Human Computer Interaction

Products as Agents: Metaphors for Designing the Products of the IoT Age

Prof. Andrew D. Bagdanov

Dipartimento di Ingegneria dell'Informazione
Università degli Studi di Firenze
andrew.bagdanov AT unifi.it

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Outline

Overview

Changing times

- Information processing has become cheap and widespread.
- The capability to collect and handle information has become one of the many 'materials' from which products can be made.
- Computational power and network connectivity, cars, thermostats, and even light bulbs have begun to communicate with their users, manufacturers, and of course one another.
- So what? What does this mean?
- To begin to think about deeper issues in design and innovation, we must take a serious look at what these changes mean.

Searching for meaning

- The "Internet of Things" (IoT) provide new design opportunities to empower people and enrich their everyday life.
- To gain insight on how to create products that attain these aims, we are required to better understand not only the technical infrastructure and technological parameters.
- This is unfortunately how IoT is generally tackled in engineering sciences.
- We must also understand the social relationships of these products with everyday practices of people.

Meaning, you say?

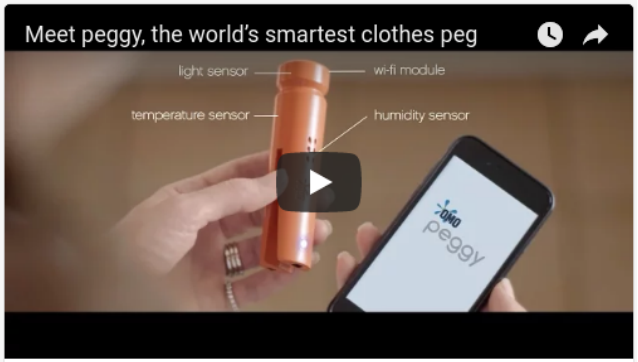
- There has been a shift in design from designing "things" to designing Things.
- Things are socio-material assemblies gathered around shared matters of concern with a visible effect in the world.
- When it comes to the current product-scape of IoT, however, we fail to observe this Thing-ness.
- This situation is humorously demonstrated at the blog "we put a chip on it":

  It was just a dumb thing. Then we put a chip in it. Now it's a smart thing.

