Five Modes and Nine Variations of Integration between HCD and Futures Design

Victor Udoewa[1]*

[1] Small Business Innovation Research & Small Business Technology Transfer Research Programs, NASA, Washington, D.C., United States.

*Corresponding author: Victor Udoewa, victor.udoewa@nasa.gov

Abstract

Human-centered Design and Futures Design both offer different routes to alternative, new designs. Human-centered Design employs a need-based, problem-based, or deficit-based approach. Through the use of a shared, preferred future vision, Futures Design utilizes an asset-based approach, potentially leading to different, present-day design choices than a Human-centered Design process. Without knowing which methodology offers a preferred present-day design for the current needs of customers using existing services, designers may choose to integrate the two methodologies, gaining the benefits of both, a type of mixed-methods approach. Instead of mixed methods implying the combination of quantitative and qualitative methodologies, in this context, mixed methods mean combining asset-based and need, problem, or deficit-based approaches. However, combining Human-centered Design and Futures Design can be confusing, especially with the multiple roles design can play in the Futures process (for example design futures versus Futures Design). I attempt to clarify how the methodologies can be integrated by sharing five modes and nine variations of integration along with their relative advantages and disadvantages.

Keywords

Human-Centered Design, Futures Design, Service Design, Integration, Design Thinking.

Introduction

Design thinking (DT) means thinking, acting and doing like a designer. For simplification, this involves at least three activities;

- Some types of information gathering, intake, or research.
- Some types of idea generation.
- Some types of prototyping and testing an idea or ideas.

If you do those things, you are thinking, acting, and doing like a designer; you are designing. Various understandings of DT have been criticized (Vinsel, 2018; Kolko, 2018). It is important to note that this paper uses the above definition when talking about DT. As everybody designs (Manzini, 2015), there are many ways of performing design thinking, each methodology carrying a different emphasis. You can implement Human-centered Design (HCD), Activity-centered Design, Task-centered Design, Behavior-driven Design, Test-driven Design, Biomimicry, Universal Design, Pluriversal Design, Values-sensitive Design, Circular Design, Speculative Design, Transition Design, Critical Design, Transgenerational Design, etc. (Gay & Hembrooke, 2004; Lewis & Rieman, 1993; Levy, 2020; Mattu & Shankar, 2007; Benyus, 1997; Leitão, 2020; Davis & Nathan, 2015; Moreno et al., 2016; Dunne & Raby, 2013; Irwin, 2015; Woudhuysen, 1993).

Because different design methodologies can follow a different path towards the same goal of solving a problem, with possibly different solutions, various designers have combined methodologies to uncover a solution that has the benefits of multiple methodologies. For example, you can combine HCD and biomimicry, circular and behavioral design, or transition and values-sensitive design (Kennedy, 2014; Wastling et al., 2018; Daae et al., 2018; Mok & Hyysalo, 2018).

Designers have also combined design with non-design methodologies, bringing new benefits to the solutions. For example, designers have combined HCD with implementation science, DT with participatory action research, and design with systems practice (Chen et al., 2021; Katoppo & Sudradjat, 2015; Ryan, 2014). There has been growing interest and practice in combining design and future studies, from conferences, meetings, papers, and projects (Hines & Zindato, 2016). In 2019, the Journal of Futures Studies even dedicated two volumes to this practice (Candy & Potter, 2019).

The vast majority of practitioners who mix design and futures use design, within a futures process, to create, build, explore, or think through future worlds or scenarios (Hines & Zindato, 2016; Zaidi, 2019; Candy & Kornet, 2019; Angheloiu et al., 2020; Toussaint et al., 2021). This paper will call on the use of a design that explores future scenarios, Design Futures. Even when futurists apply design outside of futures scenarios, design is usually embedded inside the futures process (Ollenberg, 2019).
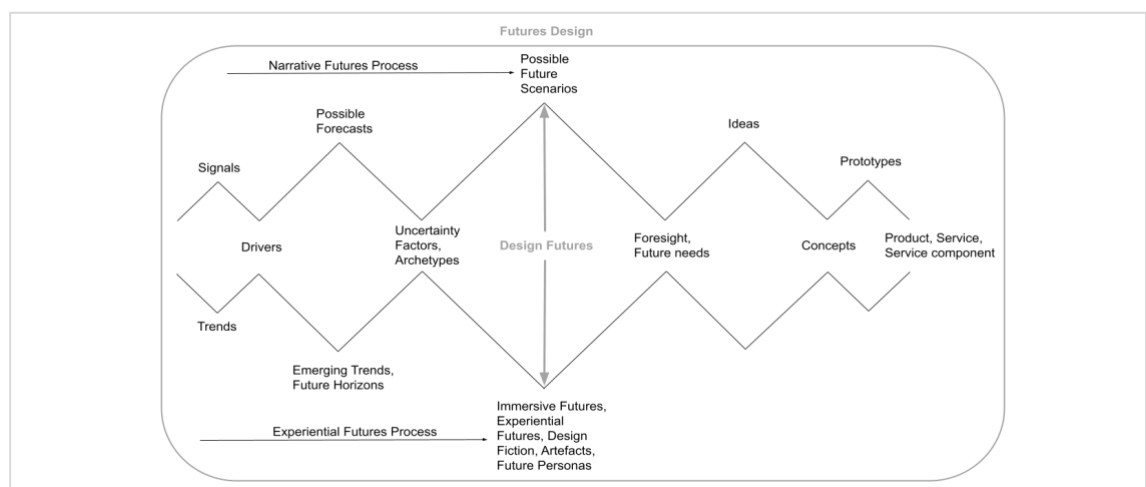

Figure 1: *Design Futures vs Futures Design.*

Instead of design futures, what happens when we create present-day design implementations after going through a futures process (Figure 1)? This type of design implementation is different from a design future, or the design of a preferred future which we achieve in 10+ years, according to the chosen time horizon. When a futures process is used to implement real, implementable design choices or changes in the present, the futures process can be considered a design methodology. This paper will call on the use of a futures process to create real designs in the present, Futures Design (Figure 1).

As a design methodology, Futures Design can be used to design solutions to problems we face today. The Futures Action Model (FAM) and the Futures Design Process Model (FDPM) are good examples of using a futures process to design innovative solutions mixing foresight and innovation (Ramos, 2013; 2017; Ollenberg, 2019).

