



HAL
open science

Discipline and Punish in the Digital Era : an analysis of GAFAM'S acquisition strategies

Maria Mercanti-Guérin, Christophe Bezes

► **To cite this version:**

Maria Mercanti-Guérin, Christophe Bezes. Discipline and Punish in the Digital Era : an analysis of GAFAM'S acquisition strategies. INEKA, Jun 2019, Verona, Italy. hal-02437427

HAL Id: hal-02437427

<https://hal.science/hal-02437427v1>

Submitted on 13 Jan 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Discipline and Punish in the Digital Era : an analysis of GAFAM'S acquisition strategies

**Maria Mercanti-Guérin
IAE de Paris, Gregor**

**Christophe Bezes
Istec**

Abstract

Purpose – This study aims to produce a clearer understanding of how surveillance has changed in our digital world and to shed light on the transformation of bodies targeted by GAFAM. Accordingly, it draws the parallel between the current digital society and that described by Foucault, first at a theoretical level, then at an empirical level.

Design/ methodology/ approach – A panel of 80 companies were selected from among the 1000 or so bought or created by GAFAM (Google, Amazon, Facebook, Apple, Microsoft) described according to their professional activities and their areas of specialization. A semantic corpus then allowed us to categorize each type of monitoring following the five types of body surveillance identified by Foucault, namely the disciplined body, the digitized body, the documented body, the augmented body and the immortal body.

Research limitations/implications – Although this study has its limitations – possible stretching of analogies in relation Foucault's theoretical work, the limited number of acquisitions studied –, it has the merit of making links between surveillance, data and the body.

Findings –Originality/value – This study shows that GAFAM's acquisition strategies are unquestionably body-centric and can be predicted. The body-centric strategies of each of the big five companies studied show very clear differences which are indicative of their distinctive positioning and discourses.

Paper type Research paper

Keywords: Body-centrism, GAFAM, Surveillance, Foucault, Acquisition strategy

1. Introduction

The conjunction, unprecedented in history, of financial resources greater than those of large states and the stated desire to master all the technologies of the future, raises the question of the transformation of human being by the dominant powers of the digital domain. For it is the human body, monitored, geo-located, analysed and digitized through the data it provides, that is subject to surveillance. The main objective of this massive data mining is to sell advertising space and services pertaining to marketing targets. Nevertheless, some authors such as Brayne (2017) point to the increasing use of data for health and safety purposes, such as recovery programmes and incentives to improve diets, engage in sports activities and respect the environment, with a view making people model citizens. The link between data and the transformation of bodies implies going beyond surveillance alone and being the vehicle for a political programme aimed at the advent of a new society.

Although many authors identify the reasons for surveillance and analyse its functioning and implications, none to our knowledge has provided a complete typology of body-based surveillance and its possible transformations. The present paper aims to make good this gap, using the analytic framework provided by Michel Foucault in *Discipline and Punish* (1995), a book that describes the surveillance society in France under Louis XV and the different ways bodies were disciplined by political power through violent forms of coercion. Foucault's work has inspired numerous studies on the formation of rules of conduct, forms of control and the shaping of behaviour (Pezet and Senechal, 2014 ; Jardat, 2005), but above all he is viewed as the philosopher of the human body. In Foucault's view, the individual is "a reality constructed by the specific technology of power known as discipline" (Potte-Bonneville 2012, p.196).

Thus identifying the correspondences between today's digital society and the one described by Foucault allows us to better understand the changes in surveillance implemented in a

digital world and to shed light on this transformation of bodies targeted by GAFAM.

The initial conceptual part of the paper revisits Foucault's text and constructs an interpretive grid so as to reveal correspondences between the disciplining of bodies in French society of the 18th century and the practices of the digital age. The second part empirically analyses 80 companies acquired or created by GAFAM over the last ten years. It draws up a typology of different forms of surveillance in the digital age and highlights strategies which we term body-centric and which vary considerably from one GAFAM company to another. These strategies are designed not only to monitor individuals, but also to transform and educate them and to change the body and its management. The third part of the paper discusses the findings, draws implications for management and considers avenues for future research.

Conceptual Framework

Disciplining people in every aspect of their lives

Surveillance goes further than simply capturing data for monetization purposes. The data captured also makes it possible to draw up the profile of a necessarily perfectible individual, that is to say, one able to provide even more data for better profiling (Bigo, 2006). In addition, technology advances the understanding of the Foucauldian concept of the monitored body by transforming it into an exploded body that is re-assembled in a different way. Haggerty and Ericson (2000) introduce the concept of "surveillant assemblage", based on monitoring processes in which information is extracted (or deterritorialized) from the human body and collected in data streams, and then processed (or reterritorialized) as "data doubles". In this respect Haggerty and Ericson (2000 and 2005) go beyond the panopticism described by Foucault. This extended post-panopticism, which is largely based on changes in surveillance offered by digital technology, reveals:

- that the link between surveillance and industrial capitalism has changed. Digital surveillance is no longer directed solely towards productivity gains;
- the generalization of surveillance to the whole population and not only to the lower classes;
- the hieratic, indefinite and borderless nature of digital surveillance;
- that surveillance is carried out both by government and by private companies;
- that surveillance is carried out by machines and no longer by humans. These machines

capture data streams and rearrange them. They produce hybrid structures from discrete observations.

