of unimaginative certainty and create surprising possibilities.

4.6
Fujitsu's path towards Human Centric Experience Design

Fujitsu has long sought to define products that are easy-to-understand and comfortable to use from the user's perspective, developing human-centric designs as technology has evolved. At first, design centered on the operability of products and hardware and later extended to other aspects, including software. The style of designing products and spaces to develop services has changed to more comprehensively consider people, goods, the environment, and technology. This evolution, leading ultimately to HXD, is delineated here.

Establish ergonomic and GUI design (1980s)
Since the early days of the general public's use of information devices, Fujitsu has ergonomically designed them to be optimal for use by everyone, not just the few. This is the starting point for thoroughly pursuing ease of use from the user's point of view. In late 1980s, ergonomics was incorporated into the then popular concept of graphical user interfaces (GUI), and GUI-specific guidelines were developed. As can be seen in the development of design methods and processes, UI design activities are a central theme in the technical field, and a human-centered approach to making them easier to understand and use is firmly established.



Designing comfortable use for everyone

From universal to inclusive design, and becoming service oriented (late 1990s to 2000s)
In late 1990s, universal design was introduced. This was to curb the widening digital divide caused by the spread of the Internet; with universal design, everyone could benefit equally and products and services could meet the standardized accessibility code, which had been advanced in Europe and the United States.

By collaborating with diverse users to design products, Fujitsu is able to discover fundamental issues. These activities have subsequently been translated into specific design methods in the area of *inclusive design* and *participatory design*. This method has led towards a design thinking approach used today.



Designing ease of use for everyone

How Fujitsu's design has evolved



The spread and commoditization of mobile phones and connected devices in the late 2000s presented a major change, and Fujitsu saw the need to create vision-oriented designs that generated visual ambitions focused on the future. This acts as Fujitsu’s proverbial North Star, guiding technology development and providing information in the context of more comprehensive service design, rather than specifically considering the needs of users, businesses, and society purely from an ICT perspective.

Evolution of user experience design and value of co-creation (2010s and later)
Prior to this period, product design and UI/GUI design predominated the design focus. With the arrival of increasing investment in IT and the emergence of more powerful digital technologies, focus shifted to unlocking the more transformational value of IT. This required an understanding of more upstream considerations in order to design services and products within the context of a strategic vision. This value would be realized through the widespread adoption of sympathetically designed, user-centered solutions. This design discipline is commonly referred to across the industry as user experience (UX). It was formulated

at the same time the design thinking method came to the fore. Practicing UX design and design thinking in the development of digital technologies has become the basis of a unique approach—that is, Fujitsu HXD.

The increased use of co-creation to help understand user needs required purpose-built design spaces in which to work together creatively. This has led to the establishment of a series of open innovation facilities built around Tokyo. These environments accelerated many collaborative projects with customers, partners, and consumers. It has also provided a breeding ground for the development of many tools and methods for empathy, inspiration, and idea generation. During this period, design practices were introduced to larger groups of people across Fujitsu and customer organizations.

The Fujitsu HXD approach has matured and evolved, embracing the design field’s new trends as they emerged and evaluating their relevance and effectiveness through continuous field application with customers. Today, Fujitsu applies and combines design trends, methods, and techniques that best reinforce our ability to support customers in the context of Fujitsu’s digital transformation growth agenda, and our role in society.

Purpose-built design spaces to work creatively



Key Takeaways

1. The Design Thinking Approach: Its Birth and Rise

Design Thinking is an innovation approach that was **born between the end of the 1990s and the early 2000s**. It has spread across industries and has been applied for different kinds of managerial purposes.

In order to have innovative ideas creativity is needed and, as a process, it is much more complex than turning on a light bulb. All the definitions about creativity mention how **managing creativity / pushing creativity is about solving a problem through new ideas and leveraging innovative perspectives**.

2. Design Thinking Evolution: Four Different Models

- Today, we can identify **four different perspectives** of design thinking:
- Creative Problem Solving (CPS):** It is mainly adopted for the creation of new ideas that start from the observation of users and their needs. The double diamond contains the first representation of design thinking and is associated with the creative resolutions of problems. There are four main phases: **discover, define, develop and deliver**. CPS is associated with ideating, and the process is iterative.
 - Sprint Execution:** This model approaches the problem in a very confined time frame (sprint) and is not only related to the definition of new ideas but also to their development (execution). This model is mostly applied in **digital environments**. The learning process takes place through the creation of **a Minimum Viable Product (MVP)**. It represents a rough hypothesis of what the final product could be.
 - Creative Confidence:** It mainly focuses on **a shift from organization to people**. It is mainly adopted to creatively engage employees inside the company’s processes and enable them to actively contribute. Everyone has a creative contribution to offer, but the challenge is making it reach the surface and making it valuable for organization. It is necessary to empathize with people so that they feel free to express themselves and they can open up their creative selves.
 - Innovation of Meaning:** It is mainly adopted to create radical new meanings in products and services. Meanings are new reasons why to buy products. In this model **what change is not the “how”, but what change is the “reason why”,** the deep reason that brought the solution into existence. **The process of Innovation of Meaning starts inside the boundaries of the company,** trying to understand if there are emerging socio-cultural models.

3. Meaning as a Source of Competitive Advantage

- In order to communicate the new meaning, it is important to **change the solution language:** it is in fact the only way to convey a new meaning.
- While a typical approach is to understand users in order to grasp their needs and desires, meaning innovation starts from emerging social-cultural models.
- Collaboration with external actors who can act as interpreters of the future is necessary to identify those possible changes.
- Four conditions should be studied to see whether meaning innovation can take place: People, competition, technology, and organization.

4. Fujitsu Human Centric Experience Design (HXD): The Fujitsu Approach

Fujitsu Human Centric Experience Design (HXD) is a Fujitsu’s unique approach to tackle digital transformation challenges.

Fujitsu Design Philosophy reflects three **values: Innovative Frontiers, Co-create tomorrow, and Empower people**, which lie as a consistent and essential foundation stone.

Fujitsu has a heritage in Human Centered Design that can be traced backed to early computing in 1980s and large IT infrastructure projects in late 1990s.

The core value of HXD is to enable the rapid development of solution derived from human centricity linked to an overall strategy (customer business or societal) delivering transformational value to customers, end users or citizens through **five stages phases: Mindshift, Vision, Proof of Concept (PoC), Proof of Business (PoB), and Scale.**

Mindset is the most essential part of HXD which support all activities in the process. It is rooted into **eight attitudes: Optimistic, Visionary, Exploratory, Receptive, Creator, Cooperative, Purpose-driven, and Human-centric.**

These attitudes are expressed by **four behaviors: Watch closely, Listen carefully, Use our hands, and Learn quickly.**

Integrating **co-creation** element makes HXD even powerful. The three elements required for successful co-creation are **Diversity, New Connections and Insight.**

Fujitsu uses technology to create better values for people, both in business contexts and in society. They leverage HXD which has established and evolved overtime along with digital technology development that is deeply rooted at Human Centered Design.

Fujitsu Case Studies

Building venues for innovation activities and self-driving organizations



Co-design team: Takenaka Corporation, Fujitsu
Country: Japan
Industry: Construction
Year: 2017–2019
Link: <https://designinaction.global.fujitsu.com/hxd-turning-strategic-aims-into-reality/hxd-applied/takenaka>

Context & Challenge

To transform the way projects are carried out, Takenaka has been promoting work style reforms by introducing innovation into the construction industry. As part of these efforts, Takenaka aimed to create opportunities for innovation, develop human resources who can make use of such opportunities, and foster an in-house culture.

Takenaka had three main challenges:

- Build an innovation space in the head office building
- Develop human resources with the skills and know-how to manage innovation activities
- Reform design and business processes by utilizing the acquired skills

Highlight

In pursuing Takenaka’s challenges, Fujitsu supported the following activities by using the know-how accumulated through building co-creation spaces and engaging in co-creation activities:

- Clarified the ideal mindset change for core teams and innovation spaces by implementing vision planning workshops and vision concept planning
- Core teams designed a pilot program (implementation of hypothesis formulation and verification) to provide know-how for developing necessary tools (e.g., systems and manuals) for operating innovation spaces
- Supported open innovation activities sponsored by core teams with program design and adoption by employees outside the core team

It was innovative in itself that Takenaka and Fujitsu co-designed a vision and concept together in the development of the innovation space. This support program was designed to help Takenaka go beyond the construction industry to promote innovation where different industries intersected.

Transformational value

In the past, projects were carried out only through meetings between the building owner and Takenaka’s team. The combination of innovation activities, however, made it possible to listen to the voices of end users, citizens, and stakeholders, and to ideate alongside the building owner.

Since the establishment of the innovation space, the project's core team has held a total of seventy-one collaborative design workshops (including "Reconsidering Value Proposition through Open Innovation" and "Workstyle Reform") with a total of 3,500 internal participants, and has conducted 151 open innovation activities across different industries.

By changing the process of construction projects, these activities have played a role in contributing to society and is fostering a new corporate culture.

Fujitsu Case Studies

Transforming the experience of law enforcement for volume crime



Co-design team: United Kingdom county law enforcement body, Fujitsu
Country: United Kingdom
Industry: Public sector
Year: 2019

Context & Challenge

Police Forces are responsible for delivering efficient and timely interventions for crimes that are committed on the street. The out-of-court disposal (OOCd) process is a way by which sanctions can be handed out for low-level transgressions at the time of the offense rather than proceeding through a lengthy and costly court process.

The challenge for UK law enforcement was threefold:

- Deliver speedy justice, ensure consistency, comply with national guidelines, and decrease time spent policing
- Improve victims' experiences in the justice process by offering meaningful engagement
- Provide a choice of rehabilitation and diversionary options for the offender

The vision was to create "a simple, credible, digital process to deliver proportionate OOCd to meet the needs of the victim, the offender, and the wider society, and thereby reduce re-offending.

Highlight

To address this delicate challenge and develop a solution concept for rapid validation and testing, Fujitsu opted for a five-day sprint process. This choice presented three benefits. Firstly, it would help build a level of intimacy that may otherwise have taken months to create. Secondly, it would enable the co-creation project team to gain insights at a deeper level to better untangle the intricacy of the challenge from a human and legal point of view. Thirdly, it would keep the needed momentum and focus to deliver more rapidly a user-tested solution for validation by senior stakeholders.

During the five-day sprint, the co-creation team walked through the experiences of victims, police officers, and offenders, taking the time to understand the deeper impact and needs of those involved. From there, together with Fujitsu technical experts, the team looked at how to simplify the process. They created a digital vision from which they developed a prototype application in four days. On the fifth day, the prototype was tested by police officers on the ground. Their response to the prototype was very positive and an agreement and plan was made to progress to a pilot phase. The solution incorporates an in-the-field app that police officers can use on their mobile devices to record low-level crime, check criminal backgrounds, and upload to offline systems in a secure and simple application. The user experience requirements were well understood following a series of interviews and simulations intended to inform the design team about the dynamic and unpredictable environment in which officers were engaged in these types of incidents. This was confirmed by police officers testing the prototype developed during the sprint.

Transformational value

An easy-to-use digital solution can help transform the experience of law being enforced for volume crime while having a positive impact at a legal and operational level for the police department. Supporting police forces in taking a consistent and reasonable approach to handle emotionally charged situations with justice and fairness can change the benefits for all parties involved: credibility and integrity for law enforcement, recognition and fair treatment for victims of crime, and sanctions proportionate to the offense committed by offenders. For the law enforcement, it means decreasing time spent policing, improving working conditions, and improving efficiency. It also supports a safer and fairer society.

Fujitsu Case Studies

Business ideas and development approaches that exceed customer expectations



Co-design team: Fujitsu Limited (Fujitsu engineers, Fujitsu Designers, End users)
Country: Japan
Industry: Finance, distribution
Year: 2017–2020
Link: <https://www.fujitsu.com/jp/services/knowledge-integration/chordship/>

Context & Challenge

Contact centers are at the forefront of customer service. As a result of digitization, they have been faced with the challenge of responding with increasing sophistication despite the lack of human resources, the diversifying needs of customers, and the increasing complexity of products and services. The goal was to develop new solutions to these challenges and to create new businesses that built better relationships through enhanced customer experiences.

Highlight

Analysis of past inquiry data, interviews with customers in different industries and different business categories, and interviews with external experts made it clear that many users who make inquiries to the contact center are dissatisfied and stressed. Complaints may include the following: "I want advice 24 hours a day, 365 days a year," "I can't get through," and "It's troublesome to inquire via the website." Therefore, we started by defining the issue: how can we solve the shortage of human resources in the contact center and add convenience for customers? To solve these problems, we identified the weak points of effective implementable technologies, next-generation technologies, and competitive technologies. From a compilation of ideas, we hypothesized that AI chatbots that can produce highly accurate dialogue even with little learning data are effective. We thoroughly discussed differentiation from competitors and created a prototype for our test users. We repeatedly confirmed points for improvement from the users' perspectives to assess whether we were able to grasp the needs of the website and whether the customer felt the chatbot was actually useful, and we made further improvements by observing the users' reactions. We discovered during this process that when it came to customer experience and satisfaction, it was important for the AI to not only have accurate but also warm, conversational responses in their dialogue. After a series of improvements based on customer feedback, in November 2017 we launched CHORDSHIP, a communication service equipped with an AI chatbot, as the solution to build better relationships through customer experience (and sophistication of customer contact points).

Now, three years after the birth of CHORDSHIP, the spread of COVID-19 is having a major impact on lifestyles and the economic environment. In many municipalities and medical institutions, the number of inquiries related to COVID -19 has increased rapidly, and the provision of solutions to prevent the spread of infection and site collapse was required in the short term. Based on practical knowledge, the system was verified with a prototype that immediately incorporated field information, and on the eighth day, a health monitoring chat service was launched. In ten days, twenty local governments and sixty health centers adopted the system. The integrated management of real-time information has been successful in reducing the burden on local government employees and improving services for users. Agile development in collaboration with test users accelerates realization of services, and the experience of prototypes inspires insights from test users and brings new customer satisfaction. The journey that begins with a vision of the future we want to realize with our customers is evolving the speed by which new business models are created.

Transformational value

- Delivered the fastest, most innovative solutions to the market
- Solved contact center challenges and increase end users' satisfaction
- Created a versatile solution for a variety of industries

3

Design and AI in the Age of Digital Transformation

As highlighted in the previous chapter, Fujitsu is committed to Human Centric Experience Design (HxD) to foster digital transformation in response to changes in society. As digitalization took off in the twentieth century, Fujitsu successfully developed technical solutions, greatly contributing to the growth of digital technologies and their industries. Yet today, in the twenty-first century, the company instead leverages technology as a catalyst to drive digital transformation, systemically transforming the lives of individuals rather than industries to generate new social values. This chapter presents the significance of digital transformation in our society today, along with case studies that illustrate the relevance of UX and public infrastructure in driving transformation. This is followed by how artificial intelligence (AI) can not only bring about new business opportunities for companies across industries, but also hasten digital transformation across business processes. The chapter ends with "Fujitsu Group AI Commitment" to promote the use and development of AI aligned with Fujitsu's ethical values and principles.

1. Why Digital Transformation Today?

1.1 What is digital transformation?

Digital technology is now a persistent part of our daily lives. This goes beyond communication and entertainment like social media, video streaming, and online multiplayer games, and extends into everyday contexts like air conditioning, cleaning, laundry, and even cooking. Every aspect of our lives and society seems to be supported in some way by digital technology, be it transit, security, logistics, medicine, or education.

Digital technology therefore has left a significant impact on society as we know it. Given its permeation throughout all aspects of our lives, it can be difficult at times to systematically study the complex history of its evolution. There is growing interest in the creation of different markets and new value in society through the use of digital transformation (DX)—but what exactly does DX refer to, and how does it differ from conventional uses of digital technology?

First of all, *digital* refers to the use of computer technology. The first computer in human history was ENIAC (Electronic Numerical Integrator and Computer), developed by John Mauchly and John Presper Eckert, Jr. at the University of Pennsylvania, and completed in 1946.

The purpose of the project was to develop a computer to more rapidly carry out complex calculations, such as those used for artillery firing tables and thermonuclear chain reactions. This project was central to enabling the evolution of military technology in the United States. As this case reflects, the initial concept of digitalization was the replacement of human power or analog technology. At the time, it sufficed for digitalization to achieve large-scale increases in efficiency (in terms of time and resources) over traditional human or analog approaches. What this implies is that the issue to be solved was clear, with the focus being on how to devise a technical solution to the problem. In other words, digitalization at that time revolved around solutions.

Computers were initially large and costly, but gradually became more ubiquitous. They went beyond simply replacing human workers and analog technologies and developed new value as the crux of the new digitalization of society. Essential to digitalization is the use of data. Data is implicated in both the input and output of digital systems, with countless new services emerging that make use of this data, as well as technical solutions like machine learning, which is used to uncover new meaning in large data sets. For example, identifying top-selling products through point-

	Closed	Open
Solution	1. 1970s–1990s Enabling task efficiency through replacement of human power and analog technology. Office automation and factory automation have significantly evolved during this period.	3. 2000s–2010s Further efficiency has been achieved through enabling tasks in the Solution x Closed phase to be done in an open network. Cloud services have significantly evolved.
Transformation	2. 1990s–2000s Utilizing the data obtained through the Solution x Closed phase, new social value has been created. Optimized calculations in the fields of finance and marketing has significantly evolved during this period.	4. 2010s– Utilizing the data obtained through the Solution x Closed phase, new social value has been created. This phase corresponds to what is called digital transformation (DX) today.

of-sale (POS) data and using this for merchandising has been central to the growth of convenience stores in the retail sector. This was achieved by first hypothesizing that data sets on daily and weekly sales could be used to uncover more popular products, then employing digital technology as a resource to demonstrate this hypothesis. In other words, the way these problems are structured and identified is in itself a source of underlying value, with the solution being subservient to the problem. Digitalization today is a means of discovering new possibilities—in other words, helping achieve transformations.

If we think about this in terms of its constituent parts, namely, that a solution refers to replacing human or analog approaches with digital technology, and that a transformation refers to using digital technology to create new social value, then we can see two vectors: *closed relationships* in specific domains (such as within companies or communities), and *open relationships* in wider, more ubiquitous domains. We can then think about their respective evolution (See the table on page 60).

Solution x Closed (item 1 on the table): At the dawn of the Information Age, Fujitsu was engaged in the development of computers and developed Japan’s first relay-based automatic computer, the FACOM 100, in 1954. Since that time, Fujitsu has pursued digitalization throughout various industries, such as through the use of office automation (OA) and factory automation (FA), contributing to the business infrastructure we use today. In the present day, there is an increasing need for systems architecture (including customization) that caters to growing security and reliability needs.

Transformation x Closed (item 2 on the table): Fujitsu Laboratories, which Fujitsu established in 1968, was instrumental in research and development into machine learning and AI. In the early 2000s, an anthropological approach to user research began in earnest as a way of asking creative questions to problems. This has supported the growth of business and services operated by companies and organizations throughout Japan and the world. With digitalization’s ongoing growth in the business sector, Fujitsu began undertaking steps that would lead to its HXD approach.

Solution x Open (item 3 in the table): In the late 2000s, several technological advances led to the rapid proliferation of cloud computing, which allows for remotely using services at metered, pay-as-you-go rates without the need for on-premises hardware or facilities. During that time, Fujitsu developed software-as-a-service (SaaS) work applications for a wide range of sectors and provided SaaS apps to enterprise clients within and without Japan. During this phase, open networks enabled

easier integration between companies and sites, thereby enabling digital services to encompass a wider range.

Transformation x Open (item 4 in the table): This is the stage at which digital transformation (as discussed in this section) took place. Starting in the late 2000s, the global growth of smartphones and Internet of Things (IoT) solutions enabled the collection of real-time digital data on a variety of people and objects. The conventional techniques and methodologies used in the Transformation x Closed domain were combined with the vast amounts of data obtained through Transformation x Open approaches, leading to the creation of new social value.

1.2 Evolution of digital transformation through cases and practices

In this section, we look at what kind of social value is created through the use of data from two perspectives: UX and public infrastructure.

The role of user experience in designing digital transformation

Since the late 1990s, various services have emerged online as the internet has become more mainstream. These include services like Google, Facebook, and Amazon, which emerged largely in the twenty-first century, as well as platforms like Airbnb and Uber, which seek to digitize real-world experiences for greater convenience.