  – http://weputachipinit.tumblr.com

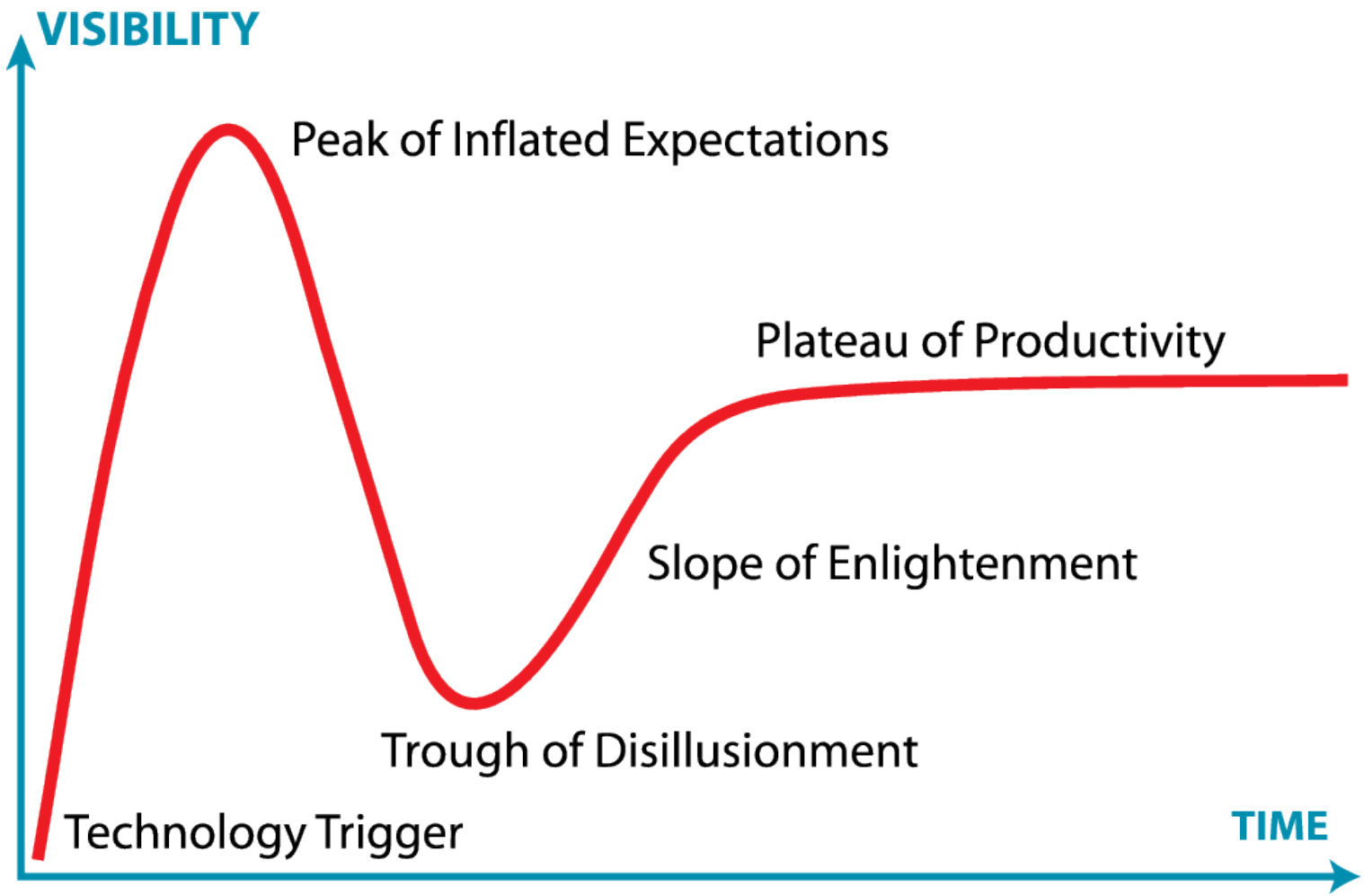
From things, to Things, to Smart Things

- This accurately summarizes the current approach towards smart products.
- Clothespins that notify you when the laundry is dry, or socks that keep track of how many times they were washed indicate how shortsightedly IoT could be executed.
- Being smart, however, has a lot more potential.