Surveillance is a multiform concept extensively discussed in literature. Body transformation is not a central concern of this research (Table 1).

| | |
|--|---|
| Surveillance as a world platformization and emergence of virtual territories | The global platform economy is reshaping infrastructures, cities, services...Platforms are replacing roads, electronic lines and communication grids (Larkin, 2013 ; Graham and Thrift, 2007 ; Cowen, 2014 ; Parks and Starosielski, 2015 ; Berlant, 2016). |
| Surveillance as a new form of capitalism | GAFAM represent the ultimate step of capitalism. The Surveillance Capitalism is based on a political economic form, which Zuboff calls a “socially reciprocal capitalism” (Zuboff, 2019). |
| Surveillance as / and for data commodification | Intrusive advertising, consumer tracking are the economic core of GAFAM. Data Monetization implies increasing surveillance and enhanced monitoring (Greengard, 2012 ; Johnson, 2013 ; Tucker, 2012). |
| Surveillance as a service | IoT (Personal Assistants) sweetens the granular forms of surveillance in more private spaces and situations. Companies like Amazon bring a positive aspect of surveillance which cultivates a sense of intimacy and a new proximity between consumer needs and brand services (Day, 2018 ; Wu, 2018 ; West ; 2019 ; Grandinetti, 2019). |
| Surveillance as cultural trend | Social Networks like Facebook sit on “surveillance culture,” a culture in which watching and being watched is fundamental to individuals. (Partin 2019 ; Browne, 2015 ; Gillespie, 2010). |

Table 1 - GAFAM and Surveillance, an hydra-headed phenomenon

“Surveillance by GAFAM is an hydra-headed phenomenon that also includes the information economy, affective capitalism, the gig economy, the sharing economy, and many more, and while surveillance may be part of all of them” (Murakami Wood and Monahan, 2019).

Body Transformation by GAFAM is a theme that suffers from this same type of hybrid thinking. There is no integrative conceptualization of this research fragmented and focuses on studying body monitoring in a different way.

Application of an interpretive grid inspired by Foucault to digital bodies

Therefore, Discipline and Punish can provide a more unified vision of body transformation and digital surveillance. Five ways of treating the physical body identified from Discipline and Punish are central to the digital society: the disciplined body, the digitized body, the documented body, the augmented body and the immortal body (Table 2).

The disciplined body in the age of digital performance

Foucault's disciplined body corresponds to the control of work, and especially of time, in schools and factories in the nineteenth century. "Time measured and paid must also be a time without impurities or defects; a time of good quality, throughout which the body is constantly applied to its exercise" (p.151). Action is broken down into its constituent elements: each movement is assigned an evaluative framework (the position of the body, limbs, joints, etc.). The same relation to time is found in the digital world. The use of time is managed through applications pertaining to the individual's schedule or that provide reminders of upcoming events, with notifications sent every morning. The need to respond to requests within a given time period is similar to the "methods of temporal regulation" used in convents, barracks and hospitals (Foucault 1991, p.150). Corporate social networks define and evaluate the activity of employees by means of analytics that take into account the extent of each employee's contributions, KPI (Key Performance Indicators) and the use of salespeople's working time with the monitoring of customer contacts, distance travelled and sales figures by area.

The digitized body in the era of facial recognition

Discipline can only exist to the extent that there is knowledge of what is being disciplined. The practice of torture was formerly used to advance knowledge of the human body, since dissections could only be performed on convicts. The disciplined body was also observed and analysed to determine its compliance with orders. Foucault takes the example of military exercises as a field of observation of obedient bodies.

Likewise, the digital society also digitizes bodies for purposes of multiple surveillance. Human

digitization is the first step in facial recognition. Two Chinese companies seem to be the leaders in this particular market: Sensetime collaborates with the Chinese government, installing millions of cameras to ensure safety on roads and in public places, while Megvii specializes in payment security, especially for Alibaba. Digitized bodies then become data that can be studied through software such as Hadoop and cloud computing tools such as Microsoft's Azure HDInsight or Amazon's Elastic Compute Cloud.

Once digitized, bodies can be duplicated thanks to advances in cloning and bioprinting technology. In fact, printing a human body in 3D is now conceivable, just as it is possible to exchange bodies and faces, to paste faces onto other people's bodies, and to insert them into totally virtual environments.

The documented body in the age of Big Data

The documented body is a body that conforms to a classification in order to maximize its utility. Foucault emphasizes the importance of training in the production of these individuals who are classified and segmented and then subjected to increasingly complex exercises. His description of armies recalls the modelling of statistical data practised in the digital world.