These platforms come in a variety of shapes and sizes, but what they share is that their core competency revolves around collecting data to create a superior UX. The high level of convenience they offer attracts more users, and service operators in turn use data from these users to further improve the UX to provide services inimitable by other companies. In this way, collecting usage data to continuously improve UX could be a necessary condition to creating social infrastructure for today’s era of digital transformation.

Example: Google Maps Google Maps is an app that has now become indispensable to our everyday lives. It analyzes GPS data on users’ smartphones to determine in real time the best route to take. It also forecasts how congestion will change over time based on past data. This is used to display the optimal route from among different transit options. Google’s business model here involves offering Google Maps to users for free, and then selling map services based on user data to third parties.

In recent years, the Online Merges with Offline (OMO) business model has gained traction. OMO goes beyond preexisting service categories to create new touchpoints with users by bridging online and offline contexts. This model maintains constant touchpoints with users and aggregates behavioral history data to improve the UX.

Example: Ping An Good Doctor One example of the OMO model is Ping An Insurance, a Chinese company providing the Ping An Good Doctor app. This app gives users more opportunities to engage with doctors prior to examinations and reduce their anxiety. This includes free 24/7 online consultations with private clinicians, as well as the ability to review doctors' backgrounds before booking appointments at clinics. Moreover, the company uses the app to identify user needs and uses this data to accommodate insurance filings in a more seamless manner. By going beyond existing service domains and offering services matched closely to users' contexts, it has gained a loyal following of two hundred million users.

Digital transformation of public infrastructure Initially, the premise of digital transformation was that companies with advanced technology would provide services to individual users. Recently, however, governments have begun actively providing data and information that have significant public interest, making services more accessible to all and creating even greater social value.

Example: India's digital policy India is expanding its services around a digital infrastructure built by the government. In 2009, the government of India launched a project to grant digital identities to all 1.3 billion of its citizens. This project sees them developing IndiaStack, a digital infrastructure that brings together open application programming interfaces (APIs) such as those used for personal authentication, electronic signatures, and payment platforms. This project enables corporations to use IndiaStack to easily gain access to authentication and money transfer solutions. For example, Milaap is a crowdfunding service that aims to solve social problems through emergency assistance to those who cannot pay medical expenses, and DriveU is a vehicles- and drivers-for-hire app that connects people looking for drivers with those offering their services. These and many other unique services are being offered by startups in the country.

Example: Helsinki Region Infoshare (HRI) Since 2010, Finland has been operating the HRI program, an open data project centering on metropolitan Helsinki. The project went formally online in 2013.

As of 2020, it offers 644 data sets and 174 APIs, with 262 services available. Companies using the above include intriguing new service providers gaining global ground, such as Blindsquare, a GPS app which offers audio route navigation for blind users, and Whim, the world's first Mobility-as-a- Service (MaaS) app. The latter allows for searching and paying for the optimal transit route by combining options offered on a single app, like buses, taxis, bicycle sharing, and car sharing.

Digital technology has continued to become more important to society since the introduction of computers in the 1950s. Fujitsu, for its part, has been deeply involved in the growth and development of technology since the dawn of computing. Now, in the twenty-first century, technology has gone beyond simply growing the industry, and is attracting great attention as a means to transform not only the lives of individuals but also social systems as a whole. Instrumental in this approach is the use of data in ways like those described in this section. Going forward, we must consider how to use data in a user-centric manner to develop new social value.

The most successful transformation programs, whether their focus is organizational or societal, are leveraging a range of digital technologies to help enable their transformational vision. These enabling technologies typically combine connectivity and data in a way that supports human beings to lead better lives. Digitally enabled transformation is likely to depend on a range of technologies rather than a single solution. These can include web-based applications, cloud services, smart devices, and IoT making use of the growth of connectivity. Digital transformation is predicated on the introduction and increasingly extensive use of automation with robotics, machine learning, and AI.

It is this latter technology that has grown enormously with the advent of greater storage and processing power to cope with ever increasing volumes of data and network speeds that allow the data to be gathered from multiple sources. Implementation of AI as a standalone project will not deliver the wider transformation possible when contextualized with a design mindset. In the next section, there will be a focus on AI as a means to explore the respective roles of technology and design.

2. The Rise of AI: Evolution and Future Scenarios

2.1 Introducing Artificial Intelligence

AI has brought about radical technological transformations in our time and is an important avenue of innovation for Fujitsu. Today, AI is generating benefits for users, creating new business opportunities for companies across different industries and countries, and opening up new scenarios for digital transformation. Fujitsu explores how the application and development of AI technology can effectively be used to foster digital transformation and

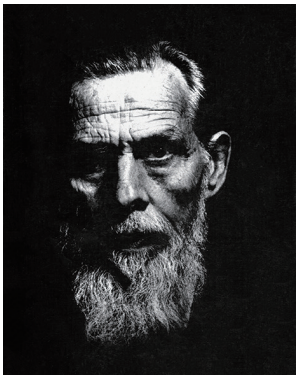
bring about change in the economy, culture, politics, and more.

AI is related to the study of machines that are able to both make decisions and act like human beings. Today, digital entities are able to learn and process information through observation, reading and processing text, and engaging in a dialog with other entities.

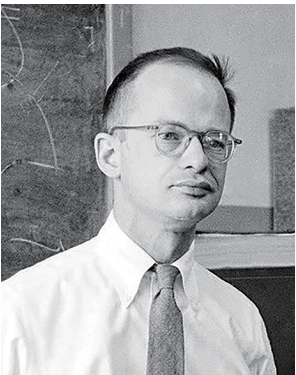
The first time the term AI was introduced was in 1956 by John McCarthy, even though the first artificial neuron had already been created in 1943 by Warren Sturgis McCulloch and Walter Pitts.



1



2



3

1. John McCarthy

2. Warren Sturgis McCulloch

3. Walter Pitts

Following a growing interest in this field, in 1950, researchers started to discuss if machines were capable of thinking. Between 1966 and 1979, the first tangible results in the context of AI were achieved, though there were still significant limitations in its ability to interact with the environment.

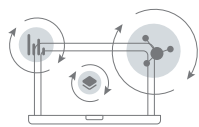
AI entered the industrial world in 1980. Its objective was to simplify and reduce manual labor, save money, and increase productivity. Finally, in 1995 intelligent agents were invented, allowing machines to respond to their environment.

Nowadays, the wide array of AI algorithms can be summarized into eight classes of solutions:

Intelligent data processing used to extract information from the analysis of both structured and unstructured data to initiate actions.

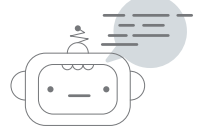
Virtual assistant or chatbot, i.e., software agents able to perform actions and/or provide services to a human interlocutor through commands and/or requests received through interaction in natural language.

Eight possible AI solutions




Intelligent data processing

01



Virtual assistant / Chatbot

02



Recommendation engine

03






Image processing

04



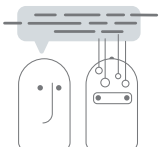
Autonomous vehicles

05



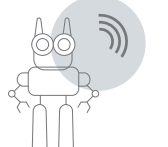
Intelligent objects

06



Language processing

07



Autonomous robots

08

- Recommendation engine** that start from the analysis of user information to orient and direct user preferences
- Image processing**, which extracts information from an image or video to allow users to recognize people, animals, and objects in it
- Autonomous vehicles**, which concerns self-driving vehicles circulating on roads, seas, lakes, and rivers, and in flight
- Intelligent objects**, which represent objects capable of performing actions and making decisions without requiring human intervention
- Language processing**, which concerns language processing solutions based on input data or documents
- Autonomous robots** that concern robots able to move by themselves, manipulating objects and performing various kinds of actions without human intervention, and being able to adapt to unforeseen or coded events

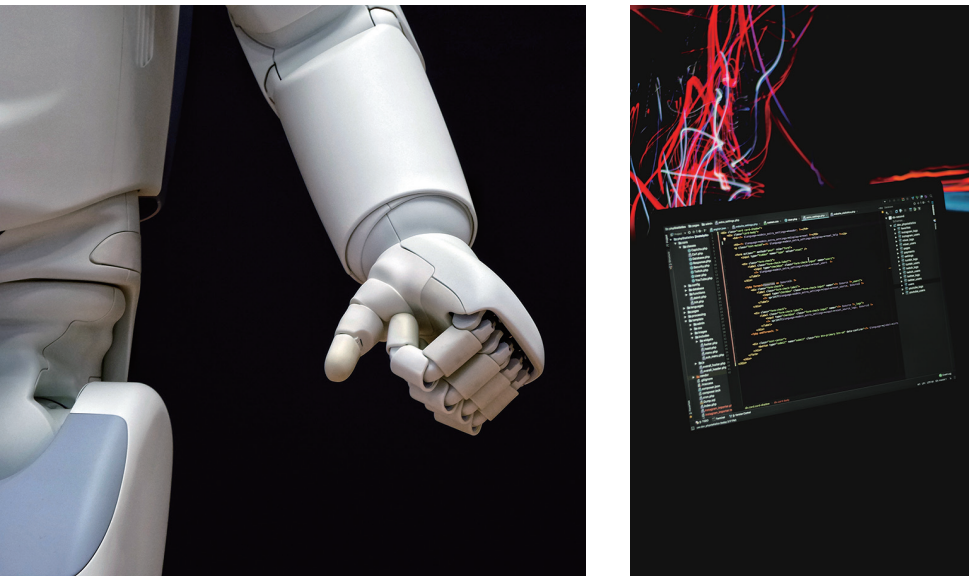
AI represents one of the most radical technological evolutions in our time. The introduction of the different forms of solutions AI enables is also thanks to the acceleration of innovation. The time between

technological inventions and their adoption is getting shorter and shorter. Some views advise caution so technology doesn't get out of hand. At the same time, more optimistic views claim that AI could aid humanity in tackling some fundamental challenges and that it could even expand and augment the capacity of human beings.

AI mimics human behavior in different forms:

- Narrow AI** is the only type of AI that is commonly employed today and it refers to AI trained to perform a specific task (e.g., playing chess, providing travel recommendations, or analyzing symptoms).
- General and super AI** refer to types of AI that can mimic entirely or even surpass the intellectual skills and self-awareness of human beings. In particular, while super AI is still regarded as a somewhat unrealistic idea, general AI is regarded as a much more concrete possibility.

It is important to look ahead and imagine how technology might affect our lives in the future, so we may be more prepared to use it for the best and handle the transformations that come with it.



1

2

1. Artificial intelligence
2. Machine learning

2.2 AI: State of the art

The most important abilities that regulate modern AI systems are machine learning and deep learning.

- Machine learning** is the ability to analyze large data sets to establish a set of rules that enable the system to perform a certain task correctly over time. A classic example is teaching an AI to identify a certain object (e.g., a dog) by feeding it a huge number of images of that object, rather than trying to program its ability to detect the object correctly.
- Deep learning** is a subset of machine learning, and it takes the learning abilities of AI one step further. When fed with new data, the system doesn't just learn how to produce the correct output; it learns to improve outcomes by repeating a task and weighing and adjusting variables, and it trains the network to react like a human brain.

While machine learning and deep learning describe how an AI system learns, they don't necessarily define the way in which AI is applied or the purpose it serves. When dealing with certain kinds of data (such as images, text, or voice), it is necessary to employ specific AI capabilities, like the following:

- Speech or voice recognition and natural language processing** identifies and makes sense of words and voices, along with the ability to produce content in human languages. Example: Replika chatbot (<https://replika.ai/>) is described as a personal companion that a user concerned with mental wellness can message and talk to.
- Computer vision and image processing** identifies, processes, and manipulates visual data. Example: the Google Translate app is able to recognize a foreign language and augment the image to overlay an accurate translation.
- Generative adversarial networks (GAN)** are deep learning, generative model frameworks. Example: painting with the GAN from the MIT-IBM Watson AI Lab (<https://gan-paint-demo.mybluemix.net/>) is better described as painting with neurons.

2.3

AI: Business opportunities

AI creates an opportunity to further accelerate the growth made possible by the digital revolution of the last few decades. Compared to traditional firms, digital companies have often achieved higher productivity and profitability: even though they employ fewer people, they tend to enjoy higher market capitalization and higher revenues per employee, thus creating more opportunities to invest in innovation. AI is very likely to make this growth exponential and therefore likely to be a key asset for companies to stay competitive.

Today, AI is already being applied in a variety of different contexts and industries. While it improves back-end operations, it is also successfully employed on the front end. What most of these different applications have in common is the possibility to delegate manual or repetitive tasks to AI, freeing people from such chores and allowing them to focus on other, more creative or strategic tasks. While it is impossible to give a complete picture of the (endless) possibilities of AI, some key trends and macro-opportunities can be identified:

Human capital management (HCM): AI can enhance operational decision-making processes to support building stronger teams.

Example: AI can assist in hiring to build and manage a better workforce, either recruiting new talent or supporting decision making by quickly screening and identifying qualified candidates. However, skewed past data may cause ethical problems.

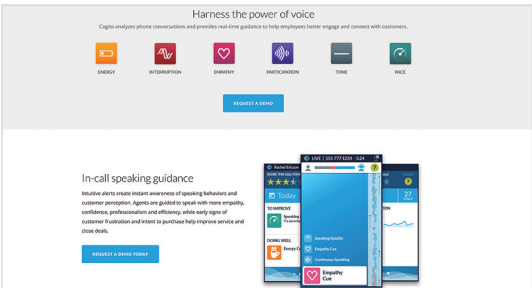
Human labor replacement: Robotic process automation with AI can supplement a human workforce.
Example: Factory automation could mean machines scurry across factory floors to deliver parts and packages.
Example: Banking or financing programs can automate administrative duties like accounting or payroll.

Market intelligence: AI can enhance internal decision-making processes and company operations.
Example: A basic AI-based data collection methodology (that is, surveys) can enable a better understanding of the state of the market. Executives can better keep track of goals and performances to make more informed decisions.

Enhanced customer service and service operations: AI solutions are being employed in customer management as a way to increase capacity, but also to improve the quality of customer care and utilize it as

an asset for the company.
Example: D.FI is an AI engine integrated into service desks, which analyzes and interprets service tickets using the natural language algorithm before routing to service agents with recommended actions.
<https://www.i-cio.com/strategy/big-data/item/leveraging-ai-to-automate-the-it-service-desk>
Example: Cogito is an AI application for customer service centers. It analyzes voice signals in phone conversations and provides support to agents to increase the quality of each call.
<https://cogitocorp.com/for-service/>

More personalized UX and ability to leverage customer insights: An AI allows for hyper-personalization of services.
Example: Spotify and Netflix use algorithms to predict user preferences. It studies the past interactions of users, tagging the typologies of preferences and then offering what can result as similar.



Cogito customer service solution

Survey



A new wave of transformation is about to take place, but companies will need to realize that becoming AI based is more than just sprinkling a bit of intelligence on existing products or processes, just like having a website or app does not necessarily make a company truly digital.

Rather, the real transformation lies in the ability of a company to harness the potential of a certain technology to serve a greater vision and strategic purpose, not only to achieve increased productivity or greater efficiency. AI will not only transform the products and services that companies put out into the world, but it will require organizations to transform themselves as well.

Over the last several years, a debate has raged about certain jobs potentially disappearing as manual tasks are increasingly performed by machines. However, new skills will be needed to design and implement intelligent systems. The challenge will mostly lie in the speed of such a transition, as an abrupt change may exclude a significant number of individuals from the job market.

Recommendations system on Netflix

3. Innovating with AI and the Role of Design

AI is one of the most radical technological evolutions of our time and represents an interesting source of new opportunities in the field of services as well. Service providers who have pursued this opportunity have faced the need to come up with new interaction models and even create new physical touchpoints (e.g., Amazon Echo) to enable this type of exchange, which is based increasingly on conversational models, either verbal or textual.

On one hand, this proliferation of touchpoints provides people with more opportunities to interact with a service in a more personalized way. On the other hand, it increases the complexity of the design activity. The employment of AI poses even more articulated challenges and considerations. These, more specifically, include the following:

- Users are faced with new and unfamiliar interaction models, and designers need to take into account new usability challenges related to AI but also the psychological perception of this technology.
- Other service actors (employees involved in the delivery of the service) may find themselves working side by side with AI and may face similar challenges to those encountered by users.
- Designers need to build a basic understanding of the capabilities and logic of AI and work hand in hand with developers to create meaningful experiences around this technology.

- New design skills are needed for the creation of voice- or text-based conversational interfaces, and designers need to receive dedicated training.
- All practitioners involved in the creation of AI-enabled solutions need to work within a shared ethical framework that helps them to map out the implications of their design decisions and act accordingly.

Amazon Echo



Artificial intelligence

4. The Ethical Challenges of AI

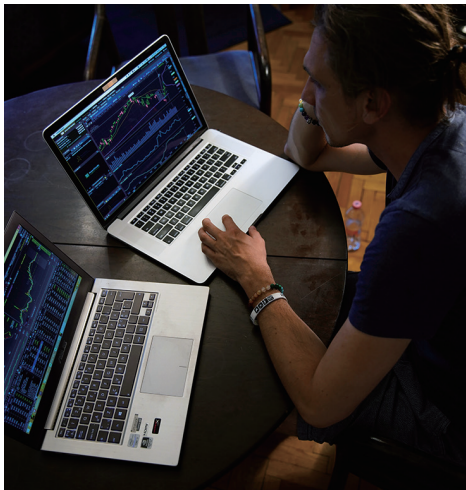
The topic of the ethical implications connected to the use of AI is huge and controversial. Different perspectives and actions are adopted in different parts of the world. Ethical challenges related to AI should rely on a clear definition of it and are connected both to the application of this technology and to the ownership and management of data on which AI relies.

People are frightened of adopting AI solutions because of the uncertainty they feel about the management of their data. There are many instances where people refuse to adopt virtual assistants at home like Alexa and Google Home due to the fear of being constantly listened to. In the same way, a lot of people were perplexed and frightened at first by Google and other platforms' collection and storage of data.

While discussing AI applications that require human interaction, it is important to keep in mind the principles of the Belmont Report, which include three key requirements:

- The personal autonomy of people is not violated.
- Benefits coming from the interaction with the technology outweigh the possible risks associated to the interaction.
- There is no discrimination in the distribution of benefits and risks among people.

Use of data



From this perspective, one of the actual ethical challenges of AI is making it transparent. Transparency is linked to the possibility to unpack the processes of the AI and make them visible. It is also related to disclosure of ethical principles, hard evidence, source code, and other information that establish the credibility of the developer of the AI solution and the solution itself.

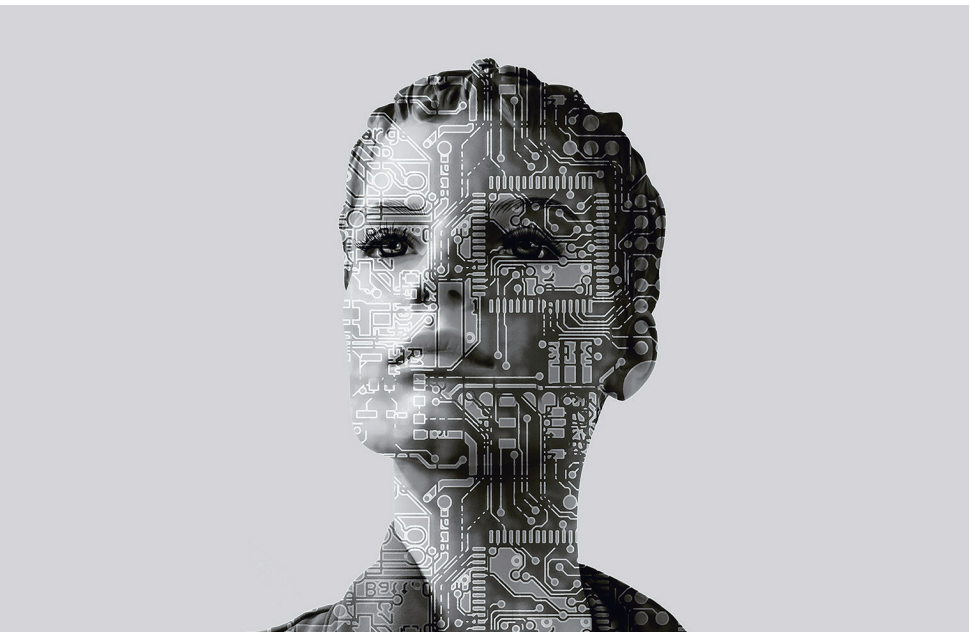
It is important to avoid creating *black boxes*: exposing the complexity behind AI systems is in many cases the only way to verify whether guidelines have been followed and whether the team who designed the system has taken into account certain ethical principles and turned them into decisions.