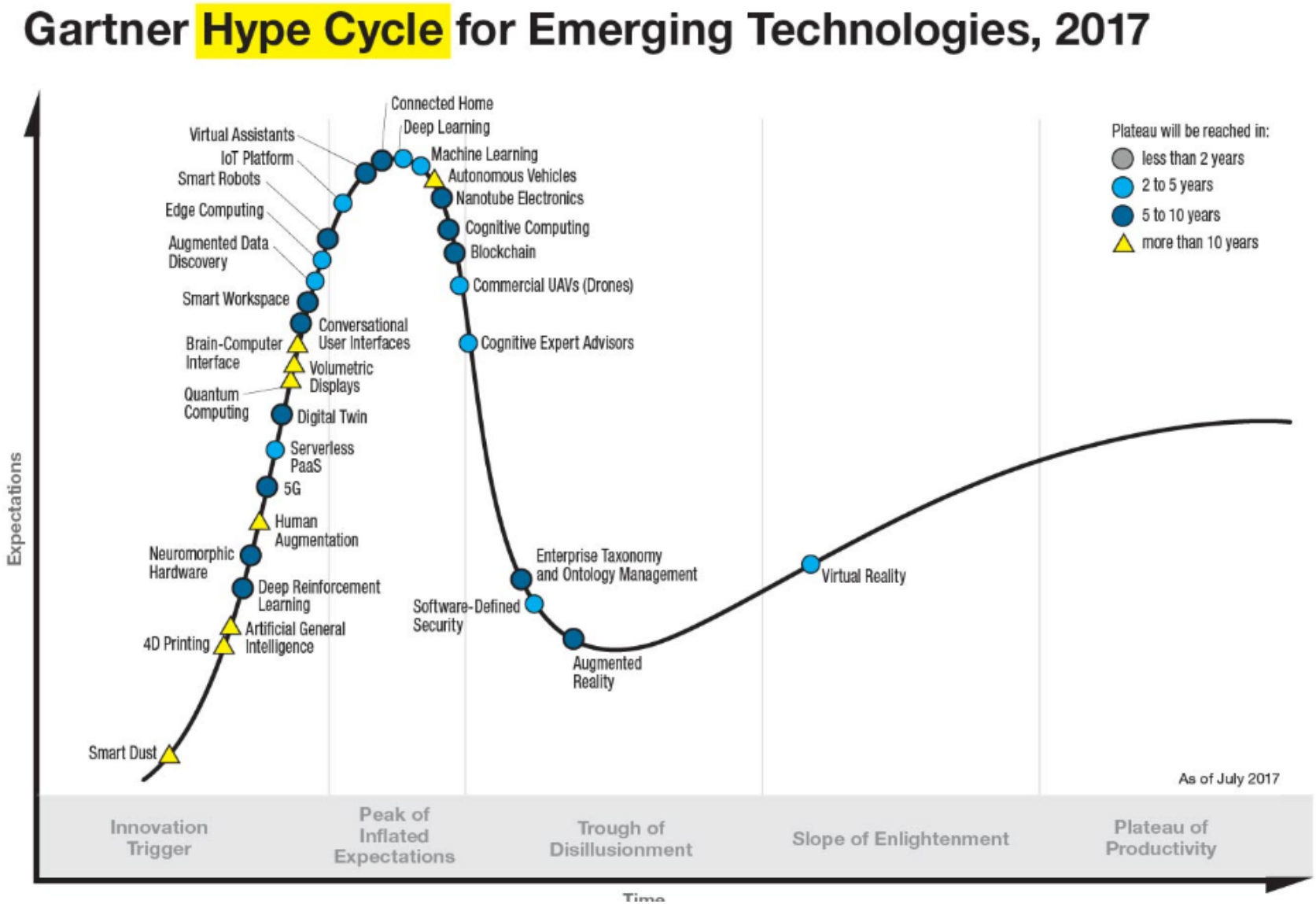


The hype curve

- To understand what the hell is going on, it's useful to look at hype curves:



The current hype curve



Contributions

- Networked products should be a hybrid of technological developments and cultural articulation.
- They need to be in a form that enables users to invite these products into their lives and makes an impact on life quality.
- Design practice: try to invent the new IoT medium by exploring the new affordances and challenges.
- Design research: must catch up with practice by inquiring into what these products mean for design culture and society, and how to create empowering networked products that go beyond simply embedding a chip in something.
- In this paper, the authors propose a framework based on the metaphor of "agency" in order to understand IoT from a design perspective.

Contributions

- IoT currently deals with four different types of products:
  1. products that connect to its users to inform their status and receive orders
  2. products that connect to its users and learn from these interactions to become more intelligent
  3. products that are connected to other products to exchange status information that is used to steer rule-based behavior, and
  4. products that do not connect to the user or other products via Internet, but have an internal architecture that can adapt to the behavior of the user.
- All these types indicate a capacity to sense and act autonomously – these products can learn and evolve.
- Seeing them as agents can help us unravel the ecologies between products and users, provide guidance about analyzing and discussing the products of IoT, and eventually offer a new framework for developing methodologies to design them better.

Related Work: What the Hell is Agency?

The rise of agency

- Agency is the capacity of an actor to act in a given environment.
- Inquiry into agency has a long tradition in science and technology studies, humanities, feminist studies and philosophy.
- Scholarship in these disciplines has recently started to retire from perspectives that place human beings at its center.
- This non-anthropocentric understanding considers humans as nodes in a system where many other nonhuman actors are also at play.

Two theories

- The most prominent account in this regard is Actor-Network Theory (ANT).
- Scholars in this tradition revoke the privilege of human actors and discuss the ontological symmetry of humans and nonhumans in networks of relations.
- In other words, human and nonhuman are studied as equal actors in any kind of network, and their agencies can be continuously transformed into one another.
- Object-oriented ontology (OOO) represents the philosophical positions that dissociate philosophy from anthropocentrism
- It considers objects to live an existence that exceeds relations with humans.
- Central to this proposition is considering objects as entities without requiring recourse to human use, perception, or meaning making.