The FAM and FDPM models are harder to implement if we are redesigning or refining existing solutions, as in-service design. For example, if we are redesigning an existing government service, we may be able to use Futures Design to transformational envision a future state of that service using a 10-year time horizon, and then back cast to the first, specific design changes that we must make today. Those first, specific design changes might fail to meet the current needs of the customers, today. While working to reach the future state or design future in ten years, how do we continue to address today's changing, current needs? We can look to other design methodologies, combined with Futures Design, to gain the benefits of solutions that both meet the needs of today and the vision of the future. Human-centered design and Futures Design can work together in addressing both.

However, the research literature says very little about how to combine HCD and Futures Design. This affects the use of Futures methods in both design education and practice because students and practitioners do not learn the multiplicity of options available in combining HCD and Futures Design, nor how to combine them. The purpose of this paper is to fill the research gaps and present a clear spectrum of options of how to combine HCD and Futures Design as well as which ways of combining are most helpful in which situations, so that designers who are refining or redesigning existing services can meet today's current needs and design for the future at the same time.

In the remainder of this paper, we explore the integration of HCD and Futures Design to continue to address current needs while moving towards a transformational future service. First, we review the literature to see what ways HCD and Futures Design have already been combined. Then, using synthesis research from the literature, interviews with practitioners, and results from experimentation, we present five modes or ways of integrating the two methodologies at a high level, as well as nine total variations. We briefly walk through the five modes and nine variations, listing the advantages and disadvantages while giving examples. Then we close with a discussion suggesting further work.

Literature Review

Human-centered Design (HCD) is an increasingly common, problem-based, deficit-based, or needs-based approach to creating innovative solutions to problems (Wong-Villacres et al., 2021; Cho et al., 2019; Pei & Nardi, 2019). It has also been criticized for its anthropocentrism, status quo design, uneven power dynamics, techno-solutionism, misrepresentation of users, short-sightedness, accountability deficit, etc. (Pasanen, 2020). The human-centered design focuses on the problem, lack, or need and utilizes a process and methodology to create a solution to eliminate or reduce the problem. Though not focused on a current problem, Futures Design can also solve current problems through a different pathway.

Futures Design can be seen as an asset-based approach, though not usually classified as such. The individual or communal asset that Futures Design utilizes is not some competency, skill, infrastructure, or financial asset; the primary asset Futures Design nurtures is the capacity for a shared vision of the preferred future of the group going through a futures process. Futures Design can also be seen as a future-deficit-based approach in that it can address future needs or problems.

In Figure 2, we can see there is an expectation gap between people's basic needs and the drivers of change (Mason et al., 2015). If, like HCD, we apply innovation to address basic needs we see more of the same innovations that fail to prepare for and address future shocks, disruptions, and needs. If, like Futures Design, we apply innovations to the drivers of change, we create present-day novelties that fail to address current needs. However, if we create innovations that both address the current needs of today while addressing the drivers of change and future needs, we find *the sweet spot*: addressing current needs while at the same time moving towards a visionary future (Mason et al., 2015). Usually, citizens, refugees, and immigrants cannot wait while public service is stopped until a new Futures service is running. We continue to innovate the current service for current needs while trying to move toward an alternative vision.
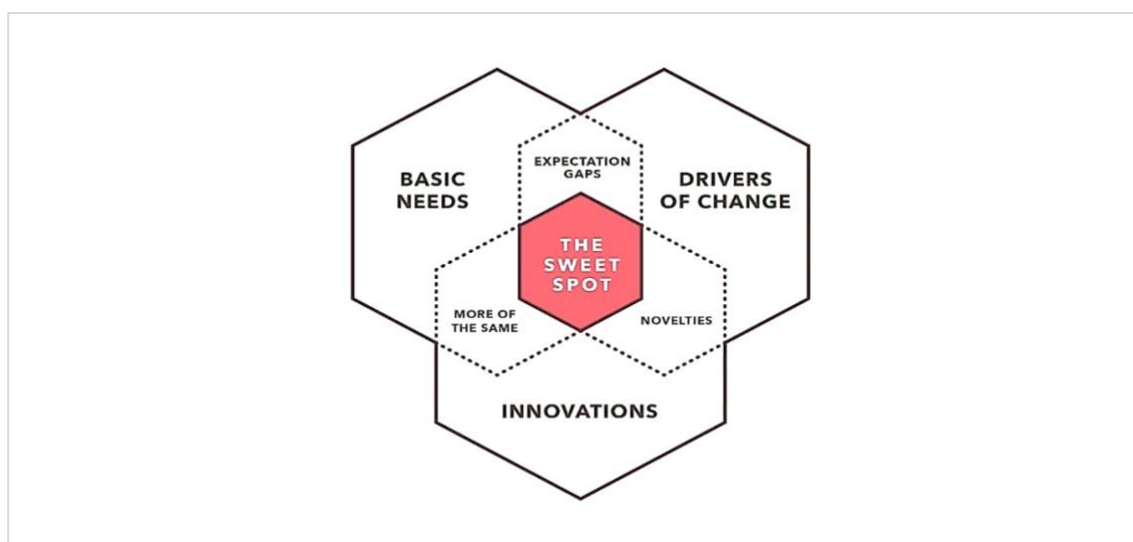

Figure 2: *The Sweet Spot (Mason et al., 2015).*

The research literature only shows a few ways people have combined HCD and Futures Design. The first way is to use the mindsets of one with the methodology of the other (Prosser & Basra, 2018; Spencer, 2021). It is not clear what it means to *use a mindset*. However, Roumiantseva (2016) used explicit futures-minded questions that designers ask themselves to guide them while going through a design process. Conversely, Ramos (2013; 2017) used a design innovation mindset to guide his futures process called a Futures Action Model.

A second way people combine HCD and Futures Design is by using one or more methods of one methodology in the process of the other. For example, Wright (2021) utilized a consequence mapping tool to explore future implications of his designs while Behboudi and Javidani (2019) inserted a Futures Wheel activity into the design process to test future implications. Systemic designers often include multiple futures methods or activities in their design process (Van Ael et al., 2018; Jones & Upward, 2014; Vandenbroeck et al., 2016).