Beyond transparency, some of the most common AI-related guidelines are as follows:

- Reliability and non-maleficence:** It is possible to trust the judgment of the AI, the inherent effectiveness of the system, and its algorithms and potential to prevent mistakes. The concept of reliability and non-maleficence also refers to the purpose for which the AI is used and its never being employed in situations where it can cause harm to others. Moreover, some guidelines stress the importance of using AI for the common good.
- Fairness:** The AI is able to avoid bias and discrimination of any kind. This aspect is also largely dependent on the data sets the system is being fed, which may be very effective for application on certain sociodemographic groups but not others (Case in point, health-related applications of AI mostly rely on data from the Western world).
- Privacy:** The AI system respects personal information and the fair and transparent use of this data.
- Protection of autonomy and human self-determination:** The AI is prevented from posing a risk of creating unwanted influence on human behavior to the point that the final decision is no longer in human hands. This potentially relates to important social or political matters as well.

Among the different organizations in Europe that regulate the adoption of AI, the European Commission released

Artificial intelligence



a report, *Building Trust in Human-Centric Artificial Intelligence* (2019), that sets the ground for a human-centric employment of AI. The report lists seven key requirements that should be respected:

- Human agency and oversight
- Technical robustness and safety
- Privacy and data governance
- Transparency
- Diversity, non-discrimination and fairness
- Societal and environmental well-being
- Accountability

Despite different principles and regulation norms, the main challenge lies in how data is interpreted and applied, which is influenced by sociocultural differences as well.

Distributed agency comes with distributed responsibility: as stated earlier in the chapter, all practitioners involved in the creation of AI-enabled solutions need to work within a shared ethical framework that helps them to map out the implications of their design decisions and act accordingly. This poses an

unprecedented challenge, since classic ethical frameworks mostly focus on individual actions, while there is now a need to define the concept of shared responsibility.

Some key aspects a sound ethical framework should address include delegation (how tasks are allocated between humans and machines) and responsibility (who is responsible for which outcome).

Delegation can have, in fact, negative consequences, especially when there isn't an opportunity for humans to intervene and potentially correct the behavior of the AI before its outcome is effective.

Building on their human-centric focus, Fujitsu has recognized the importance of anticipating and eliminating the unwanted side effects of AI and has established the "Fujitsu Group AI Commitment," a document outlining Fujitsu's core AI-related principles:

- Provide value to customers and society with AI.
- Strive for Human-Centric AI.
- Strive for a sustainable society with AI.
- Strive for AI that respects and supports people's decision making.
- As corporate responsibility, emphasize transparency and accountability for AI.

Key Takeaways

1. Why Digital Transformation Today?

In the twentieth century, **digitalization revolved around developing technologies to address *solutions***—whether it is to ease human labor or improve analog technologies. This solution-based approach may be identified in closed relationships in specific domains (such as within companies or communities).

Today in the twenty-first century, **digital technology is a means to foster transformation** to not only improve the lives of individuals but to also consider larger systems in society and generate new social values. This transformation-based approach presents **open relationships** that take into account wider domains and their evolution.

Digital transformation may generate social value through two main approaches that rely on the effective use of data collected by digital technologies. The first approach is to **continuously update and improve UX based on the data collected**, and the second approach is to **employ such data when developing public infrastructure** that better serves citizen needs.

2. The Rise of AI: Evolution and Future Scenarios

AI is related to the study of machines that are **able to both make decisions and act like human beings**. Digital entities should be able to learn through observations, reading and processing text, and discussion with others.

AI is fully **employed in market intelligence**, enhancing internal decision-making processes and company operations.

AI solutions are increasingly being employed in **enhancing customer service and service operations**, improving the quality of relationships and filtering customer issues.

AI allows for the possibility to process a lot of customer data, delivering a personalized UX while creating new scenarios of hyper-personalization.

There are many concerns about the increase in unemployment caused by the reduction of jobs for humans, who are replaced by machines. But **new roles and jobs related to AI will emerge** and be in high demand.

3. Innovating with AI and the Role of Design

Users are faced with new and unfamiliar interaction models. Designers need to take into account **new usability challenges related to AI** but also **the psychological perception of this technology**. It is necessary to **design conversations among humans and machines**.

Designers will progressively need to learn how to design for **open-ended and, at times, not fully predictable interactions**.

Designers need to build a basic understanding of the capabilities and logic of AI and work hand in hand with developers to create meaningful experiences around this technology.

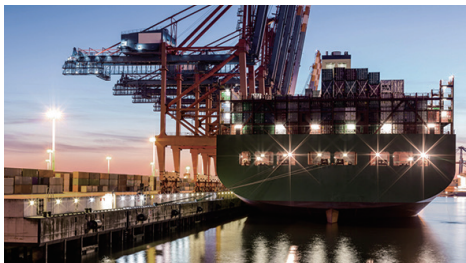
4. The Ethical Challenges of AI

Ethical challenges related to AI are connected both to the **application of this technology and to the ownership and management of data** on which AI relies.

“Fujitsu Group AI Commitment” emphasizes **transparency and accountability** of AI.

Fujitsu Case Studies

Compliance and Sustainability with New AI-powered Vessel Fuel Optimization Service



Co-design team: Kongsberg Digital team, Fujitsu Laboratories
Country: Norway
Industry: Transportation
Year: 2019
Link: <https://www.fujitsu.com/si/about/resources/news/press-releases/2019/emeai-20190605-fujitsu-and-kongsberg-digital-tackle.html>

Context & Challenge

How to leverage digital technology to rapidly respond to the pressure the maritime transport sector faces in complying with new fuel regulations.

Kongsberg Digital’s mission is to focus on next-generation software and digital solutions for customers in the maritime, oil and gas, renewables, and utilities sectors. Kongsberg Digital represents the digital spearhead of the Kongsberg Group in a maritime industry lagging behind on digital standardization and data sharing. Kongsberg Digital’s challenge was to respond quickly to regulatory pressure put on Unruptured Brain Aneurysms their customers to comply with new low-sulfur fuel regulations beginning on 1 January 2020, which would for them result in significant increases in fuel costs—one of the biggest operating costs for maritime operators.

Highlight

From a technological perspective (on the back end), the Vessel Fuel Optimization (VFO) service co-created by Fujitsu and Kongsberg Digital is a cutting edge AI and data analytics ship route optimization solution, capable of utilizing open-source automatic identification system (AIS) data. It uses AI to learn ship captains’ strategies and ships’ performances, combines this with meteorological and hydrographic forecasts (such as wind, waves, and ocean currents), and recommends optimal routes to maximize energy efficiency, safety, and profitability. It allows shipmasters and onshore managers to follow planned and updated routes and maintain dialogue with the crew about the optimal route, helping to save fuel.

The collaboration and concept development emerged from intensive HXD workshops with business leaders from Kongsberg working rapidly with expert technologists from Fujitsu. Taking a user perspective in the early design stage led to an easy-to-use (front-end) service that does not even require sensor or software installation on vessels, as the service is a web-based application that can be deployed immediately. From a business perspective, the service enables them to meet the new regulations while saving costs and improving their environmental footprint in an easy way.

This project demonstrates how cutting-edge and high-end technologies can help an entire industry rapidly achieve a tangible business and uphold responsible values while providing a smooth experience for end users.

Transformational value

VFO digital web service enables maritime firms to immediately meet new low-sulfur fuel regulations, thereby reducing greenhouse gas emissions, while generating immediate and substantial savings across shipping classes. Without requiring elaborate ship re-engineering or major expenditure by ship owners and operators. The entry point to this design challenge was triggered in part by regulatory pressures across the industry, but in addressing the project more strategically and by employing a strong co-creation ethic, the solution has opened up new possibilities that can not only drive cost efficiencies, safety, and sustainability, but also create a platform for further innovation. This provision of an open-source digital platform means that large maritime vessels can adopt new digital applications and capabilities more easily, almost like an app store at sea. This will have far-reaching benefits for the operators but also for the crew.

Fujitsu Case Studies

Enable Faster, More Accurate Detection of Unruptured Brain Aneurysms



Co-design team: Macquarie University, Macquarie Medical Imaging, GE Healthcare, Fujitsu Australia local project managers, Fujitsu Japan AI specialists
Country: Australia
Industry: Healthcare
Year: 2019
Link: <https://www.youtube.com/watch?v=XMpvhJFIUg8&feature=youtu.be>

<https://blog.global.fujitsu.com/oceania/2019-08-27/new-collaborative-project-designs-lifesaving-technology-through-the-use-of-narrow-ai/>

Context & Challenge

Ruptured brain aneurysms cause the death of five hundred thousand people worldwide every year, and half of the victims are younger than fifty. Currently, these aneurysms are incredibly time-consuming to detect and track, and they require specialist expertise. As the consequences of a ruptured brain aneurysm are often catastrophic for an individual and their family, and treatment can be very costly, expedient detection is crucial.

Highlight

Purpose-driven co-creation approach

The focus areas that Macquarie University initially intended to explore with Fujitsu regarding the potential of AI were lung biopsies and brain cancer scans. However, following interviews with resident radiologists, a more compelling need emerged linked to the detection of brain aneurysms. Field enquiries indicate that it currently takes a radiologist up to fifteen minutes to analyze CT scans in detail with error rates of up to 16%. On the patient side, one in fifty people has an unruptured brain aneurysm. A brain aneurysm ruptures every eighteen minutes and is fatal in about 50% of cases. Of those who survive, about 66% suffer some permanent neurological deficit.

From the interviews, the following became clear:

- Radiologists need support to detect and monitor brain aneurysms more quickly and efficiently.
- Patients want greater peace of mind that aneurysms are being detected and monitored well and that fatal health risks for them are reduced to a minimum.

The challenge was then reframed towards creating an AI-enabled diagnostic tool that can analyze CT scans for brain aneurysms more quickly and accurately.

From there, Macquarie University and Fujitsu formed a co-creation team and partnered with others to bring the expertise required for this vision: GE Healthcare, a medical device manufacturer; Macquarie Medical Imaging, a medical imaging practice; and the Australian Department of Industry, Innovation and Science, a funding sponsor (AU\$2.1M were provided to support the project). Fujitsu led the solution design and developed the AI algorithm. Macquarie Medical Imaging provided data of scans, annotation of aneurysms, radiology expertise, and a first trial site. GE Healthcare contributed its scanner and expertise in medical imaging technology, including commercialization, regulatory approvals, and software integration with CT scanners. Macquarie University provided academic expertise and led the research.

Transformational value

The new AI-enabled diagnostic software prototype has dramatically reduced the time it takes to review each scan from fifteen minutes down to two, and it also enables detection of aneurysms that might be missed by the human eye. Additional 3D renderings and fluid dynamic modelling may also help neurosurgeons make smarter decisions for treatment and better plan surgical interventions. If commercialized, it will be the world’s first AI-enabled solution supporting the end-to-end handling of brain aneurysms, from detection to treatment and long-term monitoring. It will make a significant impact in reducing the patient’s burden in the exam, saving patients’ lives and reducing the risk of them being left disabled. It will allow doctors to treat more cases and improve their ability to detect, monitor, and treat aneurysms before they cause irreparable harm to their patients. In addition, this in turn would result in a significant reduction in costs borne by public and private health organizations.

4

Envisioning the Future: Scenario-Building Techniques

A designer's mindset is concerned with shaping the future. This is an inherent quality made even more crucial by the rapid transformation the world is experiencing. The field of futures studies focuses on providing methods and tools that can serve this purpose. In particular, the scenario-building techniques presented in this chapter suggests that, while predicting the future is a very difficult task, it is important to use the knowledge of the present time to envision possible future scenarios. The knowledge allows one to then consciously choose in which direction to move, by retracing the steps that will get them there. This chapter presents a brief history of the discipline, its characteristics, its relevance for technology companies, and its practical application.

1. An Introduction to Futures Studies in Design

1.1

Futures Studies: what it is

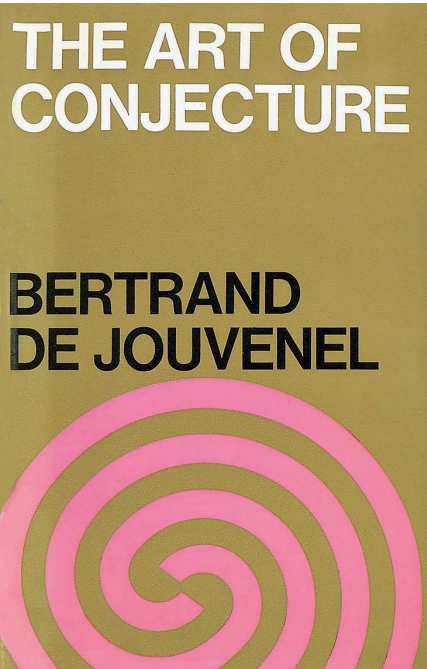
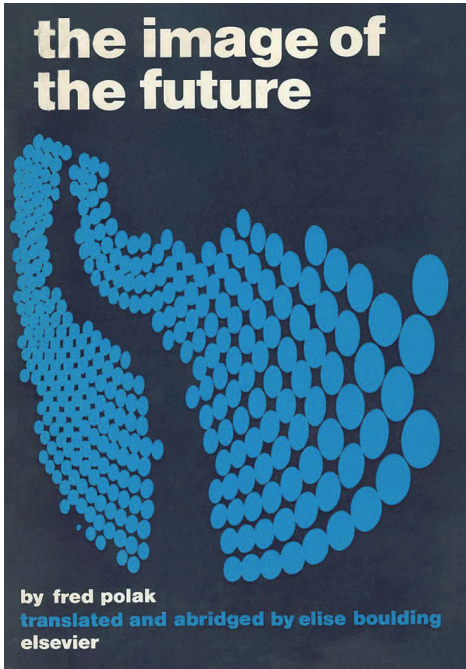
Futures studies represents a systematic study of possible, probable, and preferable futures that refers to the worldviews and myths that underlie each future. In the last fifty years and more, there has been a shift in the main focus of futurology. It has moved from the idea of predicting the future, to one of mapping alternative futures, to shaping desired futures.

The concept of futures studies is derived from a field of social inquiry where the main purpose is the systematic study of the future. It is recognized by terms such as *futures studies*, *the futures field*, *futures research*, *futuristics*, *prospective*, or *prognostics*. The practitioners related to this field are known as *futurists*. Futurists try to discover or invent, propose, examine, and evaluate

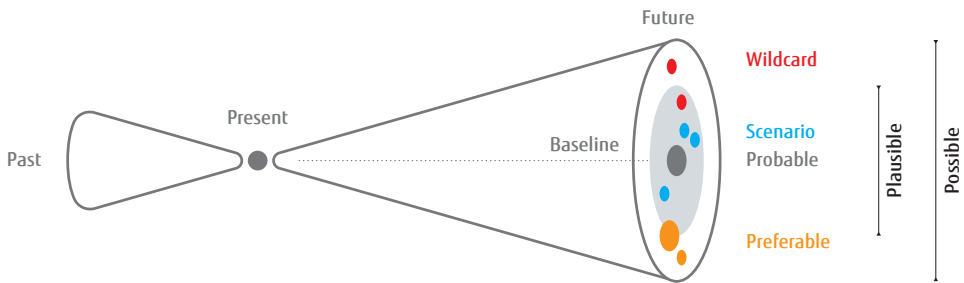
possible, probable, and preferable futures. Their objective is to explore alternative futures in order to assist people in choosing and creating their most desirable future.

The concept of futures fields, as it is recognized today, dates back to the 1960s. It is associated with the translation and publication of *The Image of the Future* by F. L. Polak in English in 1961. Together, this book and *The Art of Conjecture* by Bertrand de Jouvenel represented two very important works for this field. Polak used the concept of image of the future to analyze the rise and fall of civilizations, while de Jouvenel used his work to collect many of the principles of futures studies, something no one had done before.

- 1. *The Image of the Future*
- 2. *The Art of Conjecture*



The Scenario Cone



The futurists' objective is to maintain or improve the welfare of humankind and the life-sustaining capacities of Earth itself. They try to reach this objective by systematically exploring alternative futures using prospective thinking. Bell (1996) argued that they try to create "new, alternative images of the future visionary explorations of the possible, systematic investigation of the probable, and moral evaluation of the preferable." The main purpose is to try to know the possible, the probable, and the preferable.

To achieve this, they study and try to understand what causes change. For instance, they observe and identify the main drivers of and reasons underlying technological developments, as well as the changes in the political, economic, social, and cultural realms.

Thus, futurists attempt to clarify goals and values; describe trends; explain conditions; formulate alternative images of the future; and invent, evaluate, and select policy alternatives.

It is necessary to emphasize that not all the futurists deal with the same topics and areas of study. There are two main classifications of futurists. The first regards those who are primarily *analysts*, focusing their efforts on methods, theories, and other scholarly issues. The others are primarily *activists*, dedicating their efforts to shaping the future itself and applying those methods and theories.

Another important aspect to clarify is that futures studies also involves the present. It is crucial to have a constant look to the present, because actions that take place in the present are those that contribute to shape the future. For this reason, it is necessary to study the present conditions and understand which actions are taking place. This helps identify the actions that need to be developed to shape a future that will be as desirable as possible.

Studying the present is also important to help people balance the demands of the present against those of the future. For example, people can deprive themselves in the

present so as to profit from future payoffs that may never come, so being proactive about the future is essential to try to get the most out of the present.

All these relations between present and future are, however, fictitious. Even if there are past facts and present options, the future remains a possibility where no certain knowledge is available. It is this paradox that futurists aim to resolve: the need to know before the fact what is, in some sense, largely unknowable until after the fact. It is this gap that futurists attempt to fill with conjectural or surrogate knowledge. Futurists make contingent, corrigible, and approximate assertions about the future. However, they are conscious that these hypotheses can also be completely or partially false when the future becomes the present.

To support their research, they have adopted and invented a variety of methods. These practical techniques help futurists justify the reasons behind some particular assertions about the future. Also, many standard methods of research are used in futures studies, from sampling techniques and statistical analysis to data gathering, surveys, and participant observation. This set of methods supports futurists in obtaining an accurate and detailed description and analysis of past trends and initial conditions of the present. These results are used as a basis for both forecasting and designing the future. Developed methods support them not only in clearly stating *what was* and *what is*, but also in organizing these results to propose *what will be*, *what might be*, *what could be*, or *what ought to be*.

1.2

Scenario building and its relation to the future

Since the beginning of time, humankind has considered the future. As anticipated, in addition to the different actions and studies undertaken on the topic, the need for supporting tools arose naturally. Initially, tools from other fields were adopted, starting with tools of operations research, then systems analysis, and then strategy, before a dedicated sets of tools were finally developed. Practitioners need to integrate a rigorous method to orient action towards a desired future. Several tools have been produced and oriented to focus on different aspects, such as:

- Structural analysis for identifying the key questions concerning the future.
- Morphological analysis to identify the entire field of possibilities and to construct scenarios based on them.
- Stakeholder analysis to identify the influence of various stakeholders and to establish the relationships amongst them, as well as the stakes involved.

Morphological analysis to identify the entire field of possibilities and to construct scenarios based on them.

Among these sets of tools, one of the most used in its field and then also adopted in the design field is represented by scenario building.

The name of this tool is obtained by the most common interpretation of the word *scenario*. This word is considered synonymous with vision: the *vision* of a hypothetical future.

In literature, different definitions and descriptions are adopted. Some argue that scenarios must outline possible futures, offering a wide range of options and stimulating thinking about the future. Others describe it as a depiction of a future situation, trying to present all the events which allow one to move forward from the current to the future situation. Also, it is defined as the representation of alternative futures resulting from a combination of trends and policies.

Delphi's Oracle



1.3

History of scenario techniques

The concept of scenarios in general comes from the past where in ancient times people were already interested in understanding the future. It was also used in past military actions.

Military strategists were familiar with adopting scenarios inside war game simulations. Those were elaborated to try to predict possible strategies and risks associated with both personal and enemies' future actions.

However, among all these different applications in history, the first documented reference of what we consider scenarios today is found in the 19th century. The source is presented by writings of Von Clausewitz and Von Moltke, two Prussian military strategists also credited with having first formulated the principles of strategic planning.

