Analysing the Digital
Transformations, Territories, Frames and Uses

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Abstract: While digital space is explained in itself by computer science, important questions for the humanities – such as how the Digital affects human behaviour, or how it impacts society and economy – are outside its scope. Different disciplines have provided answers, but there has been no integrated concept bridging these insights. This paper proposes a concept to explain the Digital by integrating insights from computer science, media studies, sociology and philosophy. The resulting framework suggests that the Digital consists of characteristic dynamics, spaces and mechanisms. After explaining the concept of Digital Machine, an ontological framework consisting of four main fields of analysis - Transformation, Territory, Frame and Use - is proposed. With Transformations and Territories, the processes of the Digital and its wider socio-political and economic dimensions are analysed. Within Frames, human action and interpretation happen. In the Uses of the Digital, consumption has become a form of production, and User’s uses can be analysed in the differential between the intents of a Digital Machine and the interpretations of its users. To conclude, Anders’ concept of Promethean slope is taken to explain the increasing problems of humans to distinguish the actions of algorithms from human action, and future implications of the evolution of the Digital are discussed. Finally, routes for digital innovation and recommendations for design practice are proposed.

Keywords: Digital, Society, Analysis, Design

1. Introduction

Digital technology has become an a priori. As the Digital increasingly permeates society, fundamental questions arise: What is the Digital? How does it work? What does it do to society?1 ‘Network’ and ‘Flow’2 are popular metaphors, lending themselves to ideas of ubiquity, immediacy, and connectivity. These ideas describe certain features, but are limited in terms of providing a metaphysical basis to analyse the effects of the Digital.

Computer science describes its own field, but it does so in a self-referential manner.3 Important questions, such as how the Digital changes everyday human behavior, or how it creates social and
economic impact, have not yet been explained within an integrated concept. However, a concept is needed to make the dynamics and effects of the Digital accessible and to provide a basis for analysis for theorists and practitioners outside of computer science.

I will in the following combine concepts by Luhmann, Bataille and Baecker to explain the dynamics, and insights by Deleuze, Guattari, Certeau and others to explain the constituents of the Digital. The analytical framework proposed here attempts to abstract the Digital so that the connections of its various parts can be understood and acted upon by theorists in the humanities and practitioners in design and innovation.

I will suggest that the Digital consists of characteristic dynamics and spaces, and propose four main fields of analysis: Transformation, Territory, Frame and Use. I will suggest that within these fields there is a range of intrinsic mechanisms: digital Transformation creates digital Territory; consumption of the Digital is a production, enlarging its Territory; and user’s uses reflect the negotiated relations of humans and the Digital.

2. Dynamics and forms

Every new medium confronts society with new possibilities of information. Initially, society has no structures in place to decide which of these possibilities are compatible with its current structure. Consequentially, it comes up with mechanisms to absorb, channel and selectively manage this surplus of meaning. Once established, these mechanisms exert influence on the structure and culture of society (Luhmann, 1998, p.4). Luhmann calls these mechanisms Kulturform (culture-form, a ‘form’ of culture).

Georges Batailles lays out a similar dynamic. He describes society as a space of excess energies that are managed by being channeled in different forms of state and economy (Batailles, 1949). State and economy channel and manage these energies and adapt with different forms. With Luhmann and Bataille, these forms (culture-forms, state-forms, economy-forms) are mechanisms that channel and manage surplus energies, adapting to and shaping society. Digital technology is confronting society with a new ‘meaning surplus’ (Baecker, 2007, p.7). Its carriers are technological enablers: digital devices, web sites, social media, virtual worlds, intelligent personal assistants etc. These Digital Machines manage the surplus of meaning offered by the Digital through their design.

3. Analysing the Digital

3.1 Initial Definitions

A Digital Machine could be called a “cannibal of information” (Baecker and Kluge, 2003, p.17): It is information and it processes information. It takes information from its environment, processes it internally, and creates an output. Existing within the ‘meaning surplus’ of its time, it processes parts of this surplus according to its own rules.

