# How Anticipatory Design Will Challenge Our Relationship with Technology

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### Abstract

Anticipatory Design is an upcoming design pattern within the field of predictive user experiences (UX). The premise behind this pattern is to reduce cognitive load of users by making decisions on behalf of them.

Despite its promise, little research has been done towards possible implications that may come with Anticipatory Design and predictive user experiences. Ethical challenges like data, privacy and experience bubbles could inhibit the development of predictive UX.

A research has been conducted to identify both ethical as design challenges that come with the development of predictive UX and application of Anticipatory Design as design pattern. With as overarching question "How Anticipatory Design might challenge our relationship with technology".

## A Future Without Choice

Advancements in technology have brought us many possibilities but also pushed us towards an increasingly complex and noisy world. Back in the days, a middleman used to handle our queries, whereas we now rely on our own. We have become our own middleman (Shapiro, 2016).

Today, much is automated. Both in design as in technology. Technology disrupts daily patterns by using machine learning algorithms. As a consequence, content, in-house temperature, interests and soon transport will be predicted (Kuniavsky, 2016).

This is just the start.

We are at the dawn of an era with fully-autonomous predictive systems that anticipate user's needs. "The next evolution" as Google CEO Pichai refers to it. "Building a personal Google for every user" is Google's vision for the future. A shift from mobile first to A.I. first (Pichai, 2016).

This romantic view of a world with less cognitive load, strong A.I. and automated experiences will have impact on how UX designers approach challenges.

## Experience Design is Evolving

Design has always been crucial in the experience of a product or service. Design affects how we see, feel and think about things (Norman, 2013). There is a general misconception about the role and craft of UX designers. UX is unfairly related to UI-design (Krishna, 2015). There is a strong distinction between both disciplines that will continue to grow rapidly as new technologies emerge.

User Interfaces for example increasingly take different forms (e.g. voice-driven interfaces) that require a different way of design thinking. UX designers are getting more exposed to ethical design since a lot of confidentiality is involved by creating predictive user experiences.

With the dawn of fully automated consumer-facing systems, a clear view on design mitigations and guiding principles are desired since future designers will face much more responsibility concerning topics like privacy and data.

Current sets of design principles from Rams, Nielsen (1998), Norman (2013) and Schneiderman (2009) are insufficient for automation because principles regarding transparency, control, loops and privacy are missing.

The evolvement of Experience Design within a context of automation requires discussions and design practices to mitigate forecasted design challenges.

## Anticipatory Design

Anticipatory Design is a design pattern that moves around learning (Internet of Things), predicting (Machine Learning) and anticipation (UX Design).

Smart technology within the Internet of Things learns by observing, while our data is interpreted by machine learning algorithms. UX design is crucial for delivering a seamless anticipated experience that take users away from tech-

nology. Anticipatory Design only works when all three actors are well aligned and effectively used.

## Conceptual Framework

The idea of anticipating is an appealing but also difficult idea. Because it seems to violate fundamental principles of time, causality, or construction of abstractions.

Anticipatory Design implies circularity (Zamenopoulos and Alexiou, 2007): how can the effect of an action determine the action in advance. Conversely, how can future states of the world affect present time.

For defining the concept of anticipation, Rosen's view of anticipation is applied. Rosen's concept of anticipation had biological roots and is tied with the re-instatement of the 'lost' cause of Aristotelian logic: 'final cause'.

Rosen states that: "anticipation is coupled with the ability of a system to contain a model of itself and/or its environment. This ability enables the system to act not only according to its history, but also in response to possible or future states of the world".

For example: if your dream is to become a great pianist ($f$) and the current state is that you have little knowledge and skills about playing piano (**A**). A constructed consequence model will be focused on learning the basics first (**B**).

$$f: A \rightarrow B$$

With anticipatory design, technology will pro-actively act on present actions and desired future states to ensure your goal is reached within achievable steps. **H** in this case represents all future possibilities to learn the craft of pianists.

$$f: A \rightarrow B \rightarrow H(A,B)$$

For systems to anticipate on people's need the following data is required to construct effective and actionable scenario's:

- Intent (of individual): what future state is desired for this individual? ($f$)
- Baseline: what is the current state from which the individual acts? ($A$)
- Effect: how can the desired effect be achieved? ($B$)
- Scenario's: what possible scenarios are there for achieving this goal? ($H(A,B)$)
- Sustainment: how might the current state be sustained to enable growth?

## The Need for Less Choice

We approximately make 35.000 decisions a day. This causes a lot of mental stress and decision fatigue. The more decisions we make, the less rational they become.

Decision fatigue is a well-documented phenomenon with some interesting experiments. A noteworthy experiment features three prisoners, applying for parole.

In this article from the NY Times (Tierney, 2014), the writer tells a story about three inmates who appeared before a parole board. The three prisoners had completed two-thirds of their sentences but were judged differently. The parole board granted freedom to only one of them.

The reason for this difference in judgment was due to the time at which a judgment was made.

The inmate that was judged earlier that day had 30% more chance to get parole compared to inmates who appeared later that day. The correlation between time and decision had to do with the amount of decisions the judge already had made.

This is why the notion behind Anticipatory Design and machine learning-based predictive user experiences gain terrain. There is a need for users to lower the daily cognitive load.

## Ethical Challenges of Anticipated Experiences

Automation requires data. For anticipatory systems to work, data from users are required to be able to anticipate needs and act on them. The identification of ethical challenges is important for our understanding as designers.