Systematic use of scenarios to support thinking about the future started after World War II. There is evidence that the Rand Corporation documented the use of scenarios

in the 1950s as a method for military planning for the US Department of Defense. In 1960s, scenario methodology evolved and was used for social forecasting, public policy analysis, and decision making. After 1970, the technique made a move to the private sector and was used heavily at the corporate level of large companies. Scenarios were mostly used for long-term plans of ten years or more, and its users came from capital-intensive industries like aerospace, petroleum, etc.

Further research reveals that almost fifty percent (50%) of all US Fortune 1000 companies were actively using scenarios in the early 1980s. Thereafter, the method of scenario building was implemented and adopted on a massive scale. New meanings were associated with scenarios, employed to deal with the macro-scale of the socio-technical systems and to present a variety of possible futures in a wide range of sectors. Scenario planning stimulated strategic thinking and helped to overcome thinking limitations by creating multiple futures.

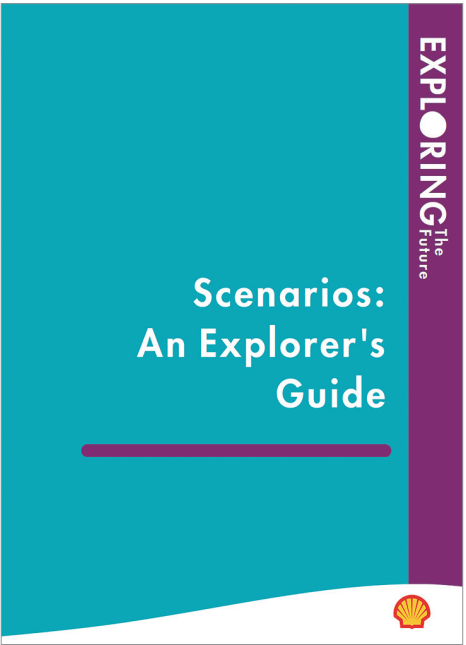
1



2



3



- 1. Von Clausewitz
- 2. Von Moltke
- 3. Shell Report

2. Characteristics of Scenario Building

2.1 What form scenario takes

Scenario building is a tool that allows for the move from an information analysis phase to a pre-project trajectory proposal phase. A scenario is a synthetic representation of a set of pre-designed information and ideas on a specific theme used to develop guidelines for designing new products and services.

A scenario prefigures possible reference *worlds*, in terms of contexts and situations of use, user-product relations, meanings, and senses associated with the use of a product or service. In the scenario method, the objective is not to predict the future. The future is considered to be too uncertain. Instead, the objective of the scenario method is to explore the future by describing different possible future states.

While developing scenarios, it is necessary that two main aspects are included: a clear motivation and a practical issue. For the first, a clear explanation of what the scenario is aiming for is needed, while for the latter, it is important to include some concrete actions that need to be implemented to develop the scenario.

The scenario can be fully applied only if the company is able to consider options beyond the traditional operational and conceptual comfort zone. This process must exclude the possibility of limiting the development of future scenarios or avoid to excluding certain alternatives. The final result should be a representation of plausible futures, connected with

actions to develop emerging opportunities, and starting from what needs to be implemented in the present.

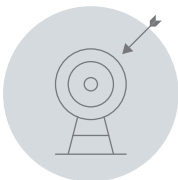
2.2 How scenario is expressed and the importance of adopting it

The adoption and development of scenarios are not connected to a particular timeframe. However, they provide greater usefulness if developed for the long term. Although the scenario technique has been used for many decades, it is not possible to find a single approach to perform it. However, there are some common aspects among the different approaches. All emphasize defining the issues, identifying key drivers, stakeholders, trends, constraints, and other important issues.

The field of scenario methodologies is characterized by extremely varied approaches, terms, and definitions that have been developed over time and are documented in several streams of literature. As some scholars point out, this diversity can sometimes appear confusing, especially as similar terms are occasionally employed in relation to different approaches.

However, a synthesis of this varied landscape of theories allows us to identify three main schools or methodological approaches for scenario building: Intuitive Logics, Probabilistic Modified Trends (TIA, CIA), and the French school of La Prospective. The last two more heavily rely on probabilistic calculations and mathematical

Scenario variables



Focus Area

(Product, Technology, Enterprise, Industry, ...)

01



Geographical Scope

(Local, Regional, National, Continental, Global, ...)

02



Timeframe

(measured in years)

03

models, while the first relies on *disciplined intuition* and on the creation of plausible scenarios through qualitative methodologies. In this last case, quantitative data may be used to broaden the understanding of the context but is not employed to estimate the likelihood of a scenario or generate predictions.

The intuitive logics method appears to be the most commonly documented and also the most widespread in

the business context, although it is also the most diverse in terms of the variety of approaches. Its approaches range from more informal applications to codified proprietary methods, particularly common amongst agencies who offer services in the field of futures studies. Scenario building can be a valuable tool to guide the design of new products and services and to help management define new launch strategies.

3. The Value of Scenario Building for a Technology Company

Innovation is ingrained in the DNA of a technology company and is by nature concerned with the future. However, innovation processes need time to take place, sometimes longer than expected. Also, the implementation of some concepts, from their ideation until the moment in which they arrive on the market, can require long periods. Sometimes, during the implementation phase, changes in technology, market, and/or society can take place. These unexpected shifts can both positively and negatively affect the outcome of innovation. Scenarios thereby represent a valuable way to cope with unpredictable changes and develop a view on the future.

The hypotheses on the future coming from this method can contribute to the creation of future strategies that can lead to possible adjustments. Researchers have also reported that there is a direct link between scenario planning activities and successful implementations of innovation inside companies. This further proves the importance of a future-oriented mindset that encourages people to invest time in researching the future and debating possibilities.

Scenario planning supports managers in making better decisions for the long term. Overall, it helps managers understand the dynamics of a business environment, recognize new possibilities, assess strategic options, and develop ideas for the future, supporting them in making better decisions in the long term.

Research shows how the adoption of scenario planning has increased significantly in the last decade.

Moreover, the adoption of scenario planning techniques can help business environments overcome uncertainty, unpredictability, and instability.

Rising uncertainty has increased the importance of identifying future trends and expected changes in the business landscape. Scenarios can facilitate the identification of critical uncertainties that can transform the performance of a company. The technique helps us understand the limitations of our *mental maps* of the world—to think the unthinkable, anticipate the unknowable, and utilize both to make better strategic decisions.

4. Applying Scenario Building

The following section focuses on the presentation of a purely qualitative scenario-building methodology. This reflects some of the main steps documented in the literature, but also contains specific adaptations proposed by the authors leveraging their direct experience with the application of the method.

4.1

A qualitative approach to scenario building

"Scenario method offers one approach to understanding and analyzing seemingly intractable problems where there are 'critical uncertainties' that span a range of subject areas or disciplinary boundaries. It is an approach that is inclusive, rather than selective" (Wright & Cairns, 2011).

Qualitative scenario-building approaches lend themselves to a large variety of applications and offer valuable support

in the analysis of multifaceted and complex problems. Their starting point for a scenario is typically a project challenge or an area of concern which can be more or less broad. The methodology can be applied both to facilitate the exploration of possible future directions and to drive alignment and decision making.

Scenarios are not classified by their probability (nor is statistical probability a key concern in this methodology), but it is necessary to ensure that they are plausible, internally consistent, and built on a clear rationale and re-traceable logic. It can be said that the benefits of the scenario-building process tend to be even more important than the reliability of the output itself. Scenarios are an important tool in overcoming barriers to innovation and transformation within complex organizations.

4.2

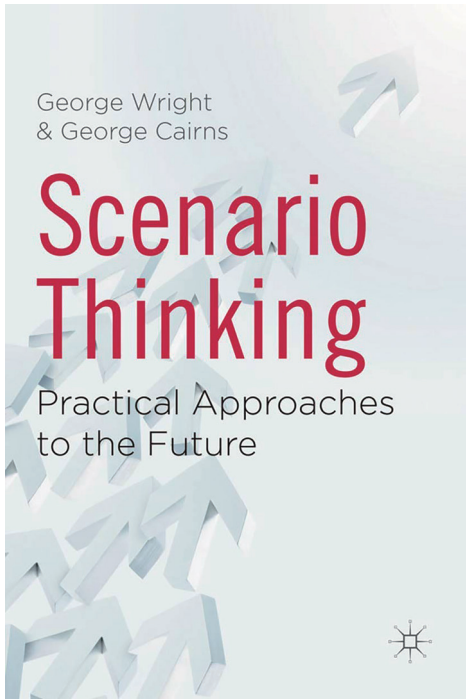
Key characteristics

The process of scenario building is inherently diverging and the ultimate aim is to challenge business-as-usual from a number of different perspectives. However, the definition of a clear sequence of steps ensures that participants engaging in this activity are able to follow a specific path, without derailing or declining into chaos. Qualitative scenario techniques display some overarching common characteristics, which can be summarized as follows:

They are based on the analysis of the relevant context for the project challenge and they rely both on inductive and deductive thinking processes to perform such analysis. Scenario-building activities assume that knowledge is created collaboratively and that participants provide their own point of view on the problem and, most importantly, share their rationale with the rest of the group.

They are often developed through hands-on workshop sessions, a format that can facilitate knowledge exchange and alignment amongst participants. Activities may include secondary research, context analysis, subject-matter expert interviews, and group brainstorming.

In scenario-building sessions, the objective is to leverage the information gathered by the team to come up with sets of polar opposites, which help participants identify diverging and distinct future

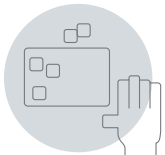


Scenario Thinking

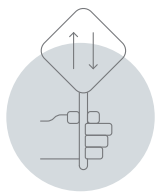
Scenario method characteristics



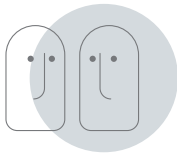
It is based on an analysis of the relevant context



It is developed through hands-on activities



It is based on polar opposites and divergent options



It involves key decision-makers in the process

scenarios. These polarities then take the form of a 2x2 matrix, in which each quadrant becomes a single scenario, presented in a descriptive form and often accompanied by photos and other visual contents to strengthen its narrative power.

Successful applications of scenario building are characterized by the involvement of key decision makers in the process, as this can result in quicker and more effective alignment. This also results in the possibility to incorporate strategic considerations in the early stages of scenario-creation activities. More specifically, best practices encourage companies to appoint internal teams to guarantee continuity and ongoing engagement, but also to involve subject-matter experts to support activities as needed.

world will be like if ...?" The aim is to represent the context and what it is going to include, and to show how the context will change after the implementation of certain proposals. It is important to understand how products and services can impact and modify life.

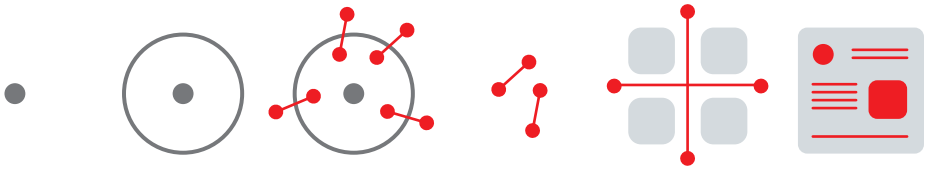
Proposal. It is what gives a concrete form to a vision. It answers the question: "What has to be done to implement that vision?" It includes the representation of the products and services that comes from the scenario. The products and services need to be coherent with the developed vision and also to be feasible, in order to not propose something utopian.

Motivation. It is the component that makes sense of the scenario's existence. It answers the question: "Why is this scenario relevant?" It is composed of general and specific goals that implement the developed scenario.

Literature on the topic identifies three main components that should be embraced in each scenario:

Vision. It is the most specific component of the scenario. It answers the basic question: "How the

Scenario-building process



Defining the project challenge
01

Analyzing the context
02

Finding meaningful polarities
03

Choosing the most relevant variables
04

Designing a matrix of possible variables
05

Detailing out narrative scenarios
06

4.3

How to apply scenario building: a step-by-step process

Despite the large variety of methodologies and protocols for scenario building, it is possible to identify some common stages. In the following section, these six stages summarized below are explained through a practical example that is related to the creation of a new scenario for a retail organization.

1. Defining the project challenge
2. Analyzing the context
3. Finding meaningful polarities
4. Choosing the most relevant variables
5. Designing a matrix of possible scenarios
6. Fleshing out narrative scenarios

Step 1. Defining the project challenge

Defining the project challenge is a preparatory step: it involves identifying an area of concern that a specific group of stakeholders is interested in investigating and addressing. The challenge might take the form of a problem statement or a “How might we...?” question, and it is generally important to keep its framing quite broad to make the exercise most effective. At the same time, it is important and useful to capture the specific nuances of the problem and to gather lower-level challenges that belong to the selected overarching theme: stakeholder interviews may be used prior to this step in order to reach a crisp definition of the problem. During this phase, it is also important to define a time scale for the chosen issue, which may span a few or several years and may also vary depending on the industry and its pace.

Example:

A client organization with a retail presence (e.g., furniture or home decor industry) wants to transform their way of working store managers and employees. They wish to build a common vision and new processes and tools that can facilitate the exchange of communication between people but also to improve service delivery for their customers.

Step 1



How might we...

design digital solutions that can enable our workforce to work and collaborate better and to create more value for their customers?

They see the potential to leverage new technologies and AI in particular to achieve this goal, but they would like to make their solution future proof and to build a solid strategy. This focal issue may, for instance, be phrased as follows: “How might we design digital solutions that can enable our workforce to work and collaborate better and to create more value for their customers?”

Step 2. Analyzing the context and identifying driving forces (variables)

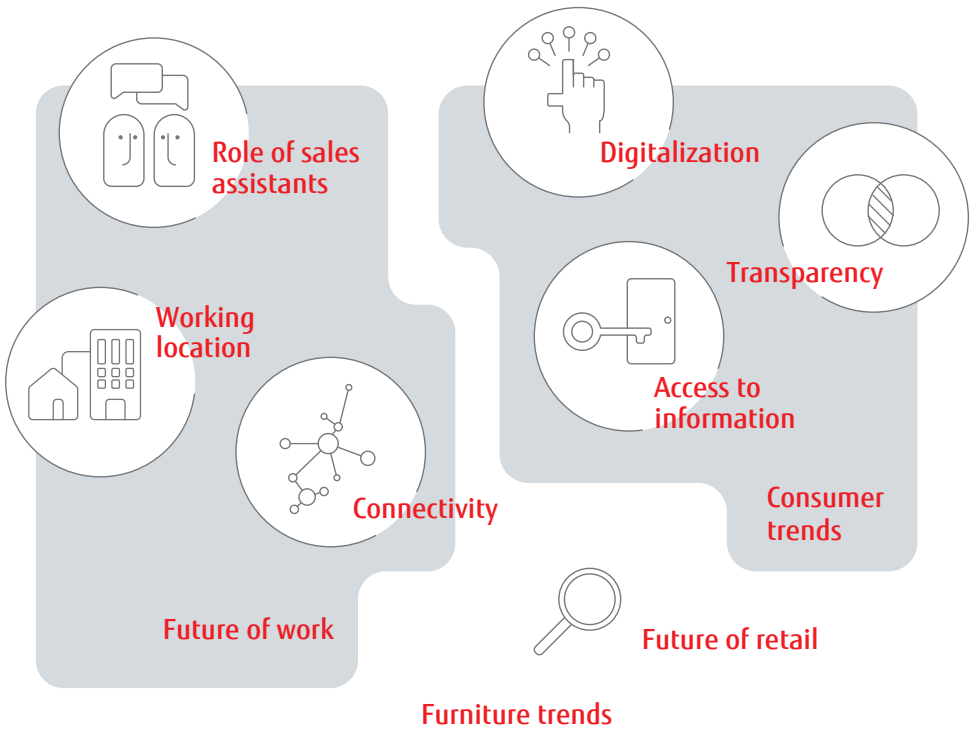
Analyzing the context means reflecting upon which driving forces (variables) might be influencing the selected challenge in the future and identifying relations between them. All participants in scenario-building activities should invest time to research the context under a number of different perspectives (political, social, economic, legal, technological, etc.) and to form an opinion around which forces may have the greatest impact. Here, the focus should be on contextual rather than internal or organizational factors. The subject of this contextual analysis might vary depending on the topic and on their relevance in relation to it. Best practices suggest running this activity first individually and then as a group to reduce bias and maximize the diversity of opinions.

Each contextual dimension can spark ideas around what the driving forces are: these should be expressed in a neutral way and never point to a specific outcome in order to allow the team to identify one polarity for each of them later on.

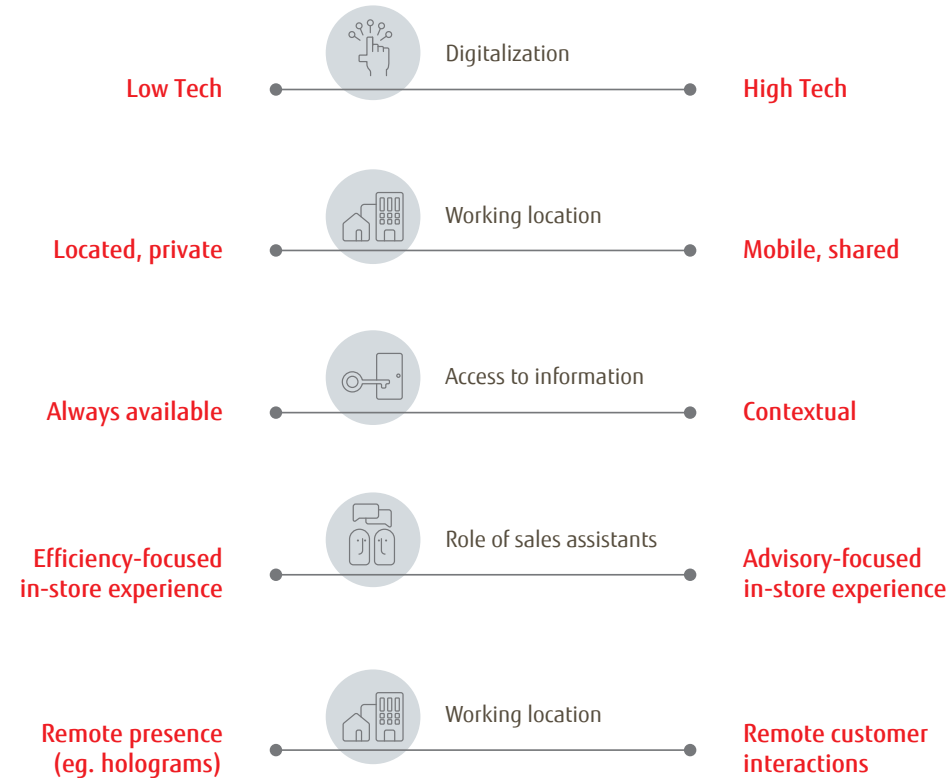
Example:

Given the nature of the challenge, it could be interesting to look, for instance, at social (user-related and employee-related), technological, and economic variables, which can impact the focal issue. An activity of secondary (and potentially primary) research related to these dimensions could yield interesting results and spark ideas around driving forces in this field. For example, secondary research might show that the role of a sales assistant is very likely to change in the future (due to technological transformations and the evolving role of physical retail stores), although the trajectory of this change isn’t necessarily well defined. Other variables may, for instance, include the role of technology (AI in particular) in retail management. It could also include user-related aspects, such as the cultural significance of furniture or the change in the degree of people’s mobility (how stable or nomadic people are).

Step 2



Step 3



Step 3. Finding meaningful polarities

Each variable can be related to a set of different outcomes. In particular, this stage of the scenario-building activity requires participants to identify two possible opposite outcomes, which will constitute a pair of polar extremes, also identified as *polarity*. While going through this step, teams are encouraged to reflect upon what these two opposite outcomes might look like and even make a list of the characteristics of these scenarios.

Example:

All of the variables listed above are expressed in a neutral form (the *role*, the *extent*, the *degree*), leaving the door open for different interpretations and allowing for the definition of coupled polar opposites. For example, the role of sales assistants could evolve in two opposite directions: on one side, they could increase their focus on ensuring visitors have a smooth, quick, and effective experience that brings them straight to their goal in the minimum possible time. On the other hand, they could increase the value they offer to store visitors, by facilitating an immersive experience focused on consultation and characterized by a slower pace.