A Digital Machine carries out Transformations and thereby creates Territory. Transformations and Territory are intricately connected within the data continuum of the Digital Machine. For instance, in a dynamic web site (a Digital Machine), the Interface (a web page on an electronic device) is often undergoing change as a consequence of its inner dynamics of Territory (the information it has processed) and Transformations (the information it is processing). A Digital Machine is externally
open to input and connections, but internally closed in order to maintain its functional algorithms. With Massumi (Massumi, 1992) it can be described as a structure. This structure differentiates itself and develops its own ontologically heterogeneous universe of reference (Guattari, 1995). With the Internet, all of these structures are articulated to each other, extending through their own ecosystem.

Figure 1: Dynamics of digital information

1: We assume an information environment I in which there is information P.
2: Process t takes some parts p of information P, processes it, and outputs information T. As information T has been processed from p, it is a space of information different from p. We define both t and T as Digital Machine D.
3: Several processes t create information spaces T.
4: Information in T can now be procured from either P or other T. Tx is the sum of all T, the entire space of Territorial Information.
In other words: Digital Machines D take bits p from the space of ‘meaning surplus’ P and process them. The results of Transformations t are Territories T. Information in P is potential information which, as long as it remains untransformed, remains “ungoogleable”.

I will in the following use common concepts such as users, device and interface. To establish constituents that are not covered by common concepts, I propose these definitions:

- **Possible or Potential Information (P):** the space of ‘meaning surplus’ made possible by a media revolution. It contains potential information – information that is possible but is not yet channeled and articulated by Digital Machines.
- **Transformation (t):** the mechanism of a Digital Machine, leading from the space of possible information to a ‘territorial’ space of (processed) meaning. Depending on its design, every Digital Machine has its particular way of framing and channeling information. Transformations create an output that we define as Territory.
- **Territory (T):** Territory comprises information after having been processed by a form (in our case, a Digital Machine). Information in this space has been managed, processed, in a sense fabricated. Territory is fluid, open to be re-processed by other Digital Machines, and interpreted by users.
- **Digital Machine (D):** a service or device whose operation is determined by algorithms. In terms of computer science, it is an abstract machine: a mechanism with input, a set of operations, and output. It takes some information (from meaning surplus) and processes it, whereby it becomes territorial information (T). A Digital machine is digital enabler (and limiter) for human action. In its simple form, it is a singular service: a website, an app, a chat bot, etc. In its complex form, it is a system combining and connecting a number of singular machines: The Internet, the ‘Internet of things’, advanced robots, smartphones, etc.

3.2 Analysis framework

Following the elementary dynamics of Digital Machines in spaces of information described above, I propose 4 fields of investigation for an analysis of the Digital:
• **Transformation**: Here, we are investigating how information is processed and transformed by code and algorithms.

• **Territory**: Here, we analyse how information is procured, saved and owned in an information environment.

• **Frame**: Here, we are looking at design, language, and signs as they are articulated in devices and interfaces, analysing how information is structured, framed and contextualized.

• **Use**: Here, we are looking at how information is interpreted, absorbed, and dealt with through human behaviours and expression.

By investigating these elements, we can analyse any chosen Digital Machine to obtain an overview of its particular dynamics, and to gain detailed views of how these dynamics are brought about.

![Diagram of a Digital Machine](image)

**Figure 2: Information processes in an application**

This diagram of a Digital Machine D represents any chosen app on a computer or a smartphone. It processes two information sources: U (User) from P (Possible information) and W (Internet) from Tx (Territorial information). Information input goes through Device De and Interface In, is processed through algorithms in t, saved to an instance of T, and selectively communicated back to U and W. Both U and W are part of feedback loops or recursive functions, where the result of each operation is the starting point for further operations.

In other words: t is what the app does and how it does it (its mode of operation). T is what the app accumulates (the information it saves on the device and on remote servers). t takes data from (and provides data to) U in P, and to W in Tx, to save processed data in T. The more users U provide input via devices De, the larger T becomes. In computer jargon, we could say that T is ‘big data’.