The human being behind the data is incorporated into one or more segments whose representativeness over time will be examined. Advertising campaigns will mobilize so-called multi-contact strategies. Allocation of resources is a way of combining different forms of advertising in order to maximize their utility.

The use of data to describe people also recalls Foucault's documented individual. Everything is recorded, including their performance in the rites of passage constituted by exams. Exams may be likened to the documentary system of major e-commerce platforms in which merchants, consumers and prospects are evaluated, tracked and classified. Such training is also found in e- HR, where individuals are classified according to their profile, age, career and performance. Generalized assessment ranges from the 360° customer-supplier evaluation used by Uber to a comprehensive panorama of the characteristics of employees. Proof of this may be found in the growth of companies like SAP Success Factors based on "human analytics" or Workday that relies on human capital. Other companies, such as IBM's Kenexa, use cognitive analytics to detect the different skills or abilities needed by some of their customers. Kenexa offers tailored tests that draw on a huge amount of data to detect profiles with a strong customer focus. One of their main clients is MacDonald's, for whom this skill is crucial.

The augmented body in the era of ubiquitous technologies and bionic technologies

To illustrate the body augmented and replicated to infinity, Foucault refers to the royal army, with its 18,000 men honed in terms of strength, military skill and submission to authority. These machine-men are augmented by imitating the machine, thereby acquiring qualities they did not have before.

The augmented body is today no longer merely a concept but a real possibility. Progress in e-health, brain-computer interface prostheses, and genetic engineering are only a few lines of research that are leading to more robust and efficient or even entirely different individuals. The body is augmented by the replacement of its organs, the addition of new biological functions (technological hybridization through implants, prostheses, holographic helmets, etc.) and the use of nomadic or household devices (smartphones, portable audio players, smart home speakers, etc.). Human-machine hybridization is likely to result in post-human individuals that will be far superior to biological man, but will also carry monitoring devices inside their bodies. Identity and otherness are at the very core of the surveillance principles of the augmented body. Where does one's own self end and the other (machine, virtual entity, etc.) begin? As in Huxley's *Brave New World* this play of fuzzy borderlines will allow surveillance by a restricted elite that is not infinitely replicable.

The immortal body in the age of transhumanism

In the past, the immortal body was the prerogative of royal power. The royal function was regenerated in rituals in which power was passed from the dead king to his successor. In contrast, the body of the torture victim had to disappear completely. The boundary between immortality and total forgetfulness of someone's existence was therefore determined, according to Foucault, by the person's social position.

Yet the use of artificial intelligence alone makes it possible today to replicate anyone and assure them a form of immortality. Applications such as Replika will get to know the user during his or her lifetime and create a post-mortem digital clone that will continue to converse with the person's entourage; start-ups like Eternime create, from the data collected, intelligent avatars that interact with the family of the deceased. However, although digital technology has not yet defined a real policy with regard to death, many social networks and messaging services are working on digital death: Facebook asks us to choose a legatee; Gmail automatically turns off after a certain period of inactivity.

But as in the time of the kings of France, there are many indications that the immortal body

could eventually be reserved for a digital elite, which is likely to be the first, and perhaps the only one, to benefit from transhumanism. NBIC technologies – nano, bio, info, cogno – that have the ability to converge in many fields, generate many analogies with the four types of individuality described by Foucault – “cellular, organic, genetic and combinatorial” (p. 192). The analogies between digital death and physical death pave the way for more general thinking about biopower, in which public action governs the relations between human beings and their natural environment (Said, 2009), and the right to enable people to live on or to let them die. To summarize, the machinery identified by Foucault survives in the era of the digital processing of the body, most often using methods of managing docile bodies. Whereas surveillance was once organized for a specific purpose, dataveillance is:

- preventive. To influence, manage or control individuals or groups, it continuously collects and analyses data on humans and their environment (Bennett et al., 2014) ;
- underpinned by a humanist ethic. The emphasis on transparency and trust allows people to confidently entrust their data to actors who present themselves as champions of a new, more humanistic society (Van Dijck, 2014).

A digital post-panopticism, using complex forms of discipline and control, thus replaces the old panopticism (Nemorin 2017). It is no longer limited to the places identified by Foucault (schools, prisons, etc.), or even to the social networks frequented by the user or epidemiological surveillance of information posted on social networks. By means of the growing number of connected devices (electronic bracelets or badges that track movements, e-learning and its analytics, RFID, CCTV, biometric tracking, cameras, beacons) listed by Lupton (2014), it insinuates itself into spaces not previously subject to surveillance: smart cities, places of consumption (shops, shopping centres), places of leisure (museums, cinemas, restaurants), domestic spaces (homes), transport (cars, planes, etc.) or 4.0 modes of production (Ahmed et al., 2017). It also penetrates people’s private space, for example with connected medical devices.