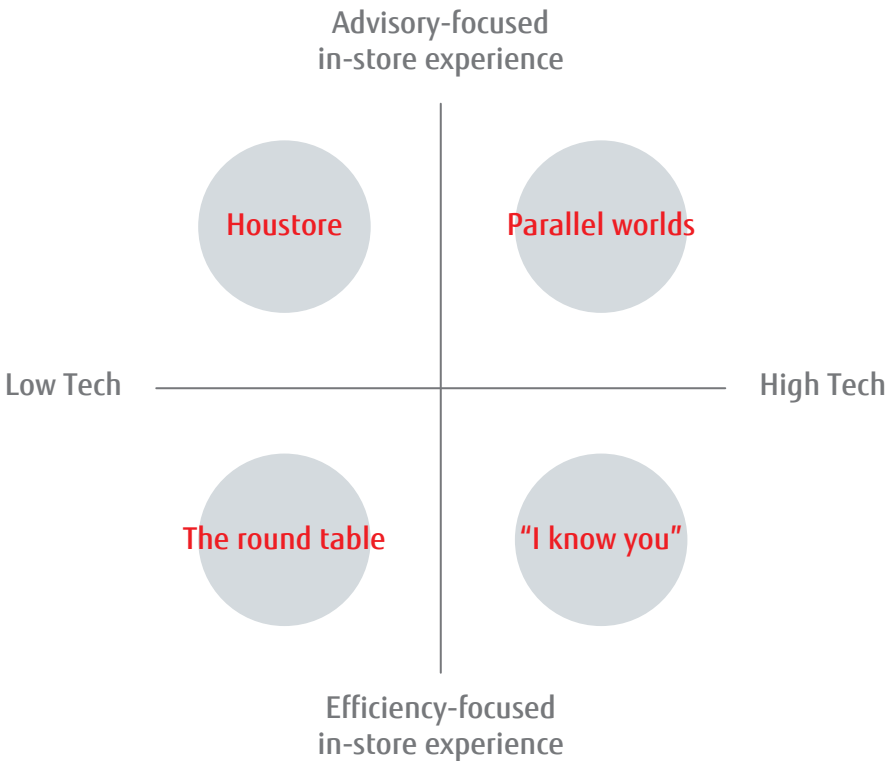
Step 4. Choosing the most relevant variables

After each variable has been discussed and fleshed out by the team, participants are asked to prioritize variables by looking at two specific characteristics: their impact, meaning the extent to which they have the potential to affect the focal issue, and their degree of uncertainty, meaning the unpredictability of their effect on the focal issue. In scenario-building activities, the aim is to select those variables that have the highest degree of both relative impact and uncertainty and to identify two of these variables to plot them onto a 2x2 matrix. It is important to select variables that belong to different subjects (e.g., user context and economic context) and to avoid picking variables from the same bucket, as that would result in narrow and meaningless scenarios.

Example:

Not all the mentioned variables are equally interesting for the creation of future scenarios. The role of sales assistants is both quite impactful on the focal issue and quite uncertain and may be considered a good candidate for the final scenario matrix. Likewise, digitalization, here intended to mean the extent to which it will take hold in the

Step 4 and 5



retail environment itself, could be interesting to analyze.

The process and the examples presented so far describe all of the fundamental steps of scenario building. Two more steps are needed to synthesize and consolidate the activity into tangible and shareable output.

Step 5. Designing a matrix of possible scenarios

The variables selected in the previous stage are utilized for the production of four detailed scenarios, which are developed with a common temporal starting point, but end in four diverse, yet plausible, causally-unfolded end-states" (Wright & Derbyshire, 2016). The purpose of the matrix is in fact to provide an overview of distinct future scenarios, each characterized by a specific title and keywords that briefly summarize the characteristic of that specific future state.

Step 6. Fleshing out narrative scenarios

In essence, scenarios are narrative artifacts that depict a plausible future and, in order to use them as a tool to facilitate strategic conversations, it is important to present them in a clear and relatable form. For this

reason, scenario-building activities make extensive use of narrative elements and visualizations (e.g., illustrations or photographic images) to represent and exemplify a future situation. It is important to note that scenarios are not yet solutions. Rather, they are representations of contexts that can become fertile terrains for the implementation and adoption of new solutions.

4.4 Scenario building use

Scenarios are very useful artifacts when it comes to facilitating conversations amongst stakeholders and facilitating alignment and decision making in relation to a specific project or initiative. For this reason, the natural next steps of a scenario-building activity are:

The discussion of the strategic implications of the four scenarios and, potentially, the redefinition or reframing of the strategic objectives for the project.

The prioritization of a certain scenario over others to potentially help the team set strategic objectives and work towards a desired future state through a process of backcasting; and the ideation of solution concepts in relation to a prioritized scenario and their organization around a roadmap.

Scenario creation allows us to use and combine content stored in a knowledge repository; formalize the launch of a project and align goals and objectives among project team members; define project briefs analytically, detailing innovation trajectories shared between designers and management; and collect and organize material that can inspire innovation paths in the company.

4.5
Risks and shortcomings

Generally speaking, the downside of scenario building is mostly related to individual biases and the qualitative nature of the technique, which may be more or less

successful largely depending on how rigorously the process is applied.

Possible shortcomings of this methodology include the risk of misinterpretation of what future developments in a certain field might look like. This is often due to certain topics receiving particular media attention in a specific moment in time and this may influence the perception of team members and the importance attributed to a single factor (Think of the impact that 9/11 had on people's lives and perceptions).

Another risk, often related to time constraints, is related to the extent to which each contextual dimension is analyzed in depth. If the level of detail is not sufficient, the team may end up performing a too-simplistic interpretation of reality or giving priority to other subjects that have received more extensive attention.

Example:
Associated Press and the future of the news industry
Associated Press (AP) partnered with Frog Design (stylized frog design) to look at the future of the news industry. The idea was to explore new opportunities to

stay ahead of the competition and remain relevant in a market that has been particularly affected by the rise of digital channels.

The collaboration revolved around a set of futurecasting workshops, in which teams from different parts of the organization got together and analyzed the technological, socio-economic, regulatory, and cultural contexts, looking for signs of change and driving forces of transformation.

The output was four distinct and divergent (non-overlapping but potentially co-existing) future states:

- 1. Social media takes over as the main channels through which the consumption of news occurs.
- 2. Online advertising disappears and new business models are needed.
- 3. Smart devices and the Internet of Things truly shapes and influences the way we consume content.
- 4. Artificial Intelligence takes over human tasks related to news gathering, creation, and distribution.

As a result, this process enabled AP to take action more quickly and jump-start a set of projects informed by this activity, feeling more confident that the company would be better prepared to face future challenges and direct its growth.

Step 6



"I know you"

AI and other advanced technologies enable retail staff to deliver hyper personalized yet extremely efficient experiences, all the way from exploring to purchasing.



KEYWORDS: recognition, human interaction, tailored communication and tone of voice, intelligent analytics, smooth employee to machine handovers, ...



Key Takeaways

1. An Introduction to Futures Studies in Design

- The discipline of **futures studies is concerned with maintaining or improving the welfare of humankind** and the life-sustaining capacities of Earth itself. It does this by systematically exploring alternative futures using prospective thinking or possible scenarios.
- Scenario building is one of the most major tool among the various approaches in futures studies and have been adopted in design field.
- The word **scenario is considered a synonym of vision**: the vision of a hypothetical future. The objective of scenario building is not to predict the future, but rather to envision potential future trajectories by interpreting the context, trends and signals.
- Scenario techniques were first adopted in the military field as strategic tools, and started being adopted for wider practices including public policy analysis in 1960s. From 1970s, scenario methods became **popular in the business context**. Shell is regarded a pioneer in this field.

2. Characteristics of Scenario Building

- The two key aspects that are considered when building a scenario are: having a clear motivation and objective for a scenario, and presenting concrete steps to achieve the scenario.**
- Scenario-building techniques are numerous** and serve different purposes: **qualitative techniques are particularly interesting for exploratory scenario activities** aimed at mapping a variety of different future states.

3. The Value of Scenario Building for a Technology Company

- Innovation is at the core of technology companies and therefore are inherently concerned with the future. In a rapidly changing environment, **scenario building offers companies the opportunity to think about future challenges and opportunities**.
- Scenario building is also beneficial for management and decision-making. It helps companies and managers carefully consider their strategy and define where the business is going, **by intentionally choosing a direction**.

4. Applying Scenario Building

- The process of scenario building can be summarized into six steps starting from definition of the project challenge to fleshing out narrative scenarios.
- The output of scenario building is to create a set of scenarios (usually four).** To define them, teams must identify the most impactful and uncertain variables, express them in the form of polar opposites, and plot them onto a **2x2 matrix** to generate four distinct and divergent future states.
- Each scenario is generally expressed in narrative form**, through images, illustrations, and text in order to make it understandable and relatable. Scenarios are not concepts: rather, they depict a context in which a new concept might exist.

Fujitsu Case Studies

Site-led workstyle reform



Co-design team: Universal Can Corporation, Fujitsu Limited, Fujitsu Research Institute
Country: Japan
Industry: Manufacturing
Year: 2016 – 2017
Link: <https://www.youtube.com/watch?v=cmCOWgmKG9o>
<https://www.fujitsu.com/jp/about/businesspolicy/tech/design/activities/unican01-en/index.html>

Context & Challenge

With production factories all over the country and members often working separately, numerous business trips were required and the challenges of communication—e.g., extended time on the phone or sending e-mails—were felt by many. The environment was one in which business management could not be conducted smoothly, presenting problems that ranged from difficulties with sharing task management throughout the organization, to limited personnel being able to organize data being heavily accessed at business trip destinations. The project was started with the objective of realizing competitive strength and sustainable growth by changing to an efficient and creative workstyle through the reinvigoration of communication and knowledge sharing across departments. On-site employees such as those in technical development and sales divisions took the lead on this project.

Highlight

Purpose-driven co-creation approach

The Fujitsu team conducted user interviews mainly within on-site departments to understand the situation there. The results were analyzed, and a workshop was held across eleven departments. Based on the output, designers analyzed the insights and drafted a vision based on three axes—the individual, the team, and society—and created twenty-six workstyle scenarios, including meetings anytime from anywhere via Web-based smart devices, real-time online co-editing of documents, and visualization and analysis of data to help streamline on-site operations. Consultants led the creation of a roadmap and implementation plan based on Fujitsu's own priority assessment of the effectiveness of the scenarios.

In cooperation with their information systems division, the company changed their highly prioritized communication infrastructure. They will continue to make step-by-step changes to realize their vision.

Transformational value

Successfully reformed the communication infrastructure and improved communication, ultimately realizing the company's vision (real-time communication). The company realized that by their own initiative, they could achieve results by working laterally with organizational structure.

Fujitsu Case Studies

Envisioning sustainable, safe, and inclusive cities enabled by technology



Co-design team: Global community of Fujitsu Distinguished Engineers (FDEs), Fujitsu Corporate Social Responsibility (SCR) Team, Filippo Veglio, Managing Director at World Business Council for Sustainable Development (WBCSD)
Australia local project managers, Fujitsu Japan AI specialists

Country: Japan, India, Germany

Industry: All industries

Year: 2019

Link: <https://www.youtube.com/watch?v=BmTojYzU1es>

Context & Challenge

How can technology make large cities more inclusive, safe, resilient, and sustainable, in line with the United Nations’ Sustainable Development Goal (SDG) 11? This is an important and complex challenge because the world’s cities occupy just 3% of the earth’s land but account for 80% of energy consumption and 75% of carbon emissions.* 95% of urban expansion in the next decade will take place in the developing world,* and there are on average two million deaths per year due to pollution.* (*UN, World Health Organization.)

Highlight

Two hundred and seventy Distinguished Engineers (a top technical talent community) from across the globe were split into twenty-seven teams to envisage a future way of living in concentrated urban environments enabled by technology solutions. The teams were organized around three significant metropolis geographies, each representing diverse profiles of urban areas around the world: Tokyo, Bangalore, and Berlin. Focus areas targeted a design space linked to specific aspects of urban life: environment, mobility, or housing and community. Each group of experts was diverse in terms of professional expertise and seniority, as well as nationalities, cultural backgrounds, gender, and age.

The setup of three cities and three focus areas allowed for significantly divergent thinking in terms of future scenarios and potential solutions. For instance, when exploring the future of mobility in Berlin, a team challenged the idea of a city itself as an entity and what it meant for mobility, while another team envisioned a scenario where use of private vehicles would be removed from Berlin. In Tokyo, a team focusing on mobility studied a scenario of travel by exception, challenging the idea of having to travel to do or get what we want, in favor of having what we want come to us on a more radical scale than is the case today. The COVID-19 pandemic proves that such a scenario was very realistic. Regarding mobility, teams agreed that life in the city must be inclusive, sustainable, safe, and affordable, in line with the UN SDG 11 vision. While looking closer at these scenarios arising from an exploration on mobility, the teams quickly realized the scenarios’ effects on housing and community and were reminded that environment, mobility, and housing and community were intertwined. For instance, a travel by exception scenario directly affects the wider environment and prompts us to think of the human impact in terms of inclusiveness, community, and housing.

Transformational value

Twenty-seven concepts were outlined and aligned to a clear vision with a clear technology component at their core. The concepts were diverse as a result of the city profile data, the focus area of each team, and the vision that had been drawn. However, all concepts converged in service of a strong, common underlying purpose: more inclusive, safe, resilient, and sustainable large cities. The value of this combined outcome lies in the rich picture it paints of potential future scenarios and visions, the technological capabilities that can be applied to support the solutions envisaged, and the potential to combine some of these concepts to build more complete and impactful solutions.

5

Designing the Intangible: Services and Service Design Methodologies and Tools

Today, global economies are dominated by services; technology is creating even more opportunities to create meaningful service experiences for users. The ability to envision and implement complex systems and services is key for companies today. This chapter presents a few relevant trends in the field of services, describes the structure and the components of a service, and presents the most important service design tools, such as service offering maps, user personas, user journey maps, and service blueprints.

1. Introducing Services and Their Evolution

1.1 Services, the heart of modern economies: what are they?

While the end of the 19th century was marked by the industrial revolution and the subsequent distribution and diffusion of new physical goods, the end of the 20th century saw the rise of services. In a market saturated with physical products, services emerged as an opportunity for differentiation and gave companies a chance to stay ahead of their competitors.

Over the last few decades, services have become an essential component for the economic growth of a large number of countries across the globe. Almost all countries have experienced an increase in the contribution that the service sector brings to their national economies and to their GDP, with low- and middle-income countries growing at the fastest pace. By contrast, the contribution of the manufacturing and agricultural sectors has declined

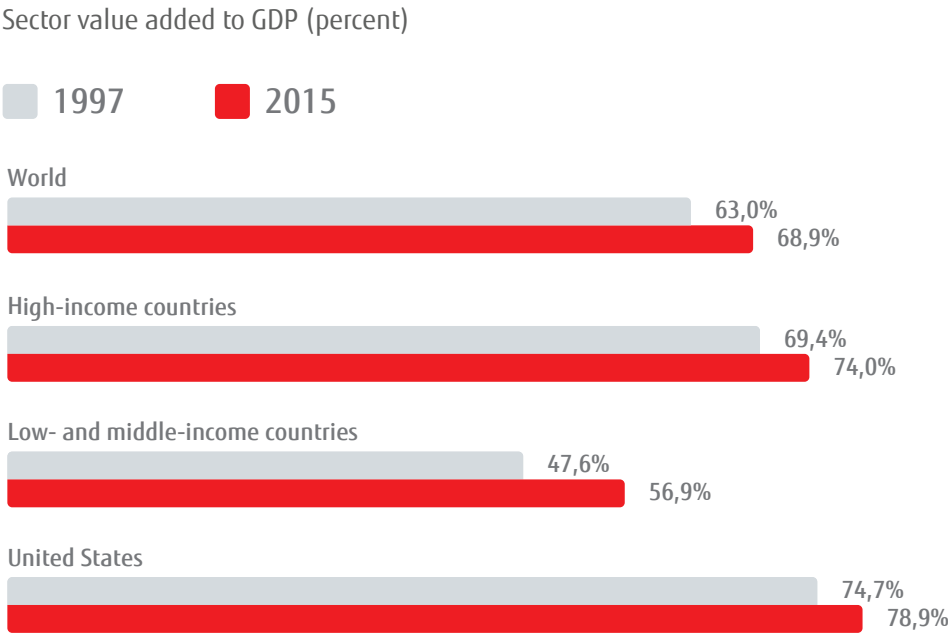
globally, marking a clear shift to the so-called service era.

Services play a central role in the public sector as much as in the domain of enterprises. Today, governments, policy makers, and public stakeholders are confronted with new and increasingly complex challenges concerning societal, economic, ethical, and environmental aspects. In order to successfully deal with this complexity, new tools are needed and the public sector is turning to service design for help. Not only is service design contributing to the creation of frontline services to improve the life of citizens and communities, but in some instances it is also contributing to policy design.

But what exactly is a service and how can it be defined?

Traditional definitions of service tend to stress the difference between physical goods and services by outlining some key characteristics that set them apart from the world of physical objects.

Services' share of GDP



First of all, as the common use of the word suggests, a service is the act of performing duties that can help someone else. From an economic standpoint, services are defined as “means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks” (Information Technology Infrastructure Library - ITIL). Services are therefore those complex systems based on processes that coordinate the actions of multiple actors in order to deliver efficient solutions and meaningful experiences to their users.

Defining what makes a service is not easy, but the existing literature on this topic has traditionally relied on four main characteristics: intangibility, heterogeneity, inseparability, and perishability, also known as the **IHIP framework**.

Intangibility. Services are intangible performances that facilitate an outcome. Although physical objects are often part of the service system and provide anchor points to the user experience, the value that services generate for their users is typically not material, as it lies in the actions performed by a service provider. For instance, if we look at services in the field of education, we can quite easily observe that “the process of educating or operating is intangible and not the teacher, the books or the instruments” (Moeller, 2010), which are the means used by a provider to reach a specific outcome. Also, services typically do not result in the ownership of material goods. Rather, they result in the access to the intangible value that can be facilitated by physical artifacts as well: car- or bike-sharing services are a classic example in this regard.

Heterogeneity. Compared to physical products, services are confronted with the challenge of maintaining homogeneous quality standards. This is particularly true for labor-intensive services, where the human factor can create variable (heterogeneous) service quality. As a consequence, the evaluation of service performance becomes particularly complex.

Inseparability. In services, production and consumption typically happen at the same time, determining an immediate outcome for the user (e.g., medical services) or the user’s resources (e.g., financial services). The user must be in the presence of the service provider for the service to be performed.

Perishability. The concept of perishability refers to the idea that if a service is not consumed in a certain moment or timeframe, its value is lost, as there is no

possibility to store a service or its unused capacity for later use. This is the case for transportation services, which rely on a specific schedule to operate. Likewise, healthcare services rely on the capacity of the medical staff and the procedures or actions they can perform with the available resources.

1.2 Services: a field in constant evolutions that provides new opportunities for service companies

Our societies are transforming rapidly thanks to the advent of new technologies and the evolution of our habits and consumption behaviors in many different domains of our lives. Services permeate our lives and are all around us: the needs that we used to satisfy with physical products are nowadays addressed by service solutions, and services are becoming more complex and sophisticated. From fashion to mobility, from food to tourism, service is garnering increased attention in every industry, which is also spreading to the business-to-business sector as well. These transformations are creating new opportunities for companies to provide value through services and to even transform their businesses, shifting from a product-based to a service-based offering.



Bike sharing: an example of how services permeate our lives

New consumer habits are arising

Consumer behavior and forms of consumption, in general, have changed significantly in the past few decades. The rise of certain sharing economy models is tangible proof that the consumer-firm dyad is no longer the only dominant economic paradigm. Consumers are given more and more opportunities to exchange value independently or to become co-creators of value within a service ecosystem. This is often supported by digital platforms that make this exchange easier.

At the same time, a growing number of individuals have become interested in playing a role as creators or co-creators of value. This is often referred to as the *prosumer* movement, a social phenomenon that sees consumers becoming producers or, more generally, enacting processes of production that typically belong to firms.

Services rely by nature on a shared creation of value between the provider and the receiver, due to the fact that they are produced and consumed at the same time. New and more distributed service models typical of the sharing economy simply amplify the number and type of these exchanges. This is what Airbnb does by leveraging a network of private intermediaries for accommodations all around the globe.