### 3.3 Initial Examples

For example, to analyse a social media site such as Facebook, we would initially look at the space of information where data are procured. Facebook generates information that, before being transformed, exists only potentially (in a space of possibility): Personal diary information that comes into being as individuals live their lives and report about it. The space of information utilized here is P, transformed by the site in t to be stored in its Territory T. This Transformation
Analysing the Digital capitalizes on information provided by users. The Transformation of an information potential of nearly two billion users creates an extensive digital Territory that grows every time its users provide information.\textsuperscript{12}

An analysis of the Frame would look at how the service presents itself and how users are nudged to perform certain actions. For instance, a user activity such as ‘liking’ is \textit{framed} by certain social conventions (user ‘etiquette’) and symbols (the Facebook thumbs-up symbol) that make the information input it elicits a property of the site. An analysis of its Use would look at the ways users interpret and use the service. In a Digital Machine, consumption (Use) is also production.\textsuperscript{13} By consuming, users produce, also when they do not actively contribute by posting a message or image. Every user activity, including searching and browsing a site or looking at text and images, produces information that allows inferences on interests and behaviours.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.png}
\caption{Information procurement}
\end{figure}

\textit{Information can only be procured from either the space of possible information P or from Territorial Information Tx. Web service 1 is a social media site such as Facebook, transforming personal information into a digital diary. Web service 2 is a message service such as Twitter, transforming personal messages to digital messages. Web service 3 is a search site such as Google, procuring data from other Territories Tx.}

‘Tweeting’ is a user activity \textit{framed} by an Interface (messages are limited to 140 characters) and its language and signs (‘to tweet’ is a coinage of the brand Twitter, the sign # is a twitter-typical way of referral). Tweeting, combined with another \textit{framed} activity, ‘following’, is defined in the Transformation the site creates: a recursive system of user input and feedback. With ‘Retweets’ this system can be multiplied, resulting in the possible amplification of messages in its Territory.
Also the Territory of an aggregation site such as Pinterest depends on the activities of its users. By making the collection of digital images from other sites more convenient for its users, it amasses information from other Territories (Tx) that it collects in its own Territory (T). The effectiveness of its user interface (In) and the effectiveness of its algorithms (in t) to select and copy (or, in computer terms, ‘scrape’) data from other Territories are essential to the growth of its own Territory.

Search machines such as Google procure the information for its Territory (T) from other Territories (Tx) through the Internet. Consequently, the better its algorithms (Transformations in t) are in obtaining information from other Territories, the larger its own Territory becomes.

Digital Machines can prompt new behaviors and expressions. For instance, the word “hello” did not exist until the development of the telephone (German and Drushel, 2011). The way Digital Machines frame human action can be analysed by looking at design, language, and signs as they structure, frame and contextualize information. The way humans respond to these *Frames* can be analysed through *Use* by looking at human behaviors and expressions.

The term “user” is somewhat misleading. It suggests sovereignty: Who uses something, has a position of power towards what is used. However, users are not in control of the Digital Machines they use. User actions are reactions and interpretations of commands rather than commands, resulting in behaviors and expressions influenced by practicalities, self-interest and inventiveness.

For instance, In KakaoTalk, a Korean instant messaging service, users can download a wide variety of emoticons designed by Manga and comic strip artists. These emoticons are highly complex and culture-specific, often only meaningful to users familiar with Korean contemporary culture. The interface of this Digital Machine offers a wide variety of symbolic meaning-making possibilities. Together with writing akin to sounds, additive particles at the ends of sentences, and vowel changes (Choi et al., 2012) communication on KakaoTalk is a creative and playful activity involving the
exploration and invention of new languages.

In the following, I will discuss approaches and implications of the 4 elements of the analysis framework described above: Transformation, Territory, Frame and Use.

3.4 Transformation and Territory

Every information revolution produces information powers: The Gutenberg revolution produced book and newspaper publishers, the informational revolution produces technology companies. The Gutenberg revolution ‘imprinted’ its logic to fields from science to politics (printed ballots) and commerce and management (printed money, bookkeeping). In the informational revolution, every Digital Machine can influence meaning. This applies to a personal blog as well as to the whole of Facebook or Google. The determining factor is Territory – the larger the Territory, the larger the possibility to influence meaning.

Fundamental to the execution of almost any task, algorithms construct our experiences and “knowing-how” of interacting with hardware and software. (Berry 2011, p.31) The algorithms behind Transformations are hidden from the direct view of users. Some processed data are projected selectively to the interface; others are only visible to owners and system administrators of a Digital Machine.