This correspondence between the different digital bodies and the physical body (Table 2) justifies GAFAM’s interest in data management solutions for purposes of surveillance and transformation. It also seems able to explain the underlying objectives of GAFAM when they buy a company. Their acquisition strategies can be described as body-centric insofar as they seek to act directly on the body.

| | Processing of bodies (Foucault vs. the digital industry) | | | | |
|--|--|---|---|---|--|
| | Disciplined body | Digitized body | Documented body | Augmented body | Immortal body |
| Observations made by Foucault (1) | Control of activity | Hygienist surveillance Security surveillance Political surveillance | Segment and segmentation (Each individual is a case for Foucault) | Augmented through increasingly hard physical exercises Seen as human-machine (humans in the service of machines) | Immortality for the king Death and oblivion for offenders |
| Observations made in the digital market (2) | Redefinition of the body-object linkage | Hygienist surveillance Security surveillance Political surveillance Commercial surveillance | Individualization processing (Big data, one-to-one advertising, etc.) | Augmented through human-machine hybridization | Immortality for the digital elite The right to digital oblivion and death for all |
| Similarities between (1) and (2) | Movements and body-object relations are manifestations the disciplining of bodies. | Knowledge of the body is intended to facilitate surveillance. | Humans are the object of knowledge for the purpose of exercising power over them. They are classified and integrated into segments on which differentiated actions are carried out. | Bodies are seen as malleable and perfectible. | |
| Differences between (1) and (2) | | Surveillance is essentially political surveillance for Foucault. In the case of digital surveillance there are also commercial purposes: monitoring/tracking in order to generate clicks and conversions even though other forms of monitoring exist. | | Human-machine hybridization has objectives other than increased performance. The repair of impaired bodies is one of the major advances in digital technology (exoskeletons, digital retinas, digital modelling of organs). Machines are at the service of humans, not the reverse. | Death is the ultimate sanction for the rebellious: physical and social death. Death can be conquered by technology. To die becomes a right (physical death, digital death). |

Table 2 – Grid for analysing the processing of bodies according to Foucault and analogies with digital surveillance

Methodology

The CB Insights international database includes a monitoring platform that analyses press articles, patents, websites, financial communications, executive interviews, and so on. Drawing on Big data, CB Insights provides market typologies and constructs predictive models for forecasting major trends on the basis of weak signals. A panel of 80 companies were selected from among the 1000 or so bought or created by GAFAM, described according to their professional activities and their areas of specialization (Appendix 1). A semantic corpus then allowed us to categorize each type of monitoring following the five types of body surveillance identified by Foucault, namely the disciplined body, the digitized body, the documented body, the augmented body and the immortal body. For this, data from the various websites of the companies on the panel were mined with the help of the referencing tool SEO Quake. This tool allowed us to carry out density analysis of the most frequently used words on each web page. The entire corpus thus constructed was processed using Tropes software, allowing us to extract a corpus of more than 2400 words, from which we were able to:

1. Better describe the fields in which these companies operated;
2. Analyse through their website presentations their positions according to the five defined body types (disciplined, digitized, documented, augmented, immortal);
3. Focus on certain concepts related to surveillance.

Reference universe

The entire corpus was first processed in order to determine reference universes (sectors and businesses in which these companies operate) which group together in classes of equivalents the main words/themes of the text analysed (Figure 1).

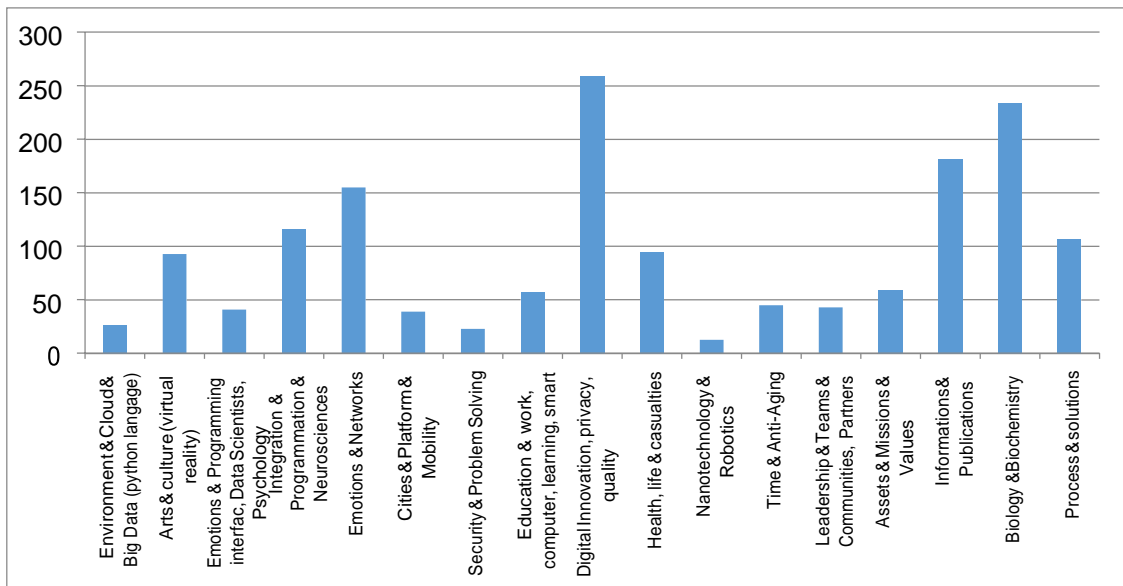


Figure 1 - Universe of the panel companies

The analysis of the universe of reference updates two main corpora describing aims:

- The most important concerns digital innovation, privacy and the quality of products and services. The companies studied present innovation as respecting privacy and enhancing the well-being of the users of these solutions. Communication focuses on the benevolence of technological innovation;
- The second is centred on biology and biochemistry. The most innovative projects or those requiring the most explanation or the most effort to make transparent are related to these themes with their development focussed on health and the fight against cancer.

The other corpora focus on the means implemented to achieve these aims:

- The internal mechanisms and purposes of structures. Much emphasis is placed on the pedagogy of research projects (partnership with scientific circles, scientific publications) and on processes (modes of organization, agility, creativity), assets, missions and values.
- Sector corpora (nanotechnologies, arts and culture, robotics, education, city management, security, environment, etc.) reveal the extent of GAFAM's hold. Some technologies are intrinsically linked to specific sectors, namely virtual reality and culture, Big Data and the management of environmental issues, etc.
- The importance of emotions, present in two corpora, namely technologies allowing them to be detected and categorized as well as their social dimension (emotions and social networks).

Classes of equivalents

The references used are grouped in equivalent classes, common names and proper names having

a similar meaning. Classes of equivalents are thus constituted according to the nouns used by the websites of the companies in the panels. The main classes of equivalents are all interrelated and cover six themes (Table 3).

| Time | Science | Computing | Business | Device | Communication |
|---|--|---|---|--|--|
| Language Perception Body Work Control | Education Behaviour Health Social networks Social well-being Nature | Language Health Production Photography, video Environment Education | Tracking Health Transport and energy Education Security | Security Tracking Social networks Education Body | Production Education Transport World Security Language Social networks Localization |

Table 3 – Panel company themes

The theme of time is omnipresent in the products and services marketed by GAFAM. Time is seen as an indispensable aspect of classification, a resource to preserve and a means of control. Time is key variable in the classification of data, algorithmics or tools for the identification and management of products, stock or location as well as in measuring periods of digital activities (web analytics in particular). It also plays an important role in the perception of the environment. The word “story” is often emphasized as a means of understanding people and tracking their activity, especially on certain social networks. Time is viewed as a resource that is saved through digital technology (the items “gain time”, “save time”, “go faster” frequently occur). Finally, time plays a part in exercising control over the body and work. Regarding the body, the items “notifications” and “counters” (of calories, of the number of steps taken depending on the time of day) are often mentioned in the presentation of connected objects. The “quantified self” is based more than anything else on the division of time (activity, rest, sleep, etc.). As regards work, the items emphasized are planning, schedule, project and agility, this last being one of the ways of adapting to temporal constraints.

Science is apprehended in its entirety, with, among others, biology, computer science, neuromarketing, and psychology being mentioned. Emphasis is placed on machine learning, algorithmics, human-machine interaction, robotics, etc. Laboratory concepts, research centres, innovation departments, international collaborations among researchers, and scientific publications allude to the creation of genuine life science universities. Social networks are presented as bringing together experts in communities of practice. Health, nature, education, behavioural sciences are incorporated into projects that emphasize human and animal welfare, and to a lesser extent corporate social responsibility.

Always at the heart of GAFAM's activity, IT and its various branches appear through the following key words: Internet, software, various programming languages, servers including the Apache http server, computer, databases, cookies, etc. The term environment is taken in the sense of computer environment (hardware, system software). However, we also find topics related to reference class 2 (health, environment, education). As well as these themes there are numerous references to the capabilities of GAFAM to digitize the outside world, with a disproportionate number of items related to photography, video and its corollaries (geolocation, plans, data visualizations).

The thematic field "Business" broadly covers the activities of GAFAM through the various sectors its constituent companies are involved in:

- consumer tracking and related activities: e-commerce, advertising;
- health, especially nanotechnology and the fight against aging and cancer;
- transport and energy, with the emphasis on autonomous cars but also on research in renewable energy (microgrids in particular) and pilot projects for Internet access in developing countries;
- education, with learning analytics, Big Data, artificial intelligence, academic cooperation, and in conjunction with certain governments as regards training;
- security, for the most part IT security with the security of exchanges, data, clouds and turnkey solutions offered to companies.

The "Device" field mainly concerns mobile phones and operating systems. Such devices are essential for consumer tracking, quantified-self applications and the use of social networks. Devices are frequently mentioned in the field of education (training via iPad, mobile applications, etc.)