Example:

Skillshare, learning from other users

Consumers become producers as they are enabled to share with other users their knowledge or skills through a digital platform. The platform allows them to promote their content, build a community, and earn money through their teaching activities.

The transformation of consumer behaviors is also evident in the rise of new forms of ownership and new perceptions of the idea of ownership itself. Not only is there a growing interest and trust in open systems that connect one user to the other, but there is also a clear shift from a concept of permanent ownership to a concept of temporary access. A typical example is bike- or car-sharing services, whether public or private, but new access-based models have begun to spread in more unexpected sectors as well.

Example:

Rent the Runway, a subscription fashion service

Users subscribe for a fixed fee to receive premium clothes that they can wear as many times as they want and they can return to swap for new ones. This model gives users access to items that would otherwise be much more expensive and leverages the desire of users to change

their style over time and try out new options.

Another key phenomenon that influences the field of services is the growing importance of experience as a distinct form of intangible value that users are more and more interested in and are willing to pay for. As American economists B. Joseph Pine and James H. Gilmore put it in their namesake book (1998), we live in an *experience economy*, in which experiences are an important differentiation asset, as they are unique to each individual (and to specific contextual circumstances) and cannot be replicated in the exact same way. Experiences are distinct from services, although services can be the stage on which experiences take place. As the two authors say,

Experiences have always been at the heart of the entertainment business.... But today the concept of selling an entertainment experience is taking root in businesses far removed from theaters and amusement parks.

Not all companies are directly charging their customers for the experiences they offer. Yet an increasing number of

companies recognize the value that comes from investing in the creation of unique experiences around a product or service.

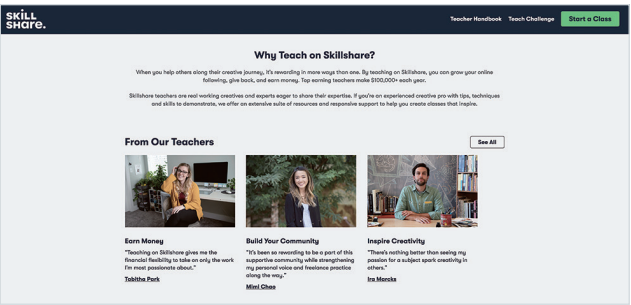
Example:

Nomad Travel and Airbnb Experiences, leveraging the value of experiences

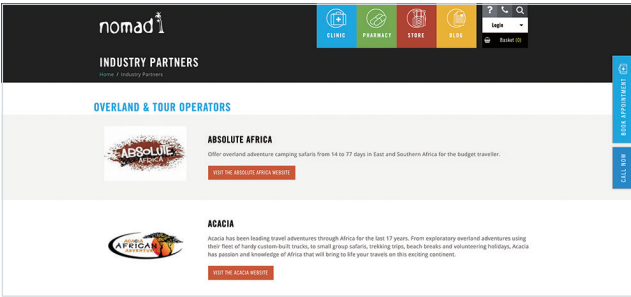
Once a chain of stores specialized in travel and camping products, Nomad Travel has invested in offering its customers more than just the tools. They offer what the customers really want, which is a memorable travel experience. They went from being a store to becoming counselors for a niche market of adventurous travelers interested in seeking advice from other expert travelers. They also started offering packages for adventurous trips, relying on a network of selected partners in various countries.

In more recent years, Airbnb has launched Airbnb Experiences, a service offering targeted at any traveler interested in abandoning the classic visitor mentality in favor of a more experience-driven approach. The latest additions to the Airbnb Experiences offering include unique and creative tours and activities to meet animals in their habitat.

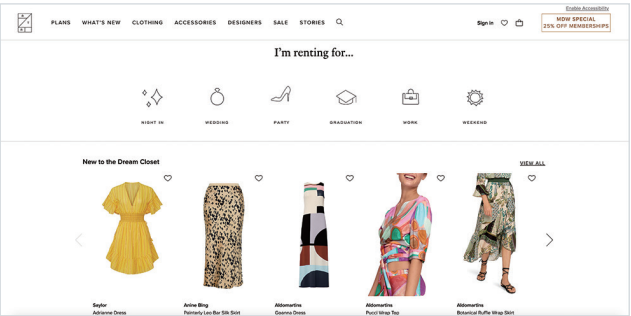
Skillshare



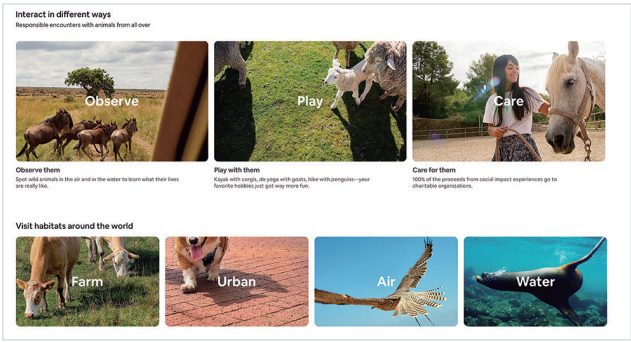
Nomad Travel



Rent the Runway



Airbnb Animal Experiences



1.3
The evolution of services in the digital era

New opportunities for the world of services also largely arise from the advent of digital technologies. In the digital era, the meaning of the word *service* is changing as well. Traditional definitions focus on the differences between services (which are intangible and can't be owned) and physical goods (which can be owned and consumed). However, today these boundaries are extremely blurred.

Indeed, the role that smartphones play in our lives reflects that they aren't just physical products. They have become service platforms through which we can access a variety of functionalities that support our daily activities, such as mobility, shopping, and finance management. In this new scenario and thanks to the technology that is embedded in them, products become intelligent and they become a key asset in the delivery of services, while a proliferation of new touchpoints occurs.

Companies are responding to this development in different ways. Product companies face the need to shift their mindset. Instead of focusing on the efficiency of their production lines, they have to invest resources in the creation of meaningful experiences for their users and in the orchestration of the complex systems that enable

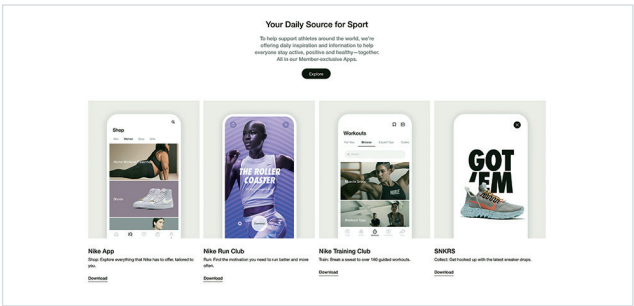
such experiences. Service companies have received a boost from the advent of new technologies, but several industries have also seen the rise of new disruptive players that propose entirely new service models (e.g., N26 in the banking industry). As discussed in chapter 3, the evolution of a company's offering (whether an upgrade or a more radical intervention) and the change of internal organization in light of the opportunities offered by new technologies is referred to as digital transformation.

Example:
NikePlus membership, augmenting the product offering

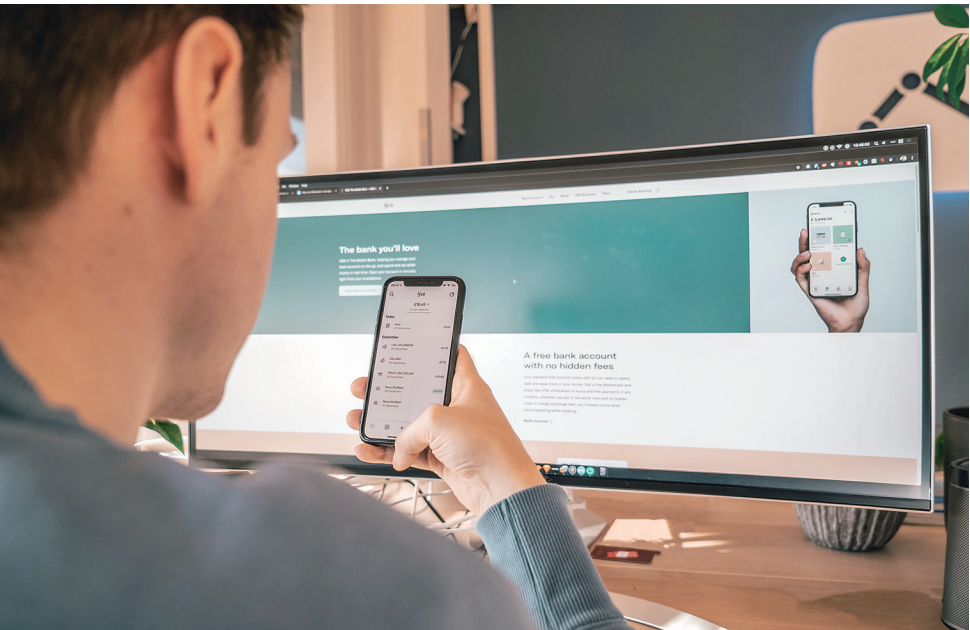
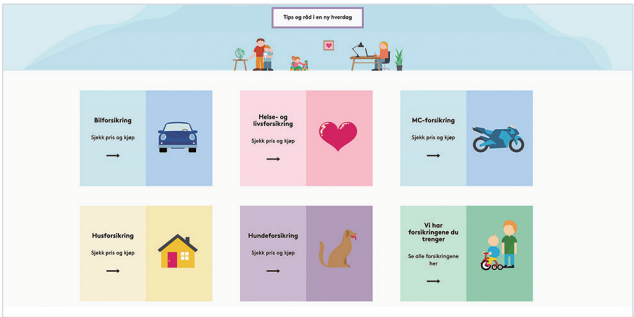
Nike, known for its footwear and sports gear, today offers customers much more. Nike+ is a membership-based club that offers a range of services that help users to monitor their training, get advice from experts, and have access to an exclusive range of products. This stretches and extends the value that Nike provides (not just clothing, but also data and valuable information) and makes it far less replaceable.

Example:
Gjensidige, leveraging digital technologies to improve the service experience

Nike+



Gjensidige



N26

Gjensidige is a Norwegian insurance company that in the past years has heavily invested in service design in order to make a typically complex service easier to understand and approach. They have radically transformed their language, visual identity, contracts, processes, and even insurance products. They pursued an objective to redefine the idea of trust itself, which is the foundation of any insurer-customer relation. For more information, see the end of this chapter.

Example:
N26, disrupting the banking experience

German N26 came in as a disruptor in the banking industry, proposing an entirely new model based exclusively on digital touchpoints. As they claim, they "stripped the way that people manage their money down to the basics," not only removing all physical components and investing in the creation of more efficient service experiences but also focusing on acting as a partner for their customers to help them achieve their financial goals.

As in the case of N26, more and more services are becoming entirely digital and barely imply human interactions. This challenges some of the characteristics through which services have traditionally been defined. Digital services still represent a source of intangible value, but they often allow for more homogeneous and controllable service quality, while also enabling hyper-personalization. Also, they give customers continuous

access and extended delivery capacity, which contrasts the idea that a service cannot be stored or pre-produced.

Principles similar to those described above apply to the public sector. Today, governments and public stakeholders are often in a more open dialog with design, service design in particular, and have begun to embrace its methods and tools. Countries such as the UK and Estonia have often been regarded as best-in-class examples of good service design, the former for its investment in service guidelines, the latter for the digitalization of almost all its services. However, more governments are taking action today, though the breadth of innovation efforts may vary. While in some cases it concerns public administration services at large, in others it focuses on specific areas, such as healthcare, mobility, and education.

2. Designing a Service

2.1 Introducing service design

The term service design made its first proper appearance in an article called "How to Design a Service," published by the *European Journal of Marketing* in 1982, and written by bank executive G. Lynn Shostack. She acknowledged the importance of defining new models to create successful services, and pointed out that services are different in nature from products and deserve a dedicated, methodological approach.

The 1980s and 1990s saw a flourishing of literature on the topic and the consolidation of a service design approach, based on the ability to envision and create complex systems. *Total Design*, published in 1991 by authors Bill Hollins and Gillian Hollins, marked an important milestone for the service design methodology. The end of the 1990s and the beginning of the 2000s witnessed the evolution of the practice and the opening of service design studios.

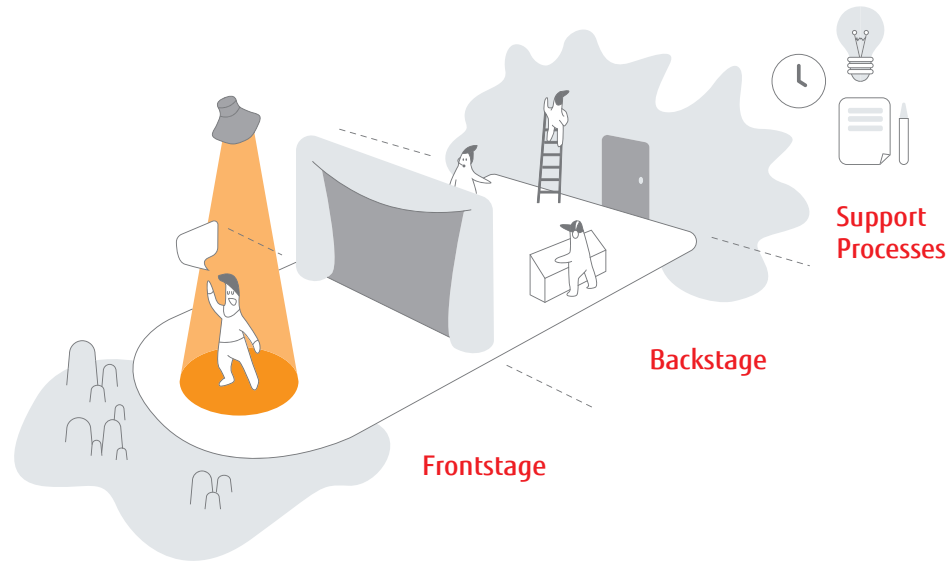
The discourse around service design was first concerned with defining why services could be an object of design, then with how services should be designed, and eventually with the integration with other adjacent practices. Also, service design was born with a primary focus on the service experience (user-service interaction).

Later on, it expanded into the realm of organizational processes and all the mechanisms that enable the delivery of a service. This has also generated interest in theories of organizational activation and change. In its evolution, service design has also been influenced by participatory design, which has further strengthened the focus of the discipline on understanding user needs and the involvement of users in the design process.

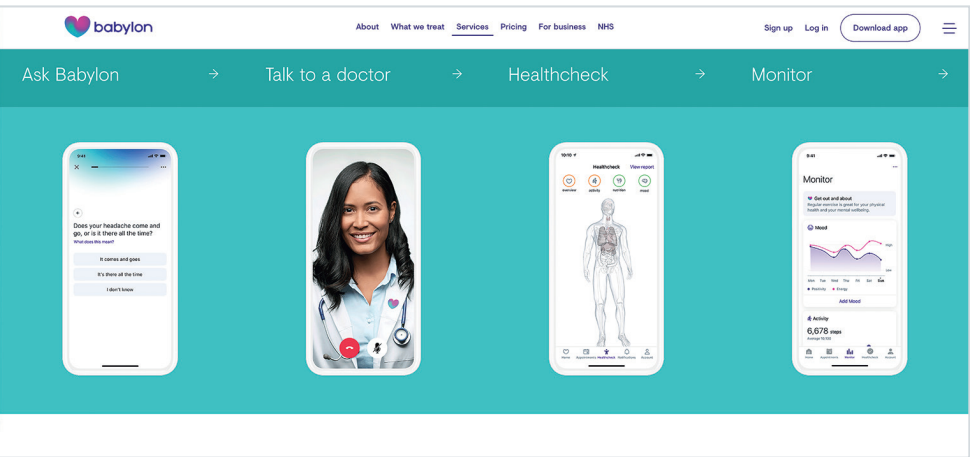
In essence, service design can be described as a process of orchestration of the different components and layers of service in order to facilitate a certain outcome for the customer. As such, the design and maintenance of service is definitely not the prerogative of designers, but it is a collective endeavor that brings together the user, business, and technology perspective in order to deliver value.

Service design is an activity that largely requires systems thinking and the ability to deal with complexity in order to make a service more than the sum of its components. In fact, creating a service means being able to simultaneously orchestrate the *frontstage* of the service, customer interactions and customer-facing activities, and its *backstage*, the ensemble of actions and processes that customers never see but enables the delivery of the service.

Stage theory



Babylon Health



Also, the creation of service is concerned both with the *what* (the value offered by the service) and the *how* (the way it is delivered to users). The theory of multilevel service design acknowledges this by identifying three levels of service design activity:

1. Designing the service concept

Designing a service concept means identifying the value proposition of service and defining the boundaries of the service offering and its potential relation with other existing services that tackle adjacent aspects of the user experience. The creation of a service concept needs to stem from a deep understanding of the problem space, the context, and the needs of the user.

Example:

Babylon Health, improving the patient's experience

Babylon Health is a digital platform that provides support to patients by allowing them to check their symptoms, receive a remote consultation or a health check via their mobile phone. Getting medical advice thanks to an AI-enabled system is the value that the company intends to provide to its users. However, the service exists in the broader context of medical care and must deal with how to direct patients towards their next step, either further monitoring or access to medical care (adjacent value area).

2. Designing the service system

The creation of the service system refers to the definition of the user experience and its key steps. It also refers to the orchestration of touchpoints, service actors, and systems that can enable the delivery of such experiences.

The act of designing a service system and its components is not just a response to user needs but can have a high strategic value as well. For instance,

touchpoints and actors play a key role in shaping the perception of a company and in enacting a certain company strategy. Therefore, they should be chosen carefully and according to clear strategic directions.

Example:

Starbucks, curating the design of touchpoints to meet local taste

Each Starbucks store is different. The famous coffee brand has always tried to adapt the design of the space, its touchpoints, and products to local needs and tastes. Upon entering the Italian market, which is dominated by a strong coffee culture, they realized the importance of creating a unique and highly refined experience that could prove truly attractive for visitors.

The building that was chosen to host the Reserve store of Milan conveys a sense of grandiosity; every single object and moment of the experience is designed to reinforce such atmosphere. A very different scenario can be observed in classic Starbucks stores, where the use of digital touchpoints to order and pick up food and drinks is widespread, pushing the experience in the direction of increased efficiency and speed. By adapting to different user needs, Starbucks has demonstrated the ability to make a highly strategic use of their touchpoints.

Looking at the way service design has evolved as a discipline, it is important to note that more and more service design projects have turned their interest towards employees rather than customers and end-users of a service. Many firms today recognize the importance of taking care of the experience that employees have when working for them, and investments made on this front are on the rise.

Starbucks Reserve store in Milan



Example:
Welcome to the Jungle Kit,
serving enterprise users with smart solutions
Welcome to the Jungle is a French start-up that has developed an application to make recruitment easier, especially for technology companies. It allows companies to curate their profile and get exposure, while providing a comprehensive digital solution. In fact, the platform assists talent acquisition and HR departments throughout the hiring process by managing job offers, tracking applications, and easing onboarding.

3. Designing the service encounter
A service encounter is any interaction that the customer has with the service and its touchpoints. As such, it is the more detailed part of service design, because it is concerned with the definition of every single action or task performed by the user. It also covers the design of interfaces and backstage service processes that enable such actions.

It is important to note that the design of processes isn't just an operational challenge concerned with efficiency and speed of service. It can also have a direct impact on the quality and the perception of the experience that is delivered to the user along with the overall perception of the brand or the service. For Starbucks, this has meant making the act of writing the customer's name on the

cup an iconic moment. In the digital realm, and for entertainment services like Netflix and Spotify, it may mean understanding how to program algorithms that can present content in a relevant and personalized way to users.