A Transformation consists of codes. These codes describe the mechanism of the Digital Machine, determining what happens to data, how users are involved, and how that impacts its Territory. Within the Transformation, its functions are detailed as sequences of actions. Transformation mechanisms of a Digital Machine are based on conditional logic, including self-similarity, randomness, repetition, and more recently, by deep learning. Colors or sizes of elements on screen, written in Cascading Style Sheets, are libraries of definitions. Programming languages are written as instructions, defining conditions and actions. Every step of a function has to be determined for a software routine to work. Transformation is an informational process: It transforms the “digital representation of the state of the system into its future state” (Fredkin, 2003). Transformation also imposes rules and can control behavior: For instance, there is a “Twitter Jail” of 1 to 2 hours prescribed inactivity for users who post more than 100 Tweets an hour.

In informational terms, Territory is the stored result of Transformations. Territory consists of stored data and is often protected by contracts (user agreements) and brands. On a social media site, users are granted ways of accessing and adding to the Territory owned by the site proprietor. Territory can be translated in various ways into economic value - by placing ads next to search results (Google, Youtube), by arbitrating services (Airbnb, Uber) or selling goods (Amazon). Acknowledging the commercial value of Territory, the Japanese government plans to enable intellectual property protection for big data collected by companies, including “where your car has been driven or where your mobile phone has been” (Nikkei, 2016). Guenther Anders (Anders, 2002) says that the machine, by way of its existential performance, plays a socially and morally prejudicing role. Within a Digital Machine, an individual can only do what its Transformations allow him to do. If there is a text input field, the software might set a limit to how long a text can be, or remove words which are designated as undesirable. For each user action, there is a prescribed sequence of steps inscribed in computer code.

To analyse Transformations, the functions of its algorithms have to be described and the data used have to be listed. Code can be made visible on the level of a website and its directly accessible components (scripts). Underlying algorithms in operating systems or operating remotely on servers
might remain hidden to the researcher. However, the visible results of these algorithms – suggestions, rankings, relative importance suggested by hierarchies and position on the interface – allow to infer which data might have been used and how they might have been processed. Transformation is defined by intent, determining how information is processed. Territory is the extent of processed information. For its analysis, we would look at the amount of stored information (database size), growth factors (how and where information is procured and transformed, number and activity of users, reach), and how its boundaries are defined (legally by legal agreements, symbolically by brands).

3.5 Frame

Digital Machines frame behavior and instill new cultural and social practices. Social media sites shape activities: ‘Liking’, ‘sharing’, ‘following’ are relational activities which have been defined by social media and established as new normal in the shaping of human relationships. Users are consumers of algorithms, and the way algorithms are designed has direct consequences in society.

For instance, the ‘people you may know’ algorithm on LinkedIn combines a variety of personal data – your profile and network activities, data of users who searched for you, selected keywords you used in your posts – to infer connections, generate rankings and hierarchies, and suggest participants of your social circle. This is an example of practico-inert: With Sartre, we could describe Digital Machines as practico-inert, fostering and limiting actions and bringing forth a praxis (Sartre, 1960).
Analysing the Digital

Through a device, user actions are transmitted (through mouse, keyboard or button clicks, screen taps, spoken instructions etc.) to the code level, where they get processed. Microphones and intelligent language processing enable devices to hear, cameras and object recognition enable devices to see, and location tracking and gyroscopes enable devices to know where it is.

An interface exchanges information between its own domain – the Digital Machine - and external spaces of information. Interfaces to the Internet are technical components and protocols required to receive and send information. User Interfaces exchange information with humans. For the device, humans are agents, external entities providing and receiving information. For humans however, devices can be mistaken for other humans (Nass, 2007).

User interfaces are the visible surface of Transformations, defined in code and suggesting uses. The “media logic” of an interface - “how material is organized, the style in which it is presented, the focus or emphasis on particular characteristics of behavior, and the grammar of media communication” (Altheide and Snow, 1979, p.19) defines the interface and impacts user behavior.