### Housing of Data

There is a general mistrust of users considering the discretion behind their data-housing. There is much skepticism due to studies around illegal data-distribution that affects the trust and willingness of users. A worrying attitude because it may inhibit the development around predictive UX.

### Privacy

Users tend to think they "have nothing to hide". The opposite is true and companies are increasingly sharing data without notifying users by forehand. Moreover, companies are changing their privacy constantly (Martijn, Tokmetzis, and Medendorp, 2016a) and studies show that still few people are aware of its contents and consequences. Automation will ask much more transparency from its users to estimate needs correctly. The current privacy-ecosystem is not sufficient and scalable in that regard.

## Experience Bubble

Eli Pariser described with 'the filter bubble' in 2011 how the new personalized web is changing what people read and how people think. The same risk applies when devices around us anticipate our needs and act on them. An Experience Bubble at which you get stuck in a loop of returning events, actions and activities. Algorithms are causing these returning events. Algorithms are binary and unable to understand meaning behind actions. It is worrisome that algorithms are not conversational. There should be a way to teach algorithms on what is right, wrong and accidental behavior.

## Predictive UX & Free Will

When everything is predicted, and anticipated without having the opportunity to change this pattern, it violates the concept of free will. Especially the concept of anticipatory design could have a huge impact on this. Users rely and act blindly on stimuli from devices without asking themselves why.

## Lack of Transparency & Control

The current definition and concept of anticipatory design leaves users completely out of the decision making to reduce the amount of choice:

> "The principle behind Anticipatory Design is that services and products decide in name of the user without the user knowing it" (Shapiro, 2016).

This will be a fix to reduce everyday decisions but also create a filter/experience bubble around that individual. More transparency and control is desired to inform users on what ground decisions have been made and what interpretation the predictive system gives on this.

As guiding design principle, feedback loops should be implemented to give users the opportunity of having a say in the interpretation of machine-learning based systems.

## Alienation of Human Capabilities

With automation, much human knowledge and skills are distilled into algorithms. This causes a risk of users getting alienated of the distilled knowledge and skills. The more we automate, the further we remove ourselves from understanding what and why we do things.

## Humanization of Predictive UX

During this study, different ethical challenges and design challenges were identified by interviewing experts and designers within the field of UX and A.I.

This resulted in a design challenge to humanize anticipated experiences. Thus, how automated and anticipated experiences can be more dynamic and empathic in respect to individual users.

## Design Considerations

The following design considerations are distilled as result of multiple expert and user interviews.

## Focus on E.I., Instead of A.I.

The head of MIT Media Lab, Joi Ito, gave a very interesting perspective that colored my beliefs regarding design principles to follow. Mr. Ito said that humanity should not pursue robotics and Generalized A.I. but rather focus on Extended Intelligence. This, because it is in human's nature to use technology as an extension of itself. It would feel inhuman to replace our daily activities by machines.

## Responsive Algorithms Make Data Understandable

The second insight was about limitations of algorithms that are used by machine learning. Conceptually they pretend to be 'personal' and 'understandable' about our actions but in real-life they are very binary. Algorithms are not ready for predictive systems and need to be more responsive to adapt to people's motives and needs. Revisiting the feedback loop is a way to implement responsiveness. In this way, people can teach algorithms what- but foremost why they like or dislike things.

## You Decide What Level of Automation is Desired

The way internet works is that users need to hack their own behavior to receive the right content. This because of one-way algorithms. Data interaction has become a crucial element in developing experiences for the future. Interviewed respondents voiced their concerns about the lack of transparency and control that comes with the internet. Much personal data ends up in a 'black box'. No one knows how our data is used and processed by big tech firms (Martijn, Tokmetzis, and Medendorp, 2016a). Providing options for automation should build trust and enable growth.

## Design Against the Experience Bubble

Eli Pariser warned us for the filter bubble with the dawn of social media and machine learning. In the future, we need experience bubbles may apply. If daily events and actions are automated and anticipated on our needs, little wonder and discovery remains. To avoid this scenario, it is advised to keep a sense of discovery available in provided services or to incorporate 'human error' in experiences.

## Personality Make Interactions More Human-like

The Internet of Things (IoT) is growing as market and mobile phones are becoming more our assistants. When respondents were interviewed, and asked about their view on smart operating systems and Artificial Intelligence, most people referred to the movie Her as a future perspective.

This is an interesting and realistic perspective. However, looking at recent developments for smart assistants like Siri, Cortana and Google Home, an essential feature is missing: personality.

Personality adds huge value to our interactions with devices, because it gives a human touch. People can relate more to devices if it has a personality. Looking at services like Siri, I believe that personality will be a more relevant asset in the future than the number of Gigabytes of storage that comes with an iPhone.

## Context is Key for Meaningful Anticipation

A big problem with predictions nowadays is the lack of empathy and understanding that systems have about the user. The Internet of Things (IoT) is key within this area for machine learning-based predictive systems in understanding the meaning behind user's actions and events.

## Anticipatory Design Manifesto

Predictive UX is an increasingly growing field of expertise. The craft of UX design is changing with it. Designers face more responsibility and a changing role within the process. Data interaction, ethical design and privacy will ask more empathy and circular thinking (IDEO, 2017). The design community has always been a supportive and collaborative community. As we are at the shift of a new AI-driven era, it is important to share design stories, insights and practices to continue the development of Anticipatory Design as pattern, and predictive UX as a service.

A conclusion of this research is that more understanding and design practices are needed. Therefore, www.anticipatorydesign.com is created for the design community to share ideas and insights about Anticipatory Design.

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