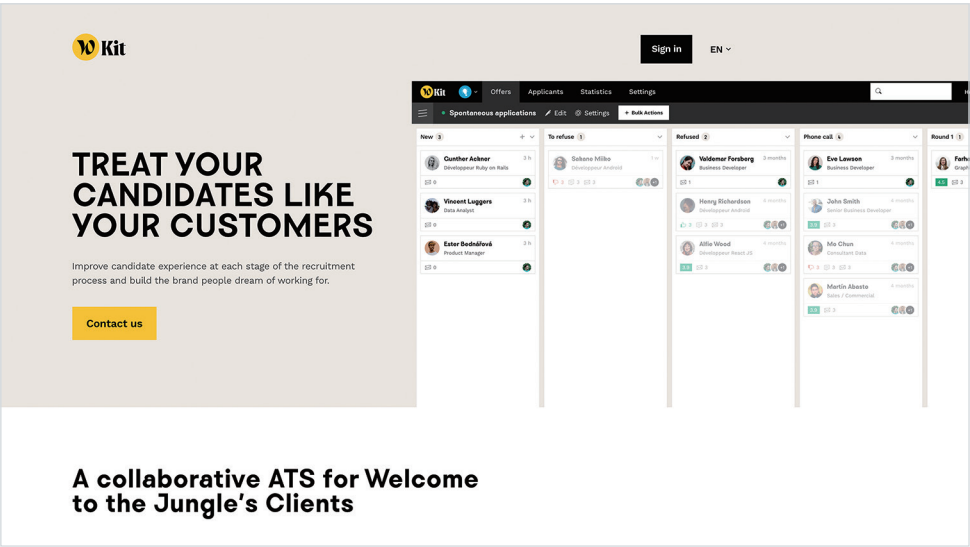
2.2
The importance of service performance and designing performance evaluation

In essence, services are performances delivered in real-time to the user. Guaranteeing service quality is challenging because it is strictly related to their intangible and heterogeneous nature, especially in services that heavily rely on human interactions.
For this reason, the evaluation of quality is an even more important activity for service firms, as it can help companies have a clear picture of their service performance and constantly improve it. Digital services certainly provide more possibilities for quality control, but the perceived quality of a service experience is far more complex than the objective performance of a programmable system.
For instance, if a user is managing their insurance plan through an online portal, the speed at which the operation is performed will only provide a partial view of service quality. The way information is visualized

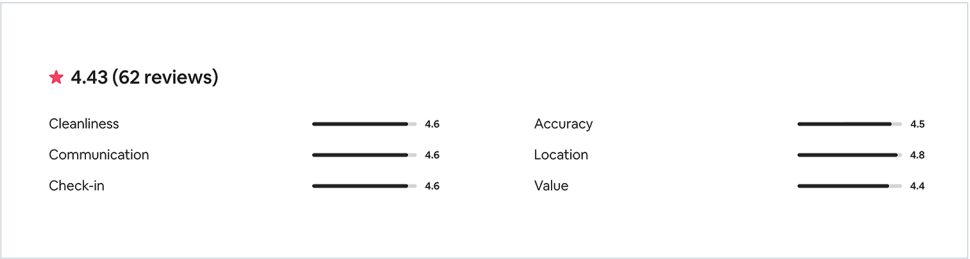
and presented to the user will also affect the perceived experience positively or negatively, depending on the expectations of the customer.
Also, quality must be looked at in the context of the value the company intends to offer and the expectation that it intends to create for its customers. As such, it is a highly strategic activity that can enable decision makers to prioritize certain service improvements over others.

Example:
Airbnb review system,
prioritizing strategically relevant metrics
Airbnb recognizes the importance of its network of hosts in keeping the service reputation high amongst its users. Also, they acknowledge that accommodation

isn't a mono-dimensional experience and that there are specific aspects that can influence the experience of the guest. According to this logic, Airbnb has changed its review system from an overall 5-star scale to a more refined set of parameters: location, check-in, cleanliness, communication, value, and accuracy. This kind of approach provides much more detailed feedback and has the potential to empower the company to look at the big picture and strategically plan service improvement initiatives.



Welcome to the Jungle Kit



Airbnb review system

3. Adopting Service Design Tools

In *This Is Service Design Doing*, German consultant and trainer Marc Stickdorn (2018) talks about the value and the limitations of service design tools in these terms:

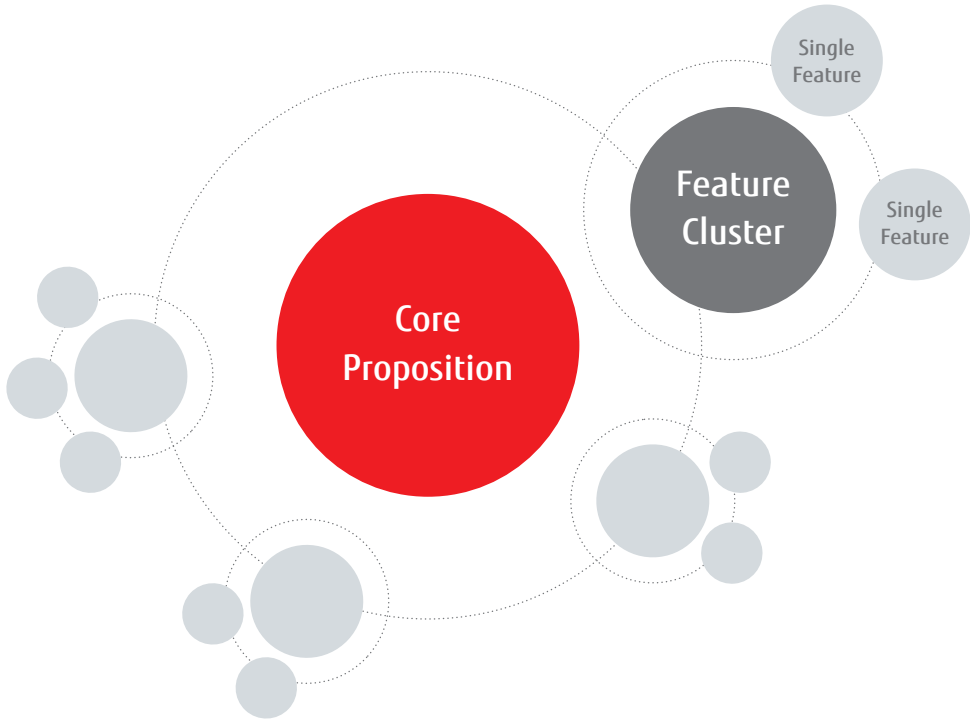
A new journey map does not mark the end of a service design project. An ideation workshop is not co-design. A survey of your employees does not reveal their real needs. Just like building a house shouldn't end with an architect's plan, a service design project shouldn't end with ideas on paper.... Many service design tools are mind hacks that help us reframe problems in a way that humans can handle better.

Visualization plays a key role in service design. It allows teams to break down the complexity of the service into smaller components, make them tangible, reduce the cognitive load, and create more opportunities for cross-

functional collaboration and alignment. Service design is a meaningless activity in the absence of a shared methodology, mindset, and process. For this reason, service design tools are definitely important for the creation of a shared language and the elimination of silos and barriers.

Service design practitioners rely on a set of well-known tools. While it is always important to use them critically and customize them for specific project purposes, it is also important to be aware of their intended use and archetypical form. This can help facilitate a shared understanding amongst team members. In the following section, some of the most common service design tools are presented.

Service offering map template



3.1 Service Offering Map

The service offering map aims to visualize what a service provides to its user, by unpacking the core value proposition of the service into clusters of functionalities. There isn't a standard visualization for such a tool: the service offering map can take the form of a diagram or a radial map, or it can sometimes be more verbal and descriptive. The images on page 106 and 107 show one of the possible visual templates for this tool.

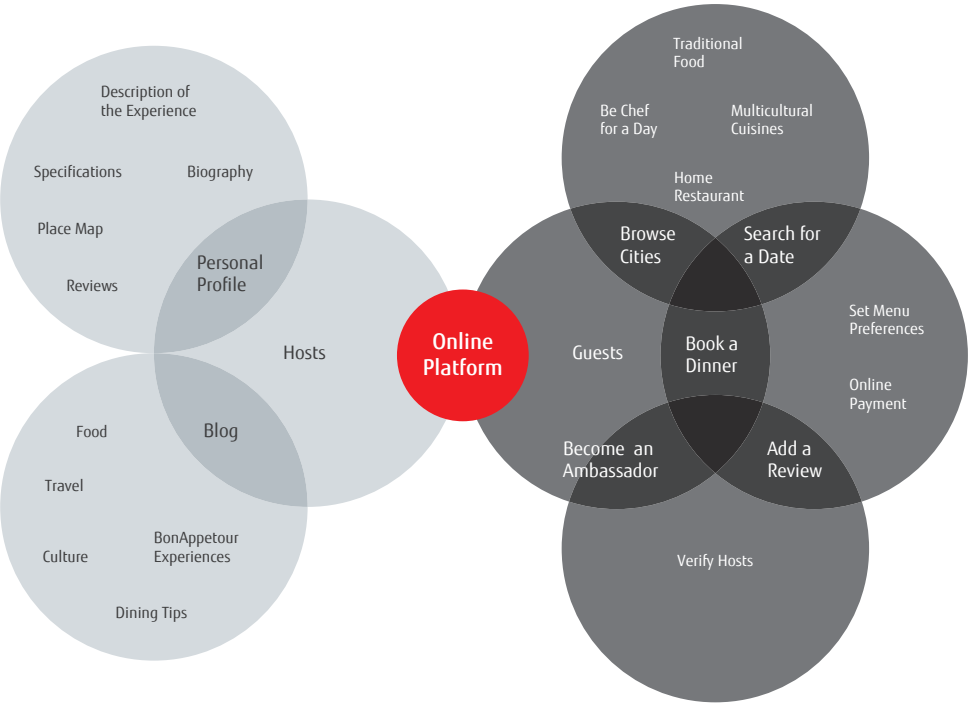
When can it be used?

- Mapping the offering of a new service and prioritizing functionalities
- Mapping adjacent and untapped areas of value that can become opportunities for growth for an existing service
- Mapping the offering of an existing service in order to identify areas of improvement

How to build it?
Despite the absence of a unified standard for this tool, there are some common guidelines for how to build a service offering map. First of all, it is important to create a sense of hierarchy (e.g., from the center to the borders of the map, or from top to bottom) and to visualize at least the three following layers:

- 1. Value proposition:** a single statement that captures the promise of value and the main purpose of the service
- 2. Functional clusters:** clusters of functionalities that present what the service offers to its users and what actions or outcomes it enables at a macro scale
- 3. Single features:** each cluster is broken down into individual functionalities which describe the single actions or outcomes that the service enables

Service Offering Map BonAppetour



3.2

User personas

User personas (or *personas*) are conceptual representations of users. People are complex, and their behaviors and motives are sometimes unfathomable, their nature in constant evolution. User personas are an essential tool that can help designers to disentangle this complexity and build a clear understanding of users by freezing a moment in time. Personas are fictional descriptions but they are grounded in real user research, and they are tools that allow design teams to present user needs in a narrative form.

However, depending on their use, personas should stress certain user variables more than others.

For example, certain projects may benefit from putting socio-cultural aspects to the forefront, because they are particularly relevant either for the industry of reference (e.g., food) or the specific focal issue that the team intends to tackle. For instance, a team interested in building a scalable model for a mobility service in different countries or cities could benefit from building a set of personas organized by geography. In this case, socio-cultural aspects would be taken into account as primary variables.

Other projects may deal with services that tend to have less cultural variability, while the specific behavior or attitude of the person is what determines different needs and usage patterns. In this case, it can be interesting to abstract user personas to the level of behavioral

archetypes that are defined by their distinctive trait. For example, when building personas for banking services, looking at the wide range of user attitudes—from the more assisted to the more autonomous ones—can offer interesting insights. This can help develop a service experience capable of catering for this variety of needs.

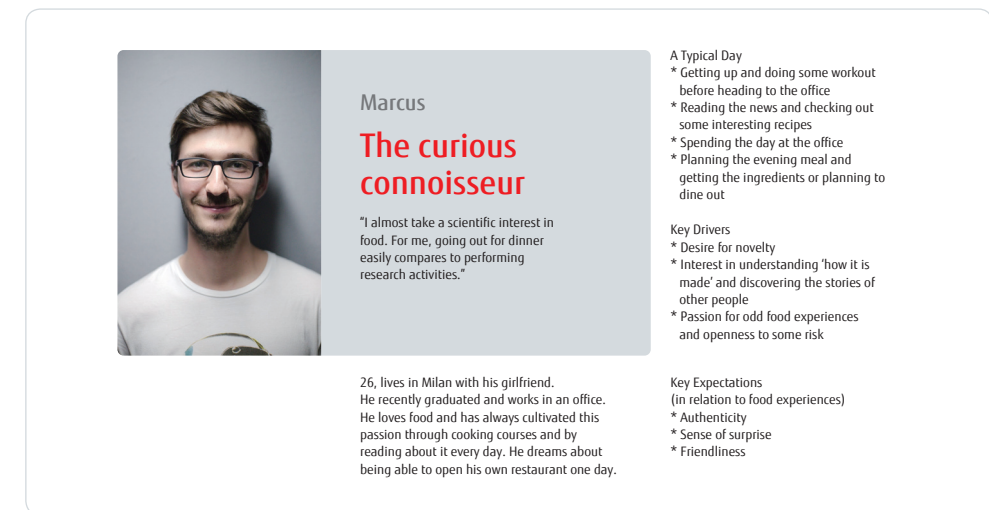
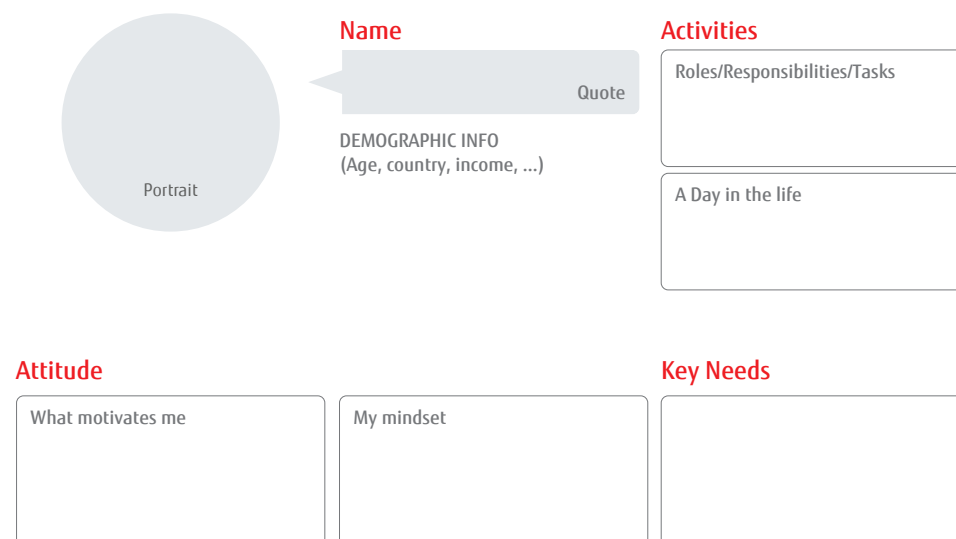
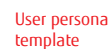
Finally, there may be situations in which users differ from one another because of their specific role or tasks: this is particularly relevant for company users and in the design of B2B solutions. For instance, a team that intends to design a patient management service for hospital personnel will need to take into account the needs of a variety of different user types and professionals that may interact with the solution at different times. Building a set of user personas with this logic can be particularly helpful.

When can they be used?

Building empathy with users and understanding their needs to come up with a clear service proposition

Comparing different user personas to support strategic decision making and the definition of strategic priorities

Facilitating the design of meaningful user experiences that take user needs into account at every single step



User persona
BonAppetour

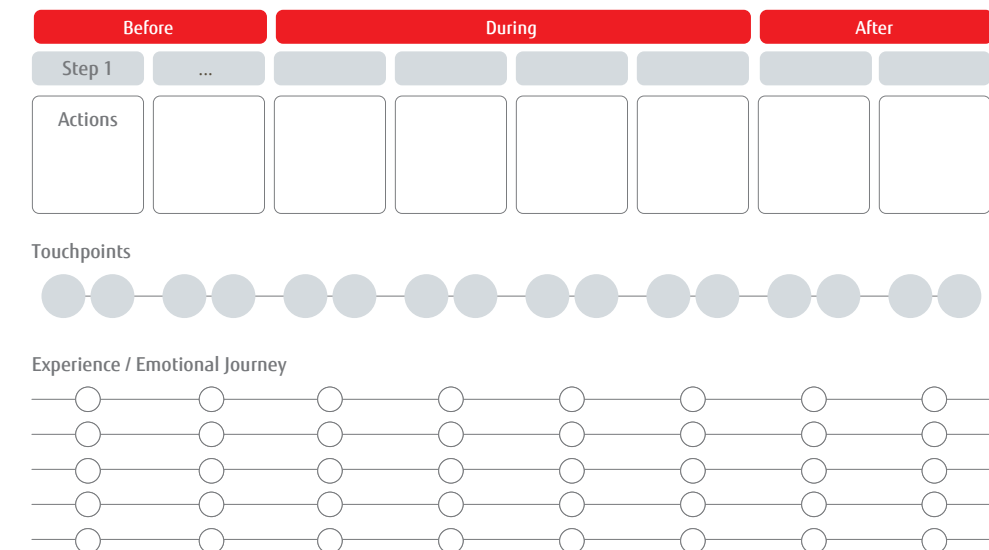
How to build them

User personas are typically the output of user research or other more indirect forms of research (e.g., interviewing stakeholders) aimed at gathering information around the user and their needs. As such, the type of information that the team intends to display in the user persona should be defined up front, prior to conducting research. The creation of user personas relies on the comparison and clustering of insights coming from different research participants and their consolidation into a set of distinct and unique profiles.

3.3

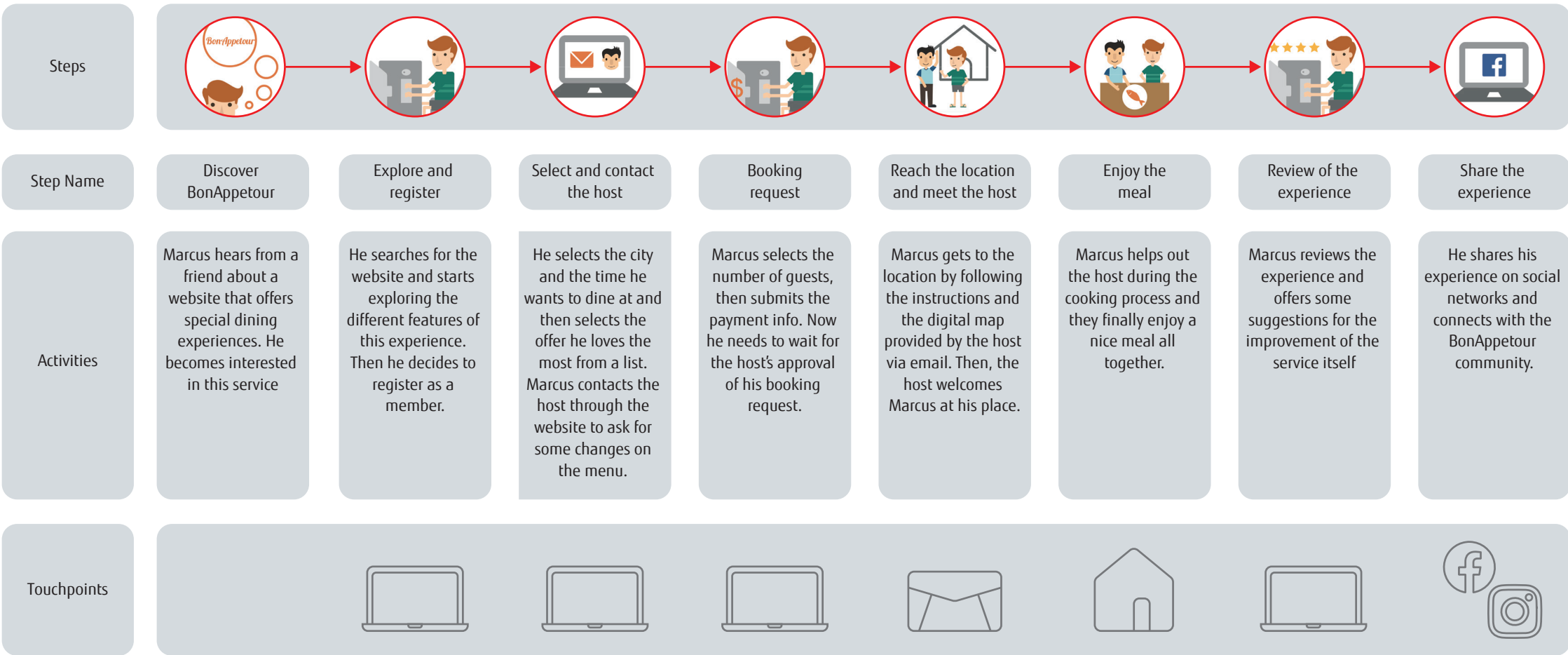
User journey map

The user journey map (also called a *user journey*) is a step-by-step representation of how a user interacts with a service or system through its touchpoints and over time. It always takes the perspective of a specific type of user (it may also reflect the differences between user personas) and takes into account the entire timeline of the service, including the phases that occur before and after the interaction with the service.