Conversely, it is difficult to find uses of design methods or activities in a Futures Design process. The vast majority of research literature points to the use of design methods to create design futures, not for Futures Design (Candy & Potter, 2019). However, there are a few instances. For example, futurists may use the design method or artifact of a persona or a scenario. A future persona or scenario can be used as a heuristic to guide the design of a product or service in a direction that satisfies the needs of future communities or decreases or increases the likelihood of a particular scenario. However, the literature shows use of personas in futures processes to be focused on design futures, not Futures Design (Fergnani, 2019). The use of future scenarios is broader and there are many examples of people using future scenarios to make design choices in the present, from sustainability and urban planning to public health and general policy-making (De Smedt et al., 2013; Skegg et al., 2021; Jin et al., 2020; Fauré et al., 2017; Kopnina, 2014).

A third way to combine HCD and Futures Design in the literature is by using both processes in a sequential approach. It is common for service designers to use HCD for their service design to uncover the current state and then switch to a process to create a future-state service in order to drive design decisions, today, based on that future vision. There are multiple examples of future-state service blueprints in the literature (Vacek & Varnum, 2018; Jenkins, 2021). They are usually created after first creating a current-state service blueprint.

The last way to combine HCD and Futures Design, documented in the literature, is a fully integrated, single process. Ojasalo et al. (2015) used a mix of both futures and HCD methods in a single approach. They used these mixed methods across four different phases: Map & Understand, Forecast & Ideate, Model & Evaluate, Conceptualize & Influence.

The question remains: are there other ways to mix the two methodologies? We now present a categorization of the ways we have found to mix the two methodologies through experimentation, conversations with practitioners, and what exists in the literature.

1. *The Singular Approach*
In the singular approach, we do not explicitly integrate HCD and Futures Design. Instead, we choose one approach because each approach has the ability to resolve what the other approach addresses.

Variation I: HCD
All design work is by definition to do with the future (Hill & Candy, 2019). Because all design is concerned with bringing unrealized, future ideas and solutions to bear on present situations, all design can be considered Futures Design. The DT process can require a design team to back cast (Ada et al., 2013). The design created by a DT or HCD team can function like a design future, future vision, or scenario from which the team must back cast (Ada et al., 2013). This phenomenon naturally happens when applying HCD to complex, systemic challenges which automatically require a longer time horizon to achieve the created design (Sya'Bana & Sanjaya, 2019; Crul & Diehl, 2010; Shapira, 2017; Riggs, 2019).

In practice, this means that it is possible to use a generic design or HCD process without a single Futures method and create a design that is still 10 years away from being realized. The temporal distance between now and the realized design can be due to systemic challenges, organizational resistance, social and political will, current technical infeasibility, desire, etc. Hill (2021) regularly back casted from designs created in his urban design work without using other future methods. Once, on a project to redesign a high school, international, summer service program (Udoewa, 2018), the design team created a new design for the program. The created redesign was so advanced for the program, the team had to back cast to smaller design changes the program would allow and could make today (Udoewa, 2023). The original design created was a design that would be achieved 10 years into the future based on organizational willingness, funding, and preparation.

There are a few advantages of the HCD Variation of the Singular Approach. Dealing with only one methodology is simpler and bypasses the difficulties of integrating two approaches. The choice of HCD for the Singular Approach opens up a wealth of guides and human and material resources to be utilized in the design process.

The main disadvantage is that you are not guaranteed to create a design that is in the long-range future without explicitly choosing a time horizon, a preliminary step in many Futures processes. Therefore, back casting or changing paths may not be needed (Carleton et al., 2013; Inayatullah, 2008). The main reason to combine HCD and Futures Design is to bring long-term design into the HCD process. There is also no guarantee that higher-order consequences and systemic implications of the HCD-based, future design is considered and built into the design which may doom the ultimate efficacy and effectiveness of the solution.

Variation II: Futures Design

Asset-based approaches have been used in education, social work, poverty reduction, international and community development (Eloff & Ebersohn, 2001; Rapp et al., 2006; Moser, 2006; Cunningham & Mathie, 2002). Assets are financial, human, natural, social resources as well as aspirational, political, productive, and psychological resources that a community or individual has that can be used to prevent negative outcomes or improve positive outcomes (Moser, 2006). Assets can be acquired, developed, improved, or transferred. More simply, assets are skills, competencies, knowledge, strengths, connections, and potentials that a community or individual has. By focusing on the strengths and assets of individuals and communities, we can build on their passions and motivations, avoid burnout, and find opportunities for positive growth that are sustainable and that solve community problems without ever focusing on the problem.

Futures Design is an asset-based approach that focuses on the aspirational and psychological asset of a shared, preferred future for a community. Futures Design can build on this capacity of a shared, preferred future and resolve current problems without ever using a deficit-based approach like HCD. For example, you can use a futures process to design policy solutions, reduce technological exclusion, address climate change, and more (Harrington & Dillahunt, 2021; Kimbell, 2019; Bruce, 2019; Yarina, 2019). Ramos (2013) applied the FAM process in order to innovate and solve problems, as well. My current project addresses common US-based racial inequities at two public schools, not by focusing on the problem, but by using a futures process to envision racially just, school community futures, and back casting from the preferred future to the present.

The advantage of the Futures Design Variation is that you only manage and facilitate one methodology. Second, internal motivation can be higher than an HCD process because we are building on a community asset, using their passion and vision to drive the process. Third, the motivation can be higher due to the inherent participatory nature and improved power dynamics of a futures process compared to an HCD process which can often be run solely by designers.

The disadvantages are due to the lack of a standard futures process. Futures processes are less codified and rigid. You will find many futures processes and toolkits and they are not all similar. For a person new to either process, Futures Design may seem harder than using the well-standardized HCD process. The biggest disadvantage is the time delay between the present and the realization of the design future. It is possible that in some cases, like climate change, a solution needs to be reached faster than the final roadmap output by a back casting or change paths process. It is important to build such constraints into the futures process. Lastly, the futures design may not address the present needs of users or customers. If the futures process is used for an existing product or service, the product or service team must decide what they will do with the existing service and customer needs while moving towards the future vision, which may diverge away from the current needs of customers or users.