For instance, “on eBay a user’s feedback rating is conspicuously displayed at the top of his/her profile page... the development and eventual achievement of a good reputation on eBay becomes a legible, highly intentional, and strategic object” (MacDougall, 2011). Priority and salience of visual elements ‘nudges’ users to certain actions (Bell, 2001). A study on the effectiveness of banner ads for online gaming sites shows that a larger size led to increased click through rates (Robinson 2007). A study on browser security warnings reveals that interface differences (design of graphical elements, number of clicks required) substantially impact user behavior (Akhawe et al., 2013).

With emotion recognition - the analysis of facial expressions, words and tone of language - the machine is also able to understand the state of human emotions. Voice assistants or intelligent personal assistants (Apple Siri, Amazon Alexa, Google Assistant, Microsoft Cortana) are operating on the basis of deep learning and are activated by human language.

Frames can be analysed by looking at how Transformations, projected to user interfaces, shape data input and output and prescribe sequences of actions, and how visual design structures and shapes information through visual emphasis, hierarchies, and signs. The overall style of the device and service – how it presents itself, how users are treated, how interactions are happening, what language is used in user interfaces and instruction manuals – is analysed to decode goals, intents and motives.

3.6 Use

In the Digital, consumption has become a form of production: Use. A Use happens when a user provides input to and gets feedback from the Digital Machine. Uses describe how users interpret the user interface, interact with its suggestions, and react with behaviors and expressions.

Any Digital Machine has code-determined boundaries, setting limits and determining a space for human interaction. Individuals and groups use the possibilities and openings in this space to interpret meaning, to negotiate opportunities, and to create new behaviors and expressions. Analogous to “It is the viewers who make the meaning” (Sturken and Cartwright, 2001), it is the users who make the Use. Suggested uses are what software and interface designers had in mind: When you ‘follow’ a person suggested by Twitter or ‘like’ a posting suggested by Facebook, you act according to the intent of the Digital Machine. However, people also invent uses the medium was not originally designed for, such as rallying members for political dissent (Beaumont, 2011) or using the Facebook
profiles of dead people as a memorial sites (Ebert, 2014).

I call these uses user’s uses: they illustrate how users make a device or service their own, reinterpret it and invent new uses. User’s uses describe the difference between the intent and strategy of a Digital Machine and the interpretations and tactics of its users. With Certeau, strategy is the method of the powerful, planning courses of action based on ownership, while tactic is the method of the powerless who do not own, the art of improvisation by exploiting possibilities, glitches and uncontrolled spaces (Certeau, 1984).

There is a wide range of user’s uses to be found within the spaces of Digital Machines. For instance, people use mobile phones to enable social distance by turning the phone off, manage their own memory of a partner by saving voice mail, brand their relationships by designating a ring tone as “our song”, or try to overcome relationships by buying a new phone as part of a ‘new me’ (Gathmann, 2008). In social media, people make themselves look better with photo filters (Chua and Chang, 2016) or make themselves happier by accumulating more ‘friends’ than they actually have (Lönnqvist and Deters, 2016). With user’s uses, people use social media to trick themselves and others into believing that they are more beautiful, more popular, and more liked than they actually are.

There can be entire markets of use. For instance, the ‘follow’ function created a virtual market for ‘social capital’ that can translate into actual capital. With 400,000 to 1.5 million followers, ‘influencers’ can command 5,000 US$ for a post promoting a commercial product on Instagram (Chafkin, 2016).

Uses are analysed by observing user behaviors and user expressions as they unfold between the intent of the Digital Machine and the interpretation of users.

4. The next Digital

4.1: The Promethean slope

“...there are now in the world machines that think, that learn and that create.”
(Herbert Simon, 1957)

“I actually think that most people don’t want Google to answer their questions. They want Google to tell them what they should be doing next.” (Eric Schmidt, CEO of Google, in Jenkins, 2010)

For Guenther Anders (Anders 2002), the Promethean slope is an effect in which the factual constraints given by machines can at some point not any longer be cognitively and emotionally comprehended by humans.