User journey template

User journey
BonAppetour



When can it be used?

- Analyzing an existing service experience (as-is mapping) to uncover its strengths, pain points, and opportunities
- Comparing the journeys of different users or user personas to uncover opportunities or prioritize design activities
- Envisioning and sketching out new service experiences (to-be mapping)

How to build it

- The user journey is built on a timeline. First, it is important to **define the timeframe** that the user journey intends to represent (in fact, a journey can take place over the course of minutes or years).
- The user journey depicts a sequence of actions (steps) that are clustered around macro stages of the experience: **defining, labeling, and clustering these steps** correctly is essential to build a clearly readable map.
- Once the timeline has been built, the user journey can be **filled in with descriptive information** that

can help readers understand how the experience takes place. For each step (column), information is mapped across multiple layers, which may include verbal description of the actions performed by the user, touchpoints, storyboard visualization, user emotions, etc. The amount and type of layers can change depending on the purpose of the user journey.

Use case
BonAppetour



3.4

Zoom out, zoom in:
creating use case storyboards

Marc Stickdorn (2018) affirms:

You can think of the scale of a journey map like the zoom levels of a map. A map of a whole country helps you to navigate on a bigger scale, while a map of a region or a map of a city helps to find a specific destination. You need both if you want to drive from one place to another.

While the user journey map aims to build a big picture of the steps in the user experience, without visualizing all of the possible turning points and variables, design teams who need to visualize such complexity can opt for more detailed experience visualizations by building use case storyboards.

A use case describes a specific situation in which a service can be used and is typically defined through a user goal. For example, a new customer needs to create a bank account: this use case is defined both by a specific type of user (a new customer) and by a specific goal (creating a bank account).

The use case storyboard visualizes and describes all of the steps the customer goes through and their single interactions with service touchpoints. Use cases are particularly useful for defining what functionalities are needed for a service to operate.

3.5

Service blueprint

The service blueprint is an operational tool that describes what actions and processes are required to deliver a certain experience or service. It builds on the user experience depicted in the user journey but digs



Physical
Evidence

Customer
Actions

Frontstage
Actions

Backstage
Actions

Support
Processes

line of interaction

line of visibility

line of internal
visibility

Service
blueprint
template

Service blueprint
BonAppetour

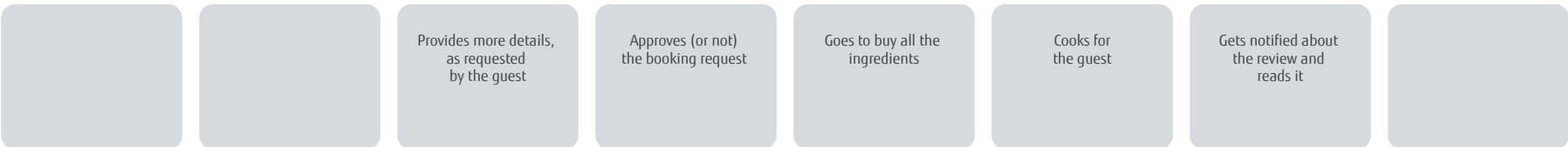
Customer Journey



Guest



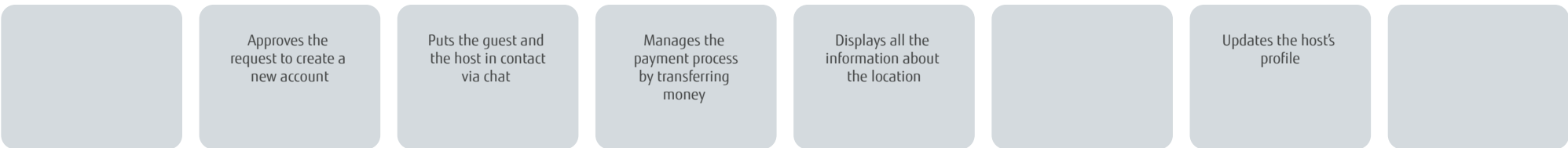
Host



Line of Interaction



Platform



much deeper. It shows how the actions that take place backstage are connected to the experience delivered to the user frontstage and vice versa. The service blueprint is made of several and progressively deeper layers, as shown in the template below:

When can it be used?

- Analyzing or mapping current processes in order to evaluate their quality or efficiency and define new opportunities
- Designing the processes and the operational layer for a new service, ensuring both efficiency and desired user experience, according to a set of defined experience principles

How to build it

Just like a user journey or use case, a service blueprint map visualizes a sequence of actions that occurs over time. The definition of the time scale and unit of analysis of the service blueprint depends on its purpose, and in some situations, more than one map may be necessary in order to give a complete overview of how the service works.

A service blueprint typically begins with a trigger action (either performed by the user or by another service actor). From that point on, the service experience unfolds according to a predefined script. There may be turning points and variations, which need to be captured by the service blueprint.

Example

Gjensidige: reinventing insurance (from 2009)

Gjensidige is a Norwegian insurance company that underwent a major transformation of their service offering, service experience, internal processes, and organizational culture. In 2009, they embarked on a journey to pursue customer centricity and make the tools and methods of service design truly part of the company's DNA.

The urge to invest in a radical transformation came from understanding a common pain point for the industry: how stressful and negative the experience of dealing with insurance was for the user. Gjensidige understood that building a better customer experience was not only necessary to avoid letting users down, but it could also create a significant competitive advantage.

Some of the implemented changes include the following:

- Shortening and redesign of the insurance contract.
- Redesign of the agent claim handling system and improvement of service guidelines for the agents to provide better support to customers.
- Delivery of a post-call recap email to support decision making and ensure transparency.
- Simplification of the offering (number of insurance products) and increased relevance of these products for customers.

Redesign of the website with new, friendlier navigation and tone of voice.

As a result of this process, they were able to measure its positive impact:

- Customer satisfaction increased from 77th to 11th place in the national customer satisfaction ranking.
- Between 2010 and 2013, the rate of sales per call grew by 50%.
- Over the same period of time, the share price doubled.
- Cross-functional collaboration increased and made it possible to create new insurance solutions for new customer segments.
- Detailed measurement of the customer satisfaction index per touchpoint (i.e., increased granularity).

Key Takeaways

1. Introducing Service and Their Evolution

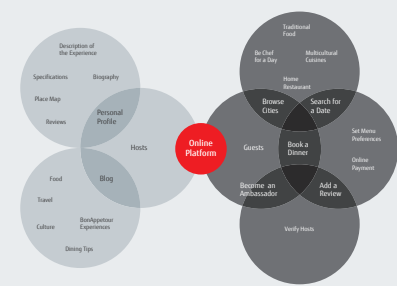
- In the 21st century, **we live in a service economy**. In a market saturated with physical products, services represent a significant opportunity for differentiation for companies across different industries. Today, services account for most of the GDP in numerous countries around the globe and have largely overtaken manufacturing and agriculture.
- Services refer to the complex system that encompasses the process, stakeholders, and actions that are required to deliver meaningful experiences and solutions for users.
- The concepts of ownership and consumption themselves are shifting**, giving rise to new scenarios of diffused ownership (renting and sharing services) and co-production of value, in which users become service providers.
- Services, digital ones in particular, are propelling change across industries:** while product companies seek new opportunities to augment their offering through services, service companies look for ways to stay competitive and improve service quality and experience. New entrants who can drive transformation through digital services is able to disrupt markets with innovative service models.

2. Designing a Service

- Initially, the primary focus of service design was to focus on the user-service interaction, but later expanded into considering the organizational process and system of enabling and delivering services.
- Service design takes place at the intersection of design, technology, and business** in order to maximize its value. Service design is, in fact, the **orchestration** of all the different layers of a service: its value proposition and offering, the customer-facing (front stage) experience and interactions, and the backstage processes.
- Within the realm of service design, **experience is considered a key differentiator**. It is something that users increasingly seek and are more and more willing to pay for. Investing in a better user experience can have great strategic value and bring significant returns. Service design has become increasingly concerned with the design of employee experiences, too.

3. Adopting Service Design Tools

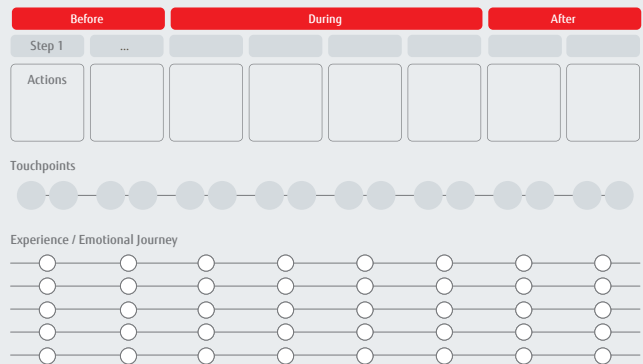
Service design makes use of a set of specific design **tools**, which are most effective when **adopted by the entire organization**, across teams and departments. The following are some of the most important ones:



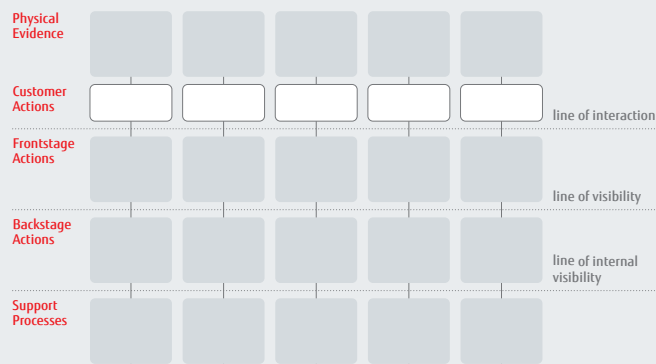
3.1 Service offering map: visualizes the service offering by unpacking the core value proposition of the service into clusters of functionalities



3.2 User persona: a conceptual representation of users grounded in real user research to provide a snapshot of key user needs and behaviors



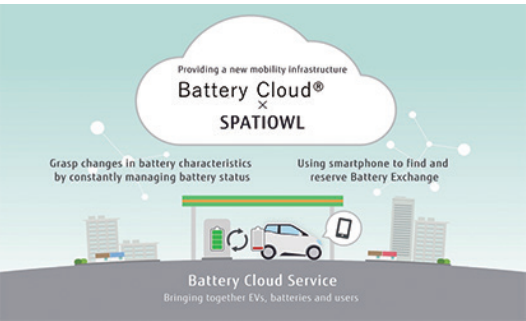
3.3 User journey map: a synthetic step-by-step representation of how a user interacts with a service or system through its touchpoints and over time



3.4 Service blueprint: an operational tool that describes what actions and processes are required to deliver a certain experience or service

Fujitsu Case Studies

Grand design of cloud services oriented toward realizing a sustainable society with compact EVs



Co-design team: FOMM Corporation, Fujitsu
Country: Japan, Thailand
Industry: Automotive
Year: 2018
Link: <https://www.fujitsu.com/global/about/resources/news/press-releases/2018/0322-01.html>

Context & Challenge

The motto is “passing the baton on energy,” and the objective is to realize a sustainable and mobile society in an emerging market by popularizing batteries for electric vehicles. The challenge then was how to develop infrastructure for electric vehicles. For context, FOMM advocates for management philosophies that conserves the global environment with eco-friendly electric vehicles. The goal is to create infrastructure in which people in an emerging market can themselves assemble and use compact EVs that can be sold at reasonable prices in the future, thereby earning income so their children can go to schools and hospitals.

Highlight

To create a sustainable and mobile society that enables cloud management of EV batteries for initial use and recycling (thereby enabling second and third uses), it was necessary to first popularize EV in a region with an expanding automobile market. Since environmental improvement is indispensable for the popularization of EVs, Fujitsu adopted a method of service design to draw a blueprint for FOMM that utilizes Fujitsu's advanced technology.

Fujitsu then conducted UX research in Bangkok, Thailand, the first sales base of FOMM, to identify necessary functions and user interfaces based on the needs and actions of users. In so doing, Fujitsu confirmed needs of compact EV users in Bangkok, a city with terrible traffic jams and air pollution. They visualized the required data and the relationship with operations as a service blueprint, and then drafted an overall service blueprint linking infrastructure development for the popularization of EVs with business operation services. It was visualized and shared to realize collaboration between FOMM and Fujitsu.

Furthermore, with the batteries’ ten-year life cycle in mind, Fujitsu formulated a concrete strategy roadmap and ecosystem strategy in tandem with the development of the Battery Cloud, which started mass production in 2019.

Transformational value

ujitsu technology (EV-Cloud) was adopted by FOMM as an idea to popularize compact EVs in emerging markets. As a result, mass production of the ultra compact, four-seat FOMM ONE began in March 2019 in Thailand. The data accumulated on the Battery Cloud may be used to improve the quality and iterations of Evs. To increase the number of EVs on the road, Fujitsu has begun experimenting with test vehicles of other manufacturers using the data stored in Battery Cloud.

Fujitsu Case Studies

Designing a new end-to-end flood warning service with the Environment Agency (UK)



Co-design team: Environment Agency Digital Service Team, Fujitsu
Country: United Kingdom
Industry: Public sector
Year: 2019
Link: <https://designinaction.global.fujitsu.com/reimagining-the-dynamics-of-success-and-resilience/co-creation-in-action/environment-agency>

Context & Challenge

Through its Flood Digital Design Team, the Environment Agency of the United Kingdom wanted to modernize its flood warning service both for involved staff and the citizens it served. They also wanted to make it more cost effective, resilient, and better integrated with other systems and communications channels.

Highlight

Four criteria are instrumental in making a difference in how the state manages people safely through early warning of a flood: speed, accuracy, accessibility, and adaptability. When working with the Environment Agency to embed a smarter digital solution to optimize the flood warning service, the HXD project team had to look at the entire service chain—from environmental considerations like weather and water to the people involved—before embarking on the development of a range of technology solutions to embed in the service. End-to-end service considerations included the following:

- Optimizing user registration to the flood warning service
- Improving the ease and speed of issuing a flood warning alert
- Ensuring the alert is instantly sent to the right contacts through the most relevant channels
- Ensuring the flood warning information received is clear and meaningful for citizens
- Ensuring the digitally enabled flood warning service is adaptable to a variety of channels and users and continuous information and technology developments, and that it can be continuously optimized at a bearable cost

In addition, the team looked at the Government Digital Strategy to ensure the digital design for the Environment Agency would be fully aligned with the wider government’s digital vision and strategy.

Taking a service design-led approach means new digital features are integrated into a holistic service that much better serves citizens. It also means providing a future-enabled platform that can integrate new elements faster, more easily, and more cost effectively over time as new user requirements are identified. As a consequence, the new service delivers flood warning alerts to users via configurable channels. A streamlined and intuitive interface reduces manual input, allowing messages to be issued quickly. Group targeting and universal templates were added, speeding up the alert process. This new platform service means DevOps and Agile working methods can now be used to continuously improve the service informed by human-centered needs. For example, it now produces accurate pronunciation in English and Welsh, with eight regional accents allowing the Environment Agency to customize local phrases and place names.

Transformational value

The impact of this digitally enabled, cost-effective flood warning service is significant when put in the context of the purpose it serves: successfully warning citizens in the event of a flood to mitigate safety risks and preserve their lives. It is quicker and easier to operate for staff, it drives greater accuracy of contact and flood information, it is more easily accessible for citizens across multiple channels, and it is integrated with other systems and communication platforms. For the Environment Agency, it demonstrates coherent and strategic relevance within the context of the wider UK Government Digital Strategy by delivering value for money transformational services.

Fujitsu Case Studies

An ecosystem to bring new Green Cloud Alliance solution



Co-design team: Twenty five C-level managed service providers partners, including SJ Solutions; Fujitsu
Industry: International
Year: 2019
Link: <https://designinaction.global.fujitsu.com/hxd-turning-strategic-aims-into-reality/hxd-applied/sj-solutions>

Context & Challenge

Fujitsu organized a two-day new service design event using the FUJITSU HXD process with more than twenty-five C-level participants from the service provider partner ecosystem. The challenge assigned to the team was to explore together new business opportunities and offerings targeting small- and middle-market businesses. As part of the process, SJ Solutions, one of the participating service providers, led a project to rapidly co-create an entirely new secure data management service. The challenge was unlocked with the insight and expertise provided by other companies in the service provider ecosystem able to collaborate using the HXD approach to develop this powerful new service design.

Highlight

The data protection challenge for small- and middle-market businesses

The requirements for enterprise-wide data protection are becoming increasingly complex and important. They involve protection against operational disruptions, protection of data across sites, and protection against information security breaches and cyberattacks. Backup and archive solutions can prevent such events, but having a cost-effective and application-aware backup and archiving solution can be a big challenge. And without careful consideration, the costs can go sky high. This is the challenge that SJ Solutions decided to turn into an opportunity, arm in arm with Fujitsu and other partners during the two-day co-creation event facilitated by Fujitsu.

Moving from reseller to service provider

Transitioning from being a reseller to service provider requires not only reimagining the corporate purpose but also designing a set of products and services that drive the new go-to market propositions. Through the FUJITSU HXD approach, SJ Solutions was able to model a new service proposition that identified unmet needs with a particular market segment, i.e., smaller companies that believe some aspects of robust data storage are too technically complex and too costly. The new service, Green Cloud Alliance, was designed to effectively manage data as a service, providing a turnkey enterprise. Green Cloud combines data storage, protection, archiving, and backup in a way that made it easy for customers to understand and buy. The service is built on Fujitsu hardware and Commvault software.

The new service provides end customers with cost-effective, best-in-class data protection on a pay-per-use basis that does not require any capex investment up front, is accessible across countries and customers, and is compliant with local regulations where the data is located.

Transformational value

This new service has helped SJ Solutions transform their business from a reseller of solutions to a managed service provider. This requires a new set of propositions and a different relationship with customers. For Fujitsu, it demonstrates the strength of a design-led approach to bring out the best of an ecosystem of likeminded businesses. Perhaps the biggest impact is on the companies able to benefit from the high-end data management service that Green Cloud offers but without the high-end pricing, which in turn protects their business and customers.

Afterword

In this book, we have followed the parallel histories of design and computing to the modern day. We now see that the powerful combination of these two disciplines can help realize a transformational vision across organizations and society.

We know that in isolation, digital technology can generate positive benefits for those able to implement it successfully. Likewise, the use of design can be extremely effective in achieving discrete goals. However, real transformation is possible when human needs are positioned as a primary focus and where technology is harnessed to meet those needs. The successful application of a design mindset is the most effective way of serving these needs.

This book illustrates that digital technology is a means to foster transformation in order to not only improve the lives of individuals, but to also consider larger systems in society and generate new social values. These broad ambitions represent a shared purpose between stakeholders in a project. This shared purpose can unify differing business units within organizations, reach across geographies, and bring together multiple organizations working collaboratively.

We have seen that humanizing the shared purpose not only galvanizes collective effort but also focuses the design effort to help create new possibilities. Using various means to understand human needs provides invaluable insight into shifting from the purely tactical to the more transformational.

Today, we can take a strategic design approach to the use of artificial intelligence, which, when coupled with other digital technologies, can generate transformational value. For example, AI can support humans by automating transactional tasks in the workplace, or support healthcare professionals with decision making. It can help support people in their homes. The desire to create a better way of life for workers, citizens, and customers opens up these more ambitious possibilities.

While computing will continue to evolve, easier access to the building blocks of digital technology is one of the most immediate and interesting changes we are experiencing today. For example, organizations and communities can buy infrastructure on a service, and consumption pricing basis which gives them extraordinary computing power without huge capital investment. We are also starting to increasingly see low-code/no-code software development, meaning not only can applications be rapidly built, they can also be developed by almost anyone with the most rudimentary understanding of computing. This democratization of technology is in some ways liberating, but it could also lead to the proliferation of solutions that do not benefit society.

We are in a moment where many organizations and communities are considering fundamental questions, thinking about their primary purpose and their responsibility to society.

Design should be liberated from a purely functional role to one that is part of everyone's mindset and used to help answer these critical questions.

If we are to capitalize on the possibilities that technology can offer, it is essential that we apply the design principles set out in this book. Only then can we elevate our collaborations with organizations around the world, and help deliver transformational value that can benefit us all.

Joachim Box
Global Head of
Co-creation

Fujitsu
Limited

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