2. The Supplemental Approach

In the Supplemental Approach, we choose a base approach. Then we gain the benefits of the second approach by supplementing its methods or activities onto the base approach. This can also be called the Auxiliary Approach.

Variation III: Futures-Ready HCD

To ensure a design process reaps benefits from futures thinking, designers may supplement the generic design or HCD process with futures thinking mindsets, methods, or activities, without running through an entire futures process.

Mindsets may be the easiest to incorporate into the HCD process. A design team can practice mindsets such as taking *an interest in the possible, not only the actual*, or *understanding the changing system* (Prosser & Basra, 2018). Implicitly, Futures mindsets can shift the time horizon, future readiness, or future consciousness of any research, synthesis, ideation, or design work (Spencer, 2021).

Explicitly, Futures mindsets can shape HCD research questions (Roumiantseva, 2016). Beyond research questions of user's needs and behaviors, Futures-empowered HCD designers may ask additional questions (Roumiantseva, 2016).

- *How are users' needs and behaviors changing and what are the drivers behind that change?*
- *What are the most creative, exciting, and unusual things happening in the world of our users today, and what implications do they have for the future of those users?*
- *Which parts of the mainstream will still be around in the future and which parts will not?*

Beyond mindsets, Futures methods can be inserted into the HCD process in any phase (Roumiantseva, 2016; Spencer, 2016; Miemis, 2010). The discovery phase is enhanced with greater context and background through ethnographic and market-based signals, drivers, trends research, emerging trends analysis, causal layered analysis, environmental scanning, etc. The synthesis (or define) phase is enhanced with greater clarification of the problems and implications through signal clustering, forecasting, scenarios, futures wheel, future personas, scenario planning, three horizons, etc. The design phase (ideation, selection, prototyping, and testing) is enhanced with greater forecasting of impact through sci-fi futures, wicked opportunities, futures wheels, immersive or experiential futures, back casting, etc. Finally, the delivery and implementation phase are enhanced through greater foresight with fusion wheels, consequence scanning, etc.

Designers may use multiple futures tools or only one. For example, Behboudi and Javidani (2019) utilized a Futures Wheel to scan for opportunities in the initial stages of the design process and explored how a design choice may unfold in later stages (Figure 3). We have used the Futures Wheel on service design projects at NASA. Wright (2021) explored design implications through consequence mapping. Van Ael et al. (2018) used futures methods to identify long-term trends while context mapping in the early stages of the systemic design process. Van Ael and Peter Jones then used futures methods to define the value proposition and total system value in later stages (Jones & Upward, 2014; Vandenbroeck et al., 2016).

There are a few advantages and disadvantages. The advantage is embedding future sustainability, resilience, and needs into your product. This advantage, though, is only as strong as the strength of the inclusion of futures methods. The benefit increases with increased numbers and quality of futures methods used and more continual placement of futures methods throughout the design process. The disadvantage is that supplementing a futures method may not be enough to truly embed foresight or bring out the future vision inside us and into the design process. For instance, you may waste time if you use a futures wheel to stop further development on a prototype when you could have used the futures wheel earlier to avoid prototyping the design in the first place. Determining where the crucial points are in the design process for incorporating futures thinking is difficult. It seems best to spread futures thinking throughout.
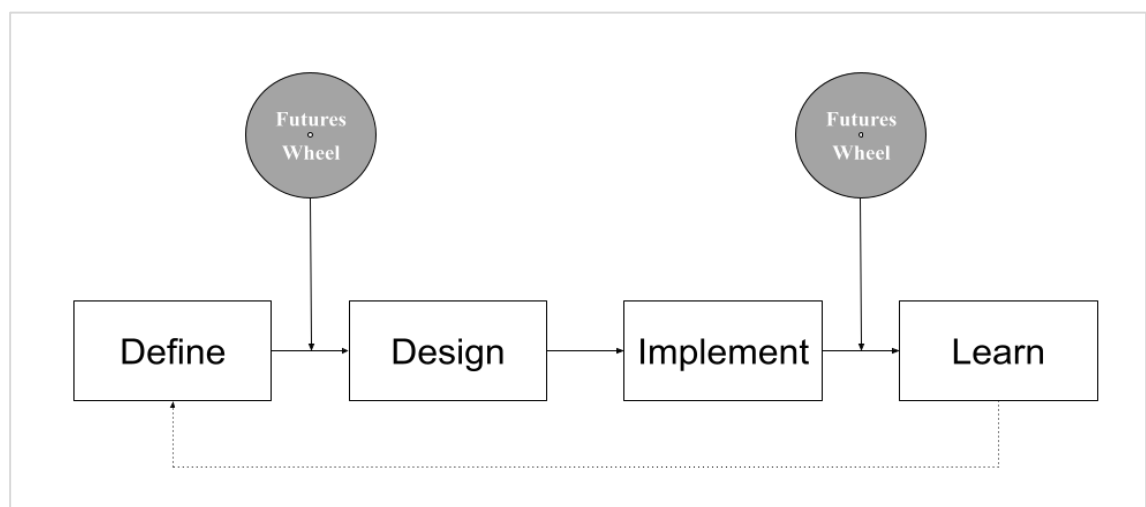

Figure 3: *Exploring Possibilities and Implications with the Futures Wheel (Behoudi & Javidiani, 2019).*

Variation IV: Design-Embedded Futures

To ensure a futures process reaps benefits from design thinking, futurists and futures designers may supplement a futures process with design mindsets, methods, or activities, without running through an entire futures process, or by running through a mini-design process.

Mindsets are the easiest to incorporate because it only requires mindful intention. Ramos (2013; 2017) used a design innovation mindset to implicitly guide the Future Action Model toward futures designs that bring innovation. In a participatory futures project at a public school, Kindred, an educational nonprofit organization, and a designer are working with the school community to embody the mindset of iteration as we move toward a racially just future, with cross-racially equitable outcomes, 25 years away, the chosen time horizon (Aquent, 2021).

Embedding design methods or processes requires more work. The most common incorporation of design into the futures process is designing, building, or creating future scenarios–design futures (Burdick, 2019; Zaidi, 2019; Leihener & Breuer, 2013). Remember that Futures Design takes an additional step beyond design futures to make real design decisions for today.