With the increasing sophistication of Digital Machines, the inner workings of devices and services are increasingly hidden from view. Early machines could be recognized by way of their own limitations: Instrument panels with levers and buttons, waiting for human intent expressed in physical action, have been the interfaces of early machines. In the beginning of the digital age, computers could only be manipulated by writing code into a command line interface. A combination of peripheral hardware (the computer mouse) and an additional layer of programming for graphical interfaces eliminated the need to know code. With touch screens, the interaction with the elements on the screen became even more immediate. With gesture tracking devices and intelligent language processing interfaces, technology is not any more signified by its own limits: Personal assistants such as Amazon Echo only need a name to be uttered, followed by a question or instruction.
Humans use the same parts of the brain to interact with machines as they do to interact with humans and attach gender, racial or other stereotypes to machine voices just as they do to human voices (Nass 2007). Once the limits that signified technology disappear, humans do not know that they are interacting with technological devices and software.

The Japanese robot Paro, designed for senior citizens in homes for the elderly, simulates emotional affection so convincingly that it can make elderly people cry. Similarly, ‘followers’ can be recruited with ‘bots’, algorithms that search through online data such as Twitter and Instagram hashtags to add random ‘likes’ and comments, thus simulating personal engagement. People mostly do not realize that they are interacting with an algorithm:

“Except for a single user ...nobody ...seemed to mind the extra likes or comments (created by bots). In fact, most of them would respond immediately with comments of their own. “Thanks dude!” they’d say. Or they’d simply give me a “[Praying Hands emoji].” I got hundreds of comments like this.” (Chafkin, 2015)

The evolution of voice-enabled personal assistants leads to autonomous social agents, “evolving intelligent communicative machines that are capable of truly understanding human behavior” (Moore 2015). With emotion recognition - the analysis of facial expressions, words and tone of language – Digital Machines are able to understand the state of human emotions.20

We may have reached a point on the Promethean slope where the Digital Machine is ceasing to be a switchboard - it is becoming a Digital Machine persona. The Digital itself is about to be further intertwined with everyday human experience, to a point where its boundaries with perceived reality become blurred.21 The Digital is already a ‘natural’ environment22 for people connected to their smartphone 24 hours a day (Steeves, 2014). External devices with visible interfaces might eventually make place for direct connections to the brain, thus eliminating the border between the Digital and perceived reality.23

Once a Digital Machine has learned your habits and preferences, it could communicate on your behalf - with a friendly tone on the phone, in a business tone in emails with business partners. Digital designs and virtual realities could adapt in structure, shape and color to what individuals find most pleasing at the moment. Information could be presented with tones of voices modified to suit individual moods, study material could be presented to suit individual degrees of alertness, and entertainment could be preselected and generatively adapted for you by Digital Machines.

A Digital Machine persona can become a proxy of its user, engaging in complex conversations, making decisions and taking over a multitude of tasks humans find bothersome to do by themselves (Waters 2015). Deep learning processes, trained in social media Territories on the expressions and behaviors of billions of individuals, might predict larger patterns of behavior indicative of political trends and opinion shifts.

These developments create a double-edged sword. Already Doug Engelbart, the inventor of the computer mouse, asked if “the computer screen could be turned into a new method to enslave the user” or transformed into a means to “augment man’s intellect” (DeLanda 1991).

4.2: Digital innovation and design

Digital design is an activity with profound implications for society. Designs and technical operations operating in the background shape who we are and how we think, and technical configurations can limit human creativity (Lanier 2010). Designers of digital media and devices are working on the processes where new culture forms are inspired or discouraged.
Based on the reasoning in the previous paragraphs, I suggest these possibilities for innovation in the Digital:

- **New Transformations**: Here, we would look at new ways to enable Transformation - for instance, deep learning is a profoundly more effective process to transform and utilize data than conventional conditional logic.

- **New Territories**: This route would look at the space of potential or possible information to find and transform data and knowledge behind the ‘meaning horizon’ not yet utilized by other Digital Machines.

- **New Frames and Uses**: This route would look at the interaction of Users and Digital Machines. For instance, in KakaoTalk (paragraph 3.3), special emoticons extend the possibilities for the meaning making of users. Augmented Reality devices such as Microsoft HoloLens merge visible reality with projections of the Digital.