The "Communication" theme is both a meta-category, because it includes all the Business categories (including GAFAM's communication and advertising activities), and a category in its own right, since GAFAM includes, in each of the services presented, descriptions of the teams and of the values and culture of their entities.

Analysis of semantics related to different types of body

Focusing on semantics related to the body and the person, we categorised the companies in the panel according to the five types of bodies identified in Table 2. Some companies belong to several corpora (see Appendix 1).

The corpus for the disciplined body includes companies that market tools pertaining to time management, productivity monitoring at work, and the quantified self, with injunctions on the need to play sports, get enough sleep or lose weight. The most frequently mentioned words

belong to the semantic field of time. Indeed the control of time is the primary element of the disciplining of the body. The notion of education (Figure 2) is also emphasized, and is closely linked to the semantic field “quantity”, which includes trackers of physical activity, such as the number of steps taken or kilometers walked, the number of calories used, etc. Education is related to feelings and entertainment. The ludic component of training is also represented by play (Figure 3). Finally, the social aspect is encouraged – with incentives to share scores with friends –, as well as the personalization of training through “stories”, which are also ways of reporting on the individual’s progress or performance (Figure 4)

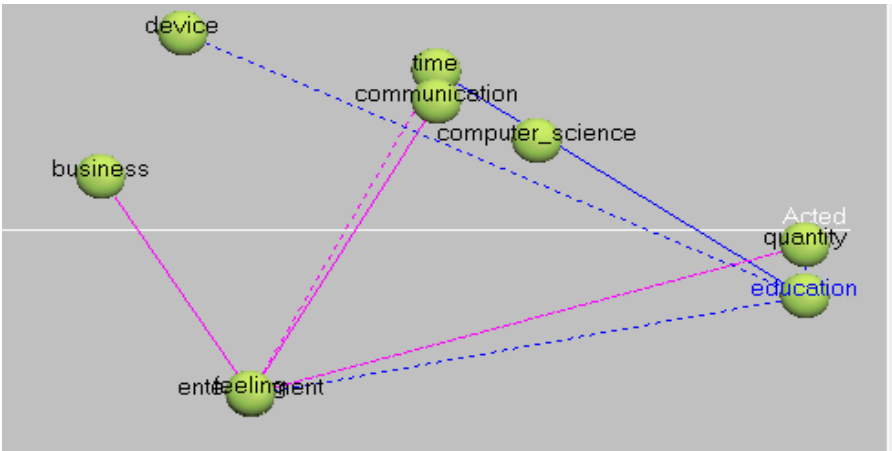


Figure 2 – The disciplined body (education)

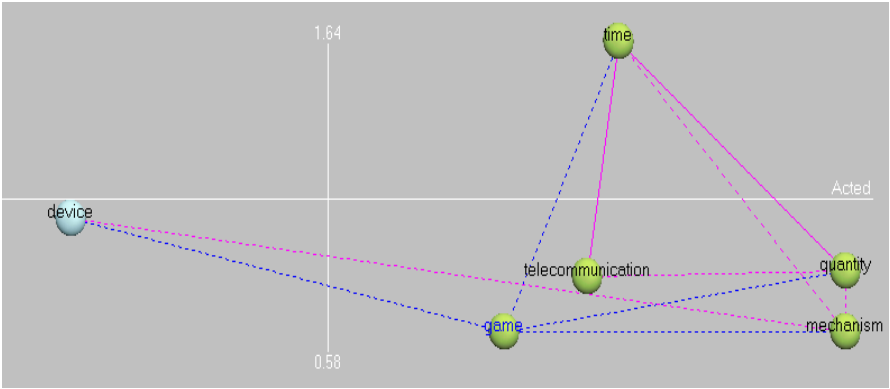


Figure 3 - The disciplined body (play)

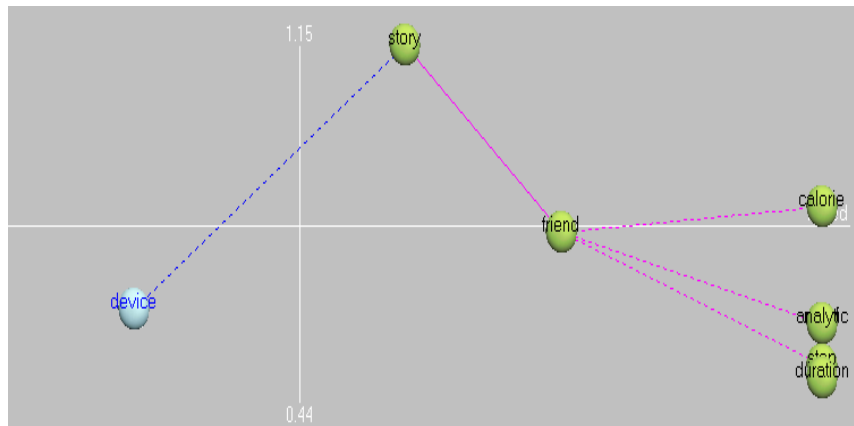


Figure 4 - The disciplined body (social sharing)