Other methods include game and communications design. An increasingly common use of design is game design to explore future scenarios and situations and to draw out discussion and values (Pollio et al., 2021; Rosa & Sweeney, 2019; Flood et al., 2018; Blythe et al., 2015). Ollenburg (2019) used design to communicate the results of each phase of her Futures Design Process Model.

Some futurists use a type of research through design, RtD where design artifacts are used for research to generate knowledge (Jonas, 2015; 2015). You can take any type of design futures artifact, or design fiction, and use it as input to conduct design ethnography research for the future with today's users (Lindley et al., 2014). We call this anticipatory ethnography. Candy and Kornet (2019) took it further by first using design ethnography research to build a shared vision of the future, prototype that future as design fiction, conduct anticipatory ethnography when today's users experience that future, and then iterate on the design future based on feedback and experience. Candy and Kornet are using an entire design research, synthesis, prototyping, and refining process to create and iteratively improve design futures.

The introduction of design elements to the future process can improve future visions or scenarios in several ways. Visions and scenarios can improve through iteration, through better feedback from more visceral and immersive experiences, and from better discussion and exploration from designed experiences like games. Design improves the process over a direct conversation as sometimes what you think you would do is different than how you actually react interacting with a design or a game.

However, there are limits to the potential accuracy of design used in futures processes. People know they are playing a game or interacting with a design fiction and that knowledge can subconsciously alter their reactions in ways that may be different from reactions in real situations. Second, today's users may be very different culturally, linguistically, and experientially from tomorrow's users so anticipatory ethnography has a weakness from a lack of access to tomorrow's users who may react differently. Lastly, most of the presented ways to incorporate design into a futures process are concerned with exploring future scenarios, future needs, values, and communication of those aspects. Leihener and Breuer (2013) used backcasting to build a roadmap to the future, but their map was a roadmap of strategic decisions. Their process would likely still require an HCD or generic design process to determine the design details of the critical points of the roadmap on the way to design future. Thus, the major weakness is that the design is not incorporated in a way to bring the needs of current users into the future design.

This weakness aligns with the fact that other than communications design; most uses of design in a Futures process are not problem-based or deficit-based. Most uses of design are aspirational, values-based, or inspirational. Thus, the asset-based mentality of Futures molds even the application of design within the process.

3. *The Complementary Approach*

In the Complementary Approach, we use both a Futures process (not a Futures Design process) and a design process. The processes may run sequentially or they may run in parallel. We also call this the Mixed Approach.

Variation V: Implicational Design

There are times we start with an HCD process and before committing to a design, we go through a Futures process to explore the long-term future implications of the design. Thus, we call this the Implicational Design variation of the Mixed Approach. The Futures process serves as a second process to validate or invalidate the proposed design direction of the HCD process. The Implicational Design variation can be planned from the beginning of a project as a type of validation process, or it can be unplanned and arise from a desire to test the sustainability, future value, or future implications of the HCD choice (Jones, 2021). The design from the HCD process can be used as a signal or possible driver to forecast future implications of various future topics at a particular time horizon.

Starnino and Wieskopf (2021) used a participatory action research and design process on a government service design project (Haj-Bolouri et al., 2016). Without initially planning a futures process and working in emergent iteration loops that would guide the direction of the process, they decided to run through a future service process after the HCD process. In product design, future journey maps may still be near-term and thus require HCD. In contrast, due to the complexity of services, the multiplicity of touchpoints and interactions in service, and the volume of services inside a system; future journey maps, future service blueprints, and future system maps often require multi-year efforts, making them increasingly amenable to a Futures process.

The Implicational Design variation offers more robust foresight than using a single futures tool or two, once or twice in a Futures-ready HCD process (Variation III). Implicational Design offers extra validation from the future. The variation allows flexibility that does not require planning a Futures process from the start.

Implicational Design could be further improved through some explicit consideration of validation from the past, or hindsight, to create a triangulation between hindsight, insight, and foresight. Triangulation could strengthen the validation. Also, due to the use of two design processes, time might be a constraint for a team that is pressured to create or make design decisions quickly.

Variation VI: Prequential Design

We may also start with a Futures process that leads to a design future but wonder how to translate that to a design, today, that resolves current needs. The process that includes a future process but ends with a design for today is what we call Futures Design (Figure 1).

There are multiple ways to determine the present-day, real design that resolves current needs, and simultaneously moves in the future direction. First, a Futures Design team may use a design future simply as inspiration. Another option is to use the design future as a simple, evaluative heuristic to choose a final design. In this option, the design teammates ask themselves *Does this design move us in the direction of our design future?* Third, in Futures Design, we may run a back casting or change paths process from the design future to today to visualize the various design milestones and experiments the service or product will have gone through to reach the design future. However, it is possible that either the design future or the first design step of the futures roadmap leading to the design future is not specific enough to create a design and still require more design and research work. In this case, we append the futures process with an HCD process–the Prequential Design variation.

In Prequential Design, the HCD process can create greater detail about what to create by determining how to design the first milestone of the futures roadmap if it is too high level (Figure 4). Or, without doing back casting or changing paths, the design team can use an HCD process with the constraint of one component or feature of the design future (Figure 4).

In this second case, subsequent design changes across the time horizon will include more design constraints mapped to other components or features of the (hopefully updated) design future. Eventually, we reach the design future; though, for institutionalized futures processes, the design future will continuously be updated.

For Futures Design practitioners, the advantage is familiarity. You still go through a Futures process in the Prequential Design variation and in Futures Design. Prequential Design uses HCD to resolve current user needs in a way that leads to the design future; while Futures Design only worries about foresight and future needs.

Another benefit is flexibility. You only use back casting or change paths if necessary. Other options include using the design future as inspiration or an evaluative heuristic. Prequential Design offers an advantage over Design-embedded Futures (Variation IV) because Prequential Design focuses on design to address current needs whereas Design-embedded Futures may possibly produce a service or product that does not meet current needs.