This is the question designers should ask with every project: What is it we are doing, and what does it do? I propose these considerations:

- **Transformation, Territory, Frame and Use**
  Driven by rapidly evolving technologies, digital design practice can find itself predominantly concerned with technicalities. Fundamental questions – to what ends a design is made, what kind of behavior it suggests and inspires, what effects it may have on individuals and groups, how it treats users and who is given control of the data it procures – can be overlooked. To gain a wider view on the social, ethical and economic implications of a design, its aspects in terms of Transformation, Territory, Frame and Use should be analysed and considered.

  Transformations should be designed to inspire, not to coerce, and code should be kept transparent; Territories should be built with ethical considerations in mind; Frames should be designed so that user’s uses can emerge; and finally, Uses are the actual result of the design (Gagliardi, 2001). They represent the needs and creativity of users and help designers to further develop their design.

- **User’s use**
  Designs and technologies can be biased by cultural assumptions (Gagliardi, 2001; Reed, 2014). Suggested uses reflect the biases of software designers, while user’s uses reflect actual needs and open opportunities. User’s uses reflect what people, by using something, make of it. Designers should intentionally open spaces of possibilities for user’s uses in order to allow the design to evolve. Features to inspire creativity and exploration should be integrated to promote innovative and creative uses.

- **Transparency**
  Digital Machines are moving across the Promethean slope, making it increasingly difficult for humans to detect where the actions of algorithms start and end. Humans use the same parts of the brain to interact with machines as they do to interact with humans. Web bots mimicking humans or robots designed to appeal to emotional needs are tricking users into believing that they are interacting with a living being. Also hidden algorithms pulling data in order to interfere in human social and emotional tasks - such as suggesting suitable acquaintances or ranking people in importance - are ethically questionable. The more pervasive interfaces and devices become, the more important it is to clearly designate which action was initiated,
analysed and completed by a machine. The reasoning of the Digital Machine should always be transparent.

4.3: Concluding thoughts

“We shape our tools and then our tools shape us.”
(Culkin 1967)

Society is going through fundamental shifts. Economies are being redistributed as Digital Machines shape activities, frame behavior and instill new cultural and social practices. Already 85% of people aged 16 to 17 are connected to their smartphones 24 hours a day. Our consumption of the Digital is the production of its Territories. These Territories contain more and more of the knowledge defining us as individuals. Across the Promethean slope, Digital Machines capable of sensing, learning and acting will confront us with the question of how to define our relationship with them. We need to ask whom we want to own the data we supply, and whom we want to control the Digital Machines which are increasingly intertwined with our lives.

The design of digital media is today often focused on the aim to accumulate the highest number of users. But there is more to the idea of the Digital. We need to create more exigent and more differentiated Digital Machines, more - in the sense of Deleuze and Guattari - digital versions of Einstein machines to inspire more creativity and better discourses.

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Endnotes

1 Software studies is a relatively new academic field asking questions on how cultural production is being changed by software (Manovic, 2008). It attempts to investigate “the way in which certain social formations are actualized through crystallization in computer code” (Berry, 2011, p.50). Meanwhile, different aspects of digital devices and services have been analysed by business studies (click-through effectiveness), sociology (usage of social media), media studies (‘conspicuous’ display of ratings) and philosophy (ontology of machines).

2 Popular understandings of ‘how the internet works’ appear to have been influenced by Manuel Castell’s ‘network society’ and ‘flow’ of information. Castells describes ‘flow’ as ‘purposeful, repetitive, programmable sequences of exchange and interaction’ (Castells 1996).

3 Computer science, concerned with defining and advancing its own field, is, perhaps necessarily, self-referential: “Computer science creates and modifies its own object of investigation. Computer scientists themselves develop formal models and description techniques for technical systems developed by computer scientists; they also develop ways of thinking about and evaluating the systems thus derived.” (Floyd et al., 1992).