The digitized body concerns companies that provide better knowledge of the body as a whole and work in the area of health (DNA, neuroscience, etc.), the interpretation of emotions, and the tracking and geolocation of consumers. This corpus largely focuses on explaining the businesses of these different companies, their forms of collaboration, fundraising, and partnerships with investment funds and universities. Many define themselves as start-ups, which suggests that the digitization of bodies is a high-investment activity that has yet to reach full maturity in terms of development (Figure 5). The areas of application of the digitized body are very broad, with a central corpus represented by health, psychology, cognitive science and everything related to affect, facial recognition and photography.

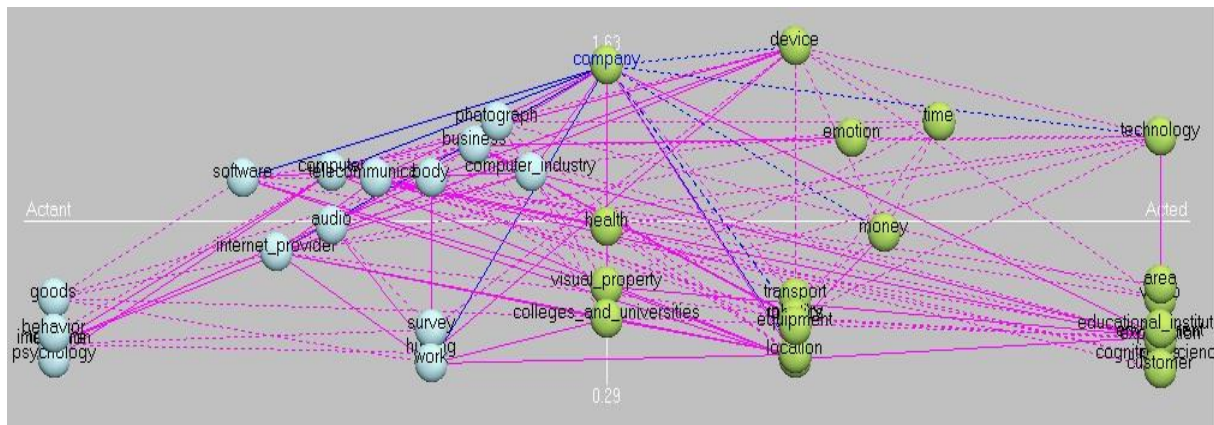


Figure 5 - The digitized body (the digitization industry)

The documented body concerns companies whose objectives mainly involve marketing: establishing precise typologies of consumers and producing relevant segmentations. They are identified as publishers and media operating on a global scale (Figure 6).

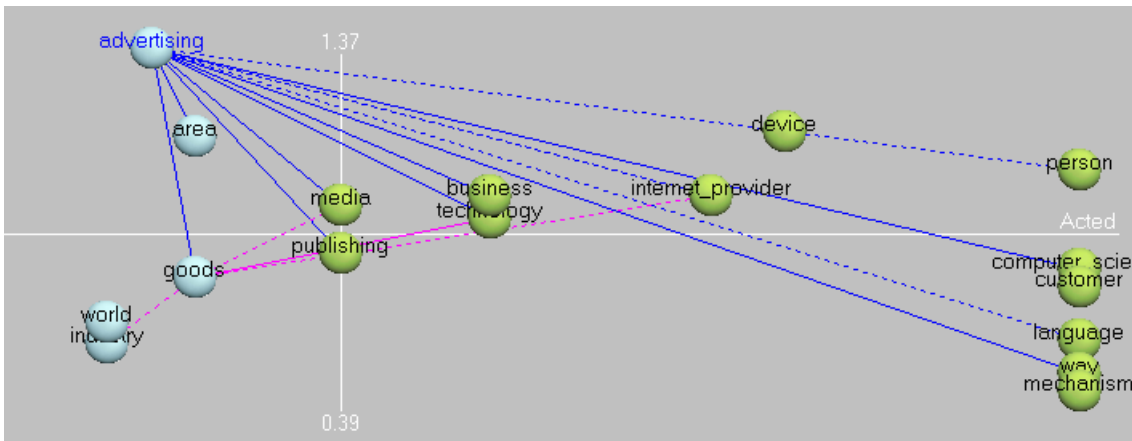


Figure 6 - The documented body (the advertising industry)

The augmented body concerns companies working in industry 4.0, but also robotics, neuroscience, virtual reality and artificial intelligence (AI). Companies providing virtual assistants also fall within this corpus. The augmented body seems to be the major challenge for the coming years: the words “vision”, “future” and “challenge” are over-represented. But the items that best represent it seem disconnected from individuals and even consumers, as if this augmented body was destined to be a substitute body. The link with human beings comes through careers and the search for new skills in the field of AI and machine learning in particular (Figure 7).