The major disadvantages relate to time. Similar to Implicational Design, Precedent Design uses two design processes that require more time and a design team that is either comfortable or familiar with both types of design.
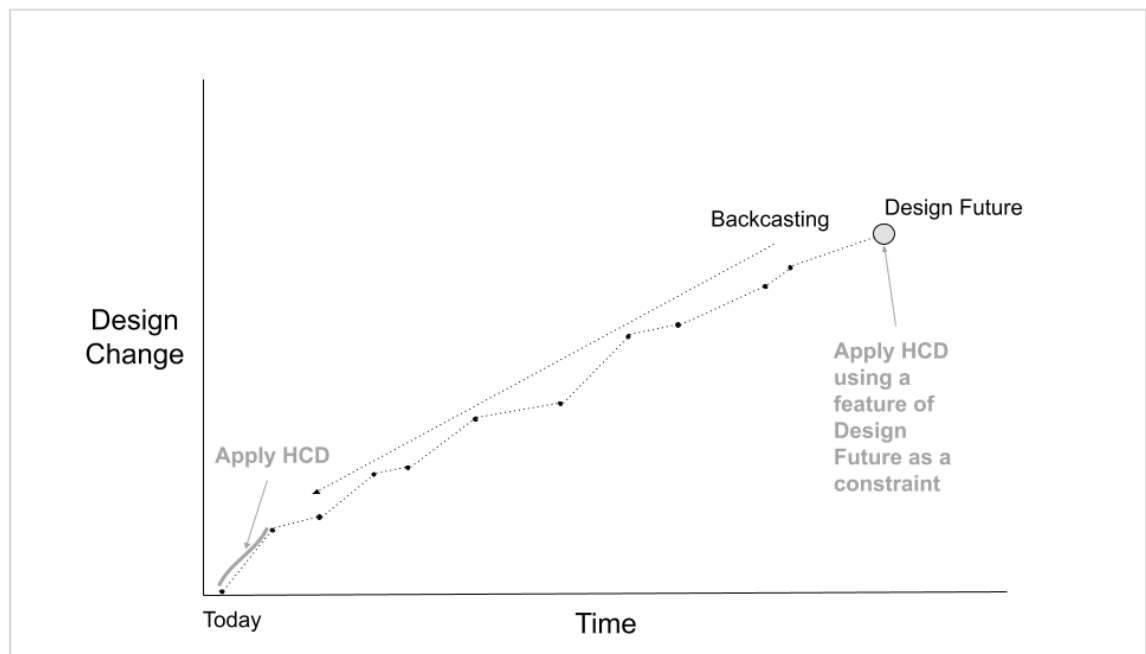

Figure 4: *How HCD is applied in a Mixed Approach: Prequential Design variation.*

Variation VII: Convergent Design

Initially, in project planning, we can intentionally plan to use two parallel processes. The Futures process uncovers future needs and trends, while the HCD process uncovers current needs (Figure 5). We then connect the two designs temporally in a roadmap. We also call this variation Parallel Design.

The two parallel processes can be conducted by the same design team. However, the most common practice in organizations is to have a different team focusing only on the Futures process. Examples include Space10 at IKEA, the Brooklyn Creator Farm at Adidas, and SEBx at SEB (SDC, 2021).

Once the two processes have resulted in a design, a current innovative design, and a design future, we explicitly or implicitly, temporally cast between the two designs. How we cast depends on the temporal placement of the two designs.
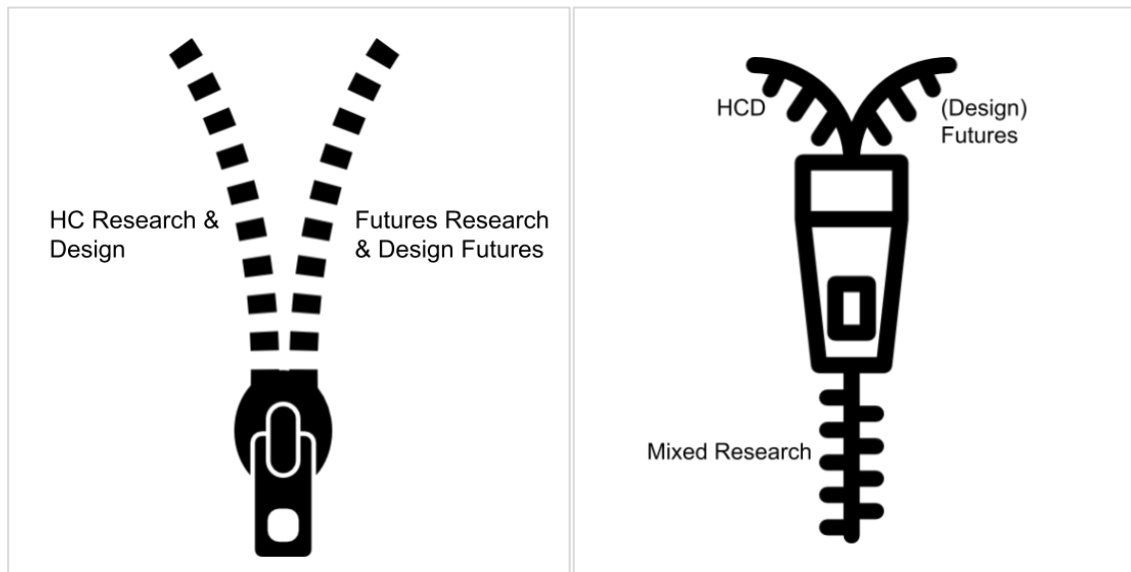
Figure 5: *Convergent Design or Parallel Design variation.* | **Figure 6:** *Mixed Research or Branched Approach.*

Usually, the design future will happen on a later time horizon due to needed technology, social desire, political will, resource availability, etc. In this case, we build a roadmap by back casting or conducting change paths from the design future to the current, innovative design.

Similar to the HCD variation of the Singular Approach, sometimes the HCD process produces a future-forward, innovative design that will take years to achieve even though it will still be before the design future. Then we back cast twice. We build a roadmap by back casting or conducting change paths from the design future to the innovative design and again from the innovative design to the present.

Lastly, similar to the HCD variation of the Singular Approach, it is possible the HCD produces an innovative design that is further in the future than the design future. Then, we build a roadmap by back casting or conducting change paths from the innovative design to the design future, and again from the design future to the present.

The advantages are primarily independence. In fact, in-house futures design teams not only can operate separately from company OKRs but run their processes on different timelines. Once the in-house futures team produces a prototype or design future, then the company determines how the design future affects the products or services it offers via implicit or explicit back casting, change paths, or inspiration. Methodologically, Convergent Design keeps each process squarely focused on its time domain.