OOO versus ANT

- Although both perspectives ascribe humans and nonhumans equal being, in OOO the reality of objects is binary – something is either real or not regardless of the relations it enters into.
- In ANT, alliances take the center stage and the reality of objects is defined through each object's relation to other actors.
- The more an object enters into additional alliances and extends the range of its effect on other actants, the more real it becomes.
- Therefore, there is a constant dynamic transformation of things through coupling.

IoT and Ubiquitous Computing

- Integration of autonomous, interacting objects in everyday life has been explored from the early days of Ubiquitous Computing.
- In his seminal work, Weiser (1991) envisioned a world in which computing is so pervasive that everyday devices can sense their relationship to us and to each other.
- Weiser's key objectives were:
  - ubiquity: embedding computation into the many aspects of the physical world, and
  - invisibility: having these computers operate autonomously
- The Ambient Intelligence paradigm of the late nineties presented a vision on digital systems for the year 2010 and beyond.
- It refers to systems that are sensitive and responsive to the presence of people, where many products cooperate seamlessly with one another to improve the user experience.

Taxonomy of IoT Agents

The Collector

- Collector products sense and process information.
- They have the ability to aggregate data from embedded sensors or social media platforms and feed the data back to its user, to other users, or to other products.
- These products are sometimes referred to as smart things, meta-products, everyware, or hybrid products.
- Most of Collector products have a dual identity – a physical form and a virtual existence that is connected to online services.

The Collector

- When a sensor gathers information about bird migrations, wind, or processes inside a living being, the invisible patterns of nature are brought into the realm of senses.
- The Lapka personal environment monitor renders the invisible radiation, electromagnetic fields, and humidity into abstract shapes.

The Collector

- Collector products are not only able to tap into environmental factors, but also reveal our patterns of behavior and webs of practices.
- They have access to data and patterns that we as humans do not and help us see what was previously invisible.
- Example: a connected baby bottle designed by researchers reveals the correlations between feeding quality and environmental noise, formula temperature, teat size, and feeding location.
- During the testing of the product, parents welcomed these less obvious insights because they made certain patterns in their feeding practice visible.

The Actor

- The second type of agency are Actor products which act autonomously according to the behaviors of users or other products.
- These products sense and interpret data like the Collector products, but also respond to it.
- Designers create a potential space for the product behavior, and users navigate it and perceive the product's behavior while the product is also engaged in autonomous interpretation of the user's behavior.
- Google Nest is an Actor product in this taxonomy as it monitors user activities throughout the day and learns to adapt itself and the environment according to their behavior patterns.

The Actor

- In interactions with Actor products, the user and the product continuously delegate action to each other (ANT in action).
- Researchers have argued that this situation induces animistic responses in users.
- The more the product seems intelligent and autonomous, the more our experience with it tilts toward animism.

The Creator

- The third type of agency is drawn from near future scenarios, in which the products will become the Creator of futures.
- Active research is being conducted on robots that can be used in daily lives and a robotic future that merges with everyday products.
- This indicates that robots and AI are breaking free from their traditional anthropometric looks and entering the daily lives of people.
- What agency emerges when everyday products with robotic qualities start making a tangible difference on their form, the environment they are in, and the way they are used?
- Carrying the concept one step further, researchers have been developing a robot system connected to a 3D printer and is able to print new robots or customized robot parts instantly to tackle any situation they face.
- Demo Video: Addicted Products

Discussion

Discussion

- User tendency for ascribing intelligence or intentionality to products has been a longstanding concern in HCI.
- What is recent is the realization that a product is contextualized within a network of other products, users, and values.
- And that it gains an agency via establishing relationships with the actors in this network.
- This theoretical position of shared agency used for describing the situation opens up new opportunities for the design and study of new forms of entanglements with smart products.
- Concerns: delegation of control, robot assumption.
- HCI is in third wave, and maybe this way of thinking of object agency will help push IoT through the trough of disillusionment.
- Video: Uninvited Guests