4 Massumi explains: “A structure is defined by its thresholds—the relative limits within which it selects, perceives, and captures, more or less consistently.” (Massumi 1992, p.57)

5 Guattari states: “...This new notion of the machine now involves differentiating itself ...we have, instead, a machine that develops universes of reference - ontological heterogeneous universes...” (Guattari 1995)
This ecosystem is what Guattari calls a ‘mecanosphere’, different from the ‘biosphere’: “The mecanosphere draws out and actualises configurations which exist amongst an infinity of others in fields of virtuality.” (Guattari 1992)

A glimpse on the ‘chaos’ of meaning surplus was, perhaps, possible when the Internet was emerging in the early nineties: “The headless, anarchic, million-limbed Internet is spreading like bread-mold.” (Sterling 1992)

In the sense of design studies, we could also define a Digital Machine as constraints (see Gross et al, 1988) of Territory and Transformation containing a design space.

Both computer science and philosophy use the term “abstract machine”. In philosophical terms, an abstract machine is a “discursive factory” with its own logic. Deleuze and Guattari describe abstract machines as “abstract, singular, and creative, here and now, real yet nonconcrete, actual yet noneffectuated” (Deleuze and Guattari, 1988, p.511). They add that abstract machines are “always in emergence, virtual, and involved in constant variation” (Deleuze and Guattari, 1983, p.12).

A Digital Machine does not necessarily need human agents. In deep learning processes, lower-level algorithms, ’trained’ on data, create higher-level algorithms. These algorithms are able to act within complex ‘real life’ situations such as car traffic.

A machine is often consisting of other machines or mechanisms needed for its operation - see also Deleuze and Guattari’s notion of the ‘machine of machines’ (Deleuze and Guattari, 1993, p.505).

Facebook is a good illustration of the economic impact of Digital Machines. There was a net income of 10 billion US$ and an equity of 59 billion US$ in 2016 (10-K Annual Report. SEC Filings, Facebook. Retrieved February 19, 2017 from https://www.google.com/finance?q=NASDAQ%3AFB).

Certeau explains: “In reality, a rationalized ... production is confronted by an entirely different kind of production, called “consumption” and characterized by its ruses, its fragmentation, its poaching, its clandestine nature, its tireless but quiet activity, in short by its quasi-invisibility, since it shows itself not in its own products (where would it place them?) but in an art of using those imposed on it.” (Certeau 1984, p.49)

It follows the modus operandi of rational technics described by Certeau: “Rational technics... has its own mode of operation, that of legibility and distinguishing between functions...in such a way as to be able to transfer this image ... in cities or in machines. ” (Certeau 1984, p.196)

Certeau states: "The (technological) system in which (consumers) circulate is too large for them to be fixated somewhere, but too small meshed to escape it." (Certeau 1984, p.95)

Agents are defined in computer science as entity perceiving its environment through sensors and acting upon that environment through effectors (Russell and Norvig, 1995).

Ibid, p.49.

See also Gagliardi, 2001.

Certeau explains tactics as: "... clever tricks, ... polymorphic simulations, joyful discoveries, poetic as well as warlike.” (Certeau 1984, p.18) and explains their necessity; “...tactics wander out of orbit, making consumers into immigrants in a system too vast to be their own, too tightly woven for them to escape from it. “ (Certeau 1984, p.19)

Emotion recognition software such as Emotient, acquired by Apple in 2016, recognizes human emotions through facial expression analysis.

See Guattari’s ‘mecanosphere’ and ‘biosphere’ (Guattari 1992).

Human conceptions of nature are constructed “to include ... artefacts...or any entity endowed with defining properties such as ... a capacity to communicate.” (Descola 1996).

The Neuralink project is “....centered on creating devices that can be implanted in the human brain, with the eventual purpose of helping human beings merge with software and keep pace with advancements in artificial intelligence. These enhancements could improve memory or allow for more direct interfacing with computing devices.” Retrieved March 27, 2017 from http://www.theverge.com/2017/3/27/15077864/elon-musk-neuralink-brain-computer-interface-ai-cyborgs. A critical discussion of the Neuralink project by Slavoj Zizek can be found at https://www.youtube.com/watch?v=kZJSmUXeU6M

Having to keep pace with quickly changing technologies and standards, design practice is often occupied with issues concerning aesthetic and technical implementation framed in terms of computer science, itself a self-referential terminology.

See Steeves, 2014.

For Deleuze and Guattari, there is “the Einstein abstract machine, the Webern abstract machine, but also the Galileo, the Bach, or the Beethoven, etc.” (Deleuze and Guattari, 1988, p.511).