The main disadvantage is that it is very time-consuming if you only have one design team and they have to run both processes at the same time. If they do them sequentially, the first process can unintentionally affect the other. Another paradoxical disadvantage is the independence of the processes which can seem like an advantage. It is possible the innovative design does not move the product or service in the direction of the design future. In this case, the design team could ignore the problem and still build the innovative design and afterwards follow a roadmap between the new, innovative design and the design future. Or a design team can throw out the innovative design and back cast from the design future to today, to determine what will be designed today. Another option is to embed a component or feature of the design future into the innovative design to alter its trajectory so that the innovative design is a step toward the design future.

4. *The Mixed Research Approach or Branched Approach*

In the Mixed Research Approach, we use a single research process with mixed methods - design research and futures research methods (Figure 6). After synthesis, we branch into two separate subprocesses, a design process and a (Design) Futures process. There is only one variation in this approach, also called the Branched Approach.

In HCD, most design researchers focus completely or mainly on qualitative research and specifically customer insights, insights from the user of a service. However, it is common for strategic and management consultants as well as futurists to uncover insights from the market and organization as well. In Combinatorial Innovation or Insights Crashing, we use these mixed insights to ideate, creating ideas from the mixture of customer, market, and organizational insights (Khan, 2017). This creates a much more robust synthesis output rather than just customer-insight-based synthesis. Innovation strategist Khan (2017) combined customer insights, industry orthodoxies, white space, core competencies, and market discontinuities together in order to synthesize his research and facilitate ideation. In a current service design project at NASA, in which we are redesigning a service for small businesses to receive help in developing their space-applicable technologies, we have conducted the following type of mixed methods research.

- Customer insights
- Employee insights
- Ethnographic signals
- Market signals
- Horizon scanning, Market trends, Macrotrends
- Emerging issues analysis, Market discontinuities
- NASA program assets and competencies
- White space analysis
- External market orthodoxies
- Internal organizational orthodoxies
- Quantitative customer feedback survey data
- Service insights
- Quantitative desk research on service health & goals
- Causal Layered Analysis

Our synthesis includes customer, organizational, market, and environmental insights of today, the future, and the trending change. After branching, the HCD work is rooted in a futures-consciousness eliminating the chance that any innovative designs from the HCD process move in a different direction than the design futures branch. We then build a roadmap by back casting or conducting change paths between the design future output of the futures process and the design output of the HCD process.

The advantages of the Mixed Research Approach are strong. The HCD work is more future-conscious than the HCD variations of the Singular Approach or the Supplemental Approach (Spencer, 2021). Likewise, the Design Futures work is more conscious of the current challenges, needs, and desires than the Futures variations of the Singular Approach and Supplemental Approach. This implicitly aligns the HCD and Design Futures branches of the Mixed Research Approach and reduces the chance that the HCD outcome moves in a different direction than the design futures outcome. Also, the need for a Complementary Approach (Mode III) is eliminated because the Design Futures branch produces the implication of the HCD design which produces the prequential designs for the design future due to the joint research phase.

The disadvantages are small compared to previous approaches. Usually, you will need the same team to go through both design branches so you lose the independence from the way many organizations practice the Convergent Design variation; however, interdependence is a strength. You need a team that is comfortable with both design processes - HCD and Futures. Secondly, the roadmap must be continually updated as you return to this process. Lastly, it requires more time than a fully mixed research and design process, the final mode presented.

5. *The Futures-Empowered Innovation Approach*
In the Futures-Empowered Innovation (FEI) Approach, we use a single research and design process with mixed research and mixed design methods (Figure 7). There is only one variation in this approach, also called Futures-Oriented Innovation (FOI) Approach.

Futures Designers are free to create their own unified approach or model. One example is the Service Innovation Approach Grounded in Foresight and Service Design created after studying over 20 different service innovation processes (Ojasalo et al., 2015; Figure 8). The model is based on the dynamic capabilities, service innovation, foresight, and service design fields.

The first two phases of the process (Map & Understand and Forecast & Iterate) are focused on sensing and forecasting the future, as well as collecting data from customers, the environment, society, and the organization. The latter two phases (Model & Evaluate, Conceptualize & Influence) are focused more on seizing opportunities and desirable futures. The methods in these phases focus on visualizing, simulating, experiencing, visioning, and transforming.
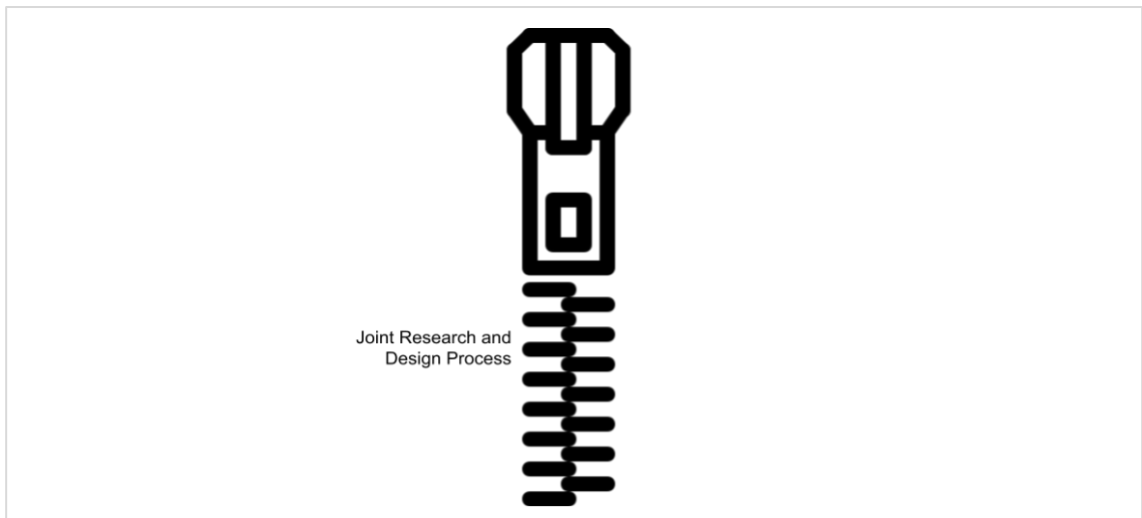

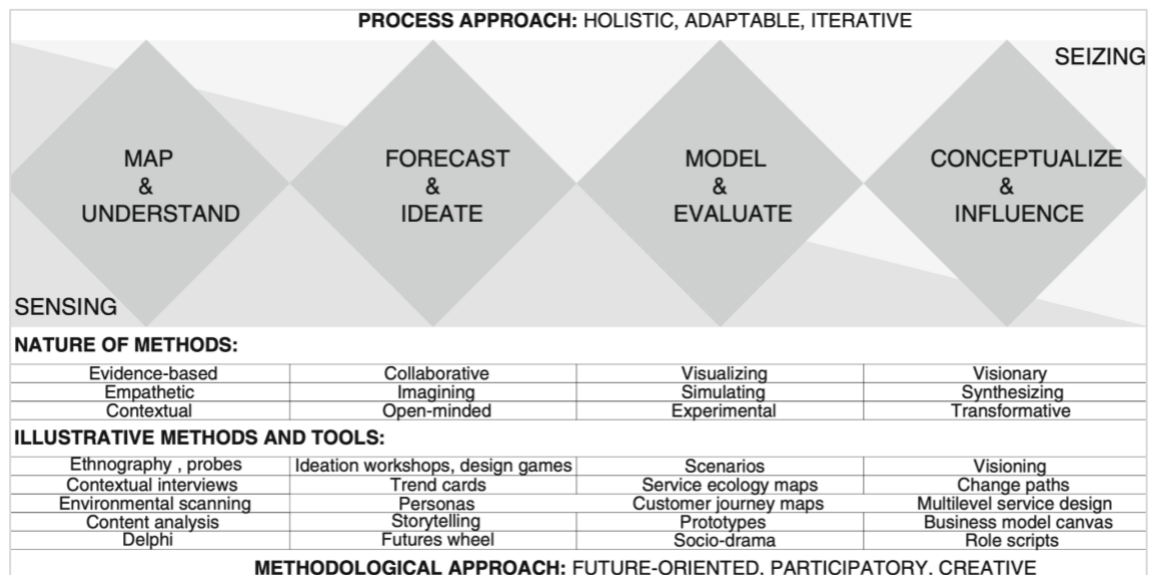**Figure 7:** *Futures-Empowered Innovation Approach.*

Figure 8: *Futures Futures-Empowered Innovation Approach (Ojasalo et al., 2015).*

There are many advantages. The unified approach is the best way to integrate futures thinking and design thinking holistically, creating a better balance between the future and present innovation than Modes I or II. Also, it is usually easier for a design team to follow one process unlike Modes III and IV. Third, this unified method provides flexibility to pick and choose what methods are important in your specific context. Fourth, you save the time spent doing a separate HCD design phase in the Mixed Research Approach. Fifth, since it is one process, you save the time spent doing two full processes in the Complementary Approach.

The disadvantages are surmountable. The design team must be comfortable using both HCD and Futures methods and switching between the two methodologies frequently. Secondly, the methodology appears linearly, however, in reality it is often performed nonlinearly. The nonlinearity of a mixed, unified process can be harder to navigate for a design team than the nonlinearity of HCD alone or a Futures process alone. Lastly, it is still not guaranteed that the back casting in a unified approach leads to a present-day design change that resolves current customer needs; though, it is more likely than Variations II, IV, and VI.

Discussion

Modes IV and V, the Mixed Research and FEI Approaches, represent a better integration of HCD and Futures than the first two modes which do not explicitly integrate the methodologies or only do so a bit. Most of my Futures and HCD work is done using Mode IV or V. But how do you decide between Modes IV and V if you have the resources for either? If the research is integrated, why separate into two design processes in the Mixed Research Approach? Why not integrate even the design phase into one integrated process?

This depends on whether the design team believes the design product is the same or different between Modes IV and V. In actuality, both the Mixed Research Approach and the FEI Approach use a back casting or change paths method. It is rare that you conduct a high-level, back casting process to the present and do not need a lower-level design process to flesh out the design detail of the first step in the back casted roadmap. In other words, the FEI process implicitly needs a generic design process, too. It is unclear if the result of a design process focused on the first milestone of a FEI-created roadmap is similar to the result of a future-empowered HCD design process focusing on addressing current needs in the Mixed Research Approach.

They would not be the same. There is no reason that an innovative design based on the first milestone of a roadmap created through back casting necessarily addresses current user or customer needs. It may but it also may not. In order to guarantee that the design does address today's needs or to force it to do so, our design teams often choose the Mixed Research Approach, Mode IV.

Conclusion

The human-centered design focuses on current needs, behaviors, hopes, and fears. Futures Design focuses on long-term trends and future needs, behaviors, and scenarios. When designing a completely new product or service, Futures Design can work adequately. However, when using Futures Design to redesign or innovate an existing service, the design outcome may fail to improve the experience of current users or community members who must still interact with the service for the entire time span leading up to the fulfillment of the future vision. Therefore, it is important to innovate and redesign services in a way that moves towards a transformative future vision while simultaneously still improving the current experiences of current users, today.

We explored 5 modes of integrating HCD and Futures Design. In the Singular Approach, you simply choose HCD or Futures Design because each methodology can naturally produce a design that satisfies both current and future needs without methods from the other methodology. The Supplemental approach explicitly appends either methodology with at least one method from the other. The Complementary Approach integrates them more strongly by running both methodologies either consecutively or in parallel, often building a roadmap by using a back casting or change paths process between the design future and the HCD design outcome. The Mixed Research Approach is even stronger using a single integrated research process and branching into two design processes–HCD and Futures, building a roadmap between the two designs. The FEI Approach is a holistically integrated approach producing one design.

If a team has the resources and time, we recommend using either the Mixed Research Approach or the FEI Approach as those approaches more fully integrate the benefits of both HCD and Futures methodologies. The question remains as to which is better at combining the methodologies or if the same team would produce the same outcome regardless of which of the two approaches was chosen. Further research can seek to answer the question. Further variations or models of the FEI Approach are needed to explore the possibility of a joint model that does not employ back casting of the change paths method and still satisfies the present-day needs of today's customers.

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