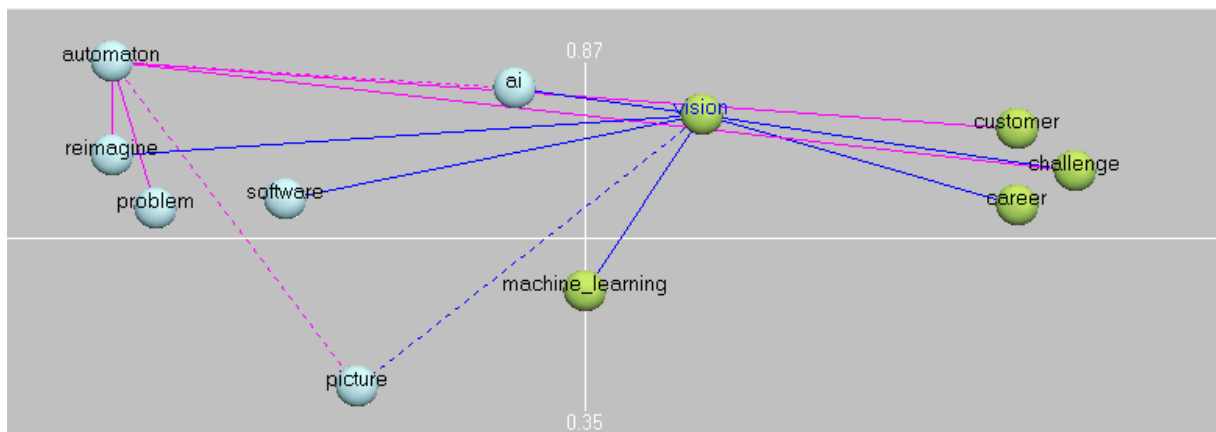


Figure 7 - The augmented body (the artificial intelligence industry)

Finally, the immortal body brings together companies working in the field of health and particularly the fight against aging, molecular and immunological research, and chemistry. We did not identify any references to transhumanism among the companies comprising the panel. The overcoming of death is addressed only as a fight against disease. We also noted a co-occurrence of means between computer science and biology (Figure 8).

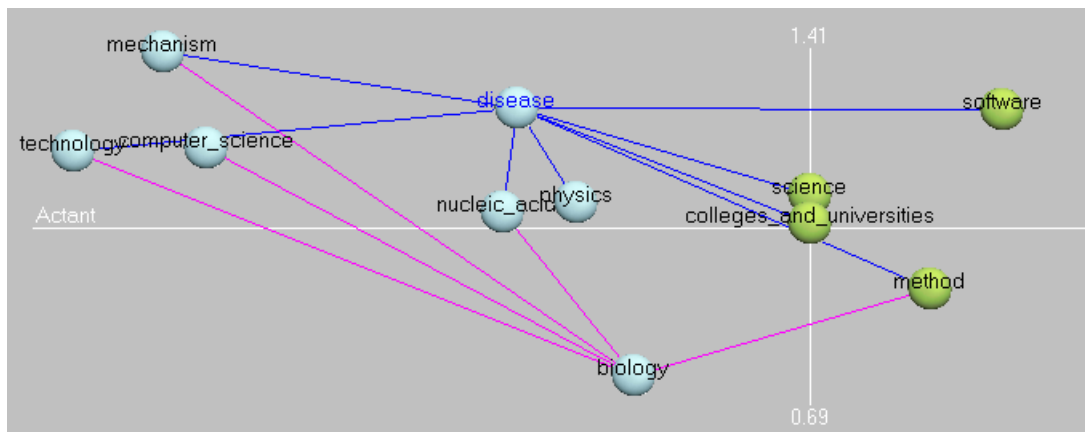


Figure 8 - The immortal body (the bioinformatics industry)

Results

The body-centric strategies of each of the big five companies

Very clear differences are apparent between the five companies studied (Google, Apple, Facebook, Amazon and Microsoft), which are indicative of their distinctive positioning and discourses. All five companies emphasize their ethical behaviour (Google's motto "Don't be evil", Facebook's "Bring the world closer together", Microsoft founder Bill Gates's promotion of worldwide vaccination, etc.). These statements of intent are all related to how GAFAM positions itself in relation to bodies.

Google or the digitized and immortal body

Google demonstrates its desire for social improvement through its "Don't be evil" positioning (changed to "Do the right thing" following its restructuring under Alphabet in 2015), in relation in particular to end-of-life management, social assistance, disease control, seniors, the medical profession and genomics (Figure 9). We also detected special attention paid to identification and security. Google was one of the first companies to have launched the "User ID", allowing it to track anyone with gmail on any device and geolocate them accurately (Google Maps). Originally designed for advertisement targeting, User ID is representative of Google's desire to digitize bodies and their production. Its policy of reviewing cultural works through the launching of numerous applications around painting and literature is also illustrative of this ambition.

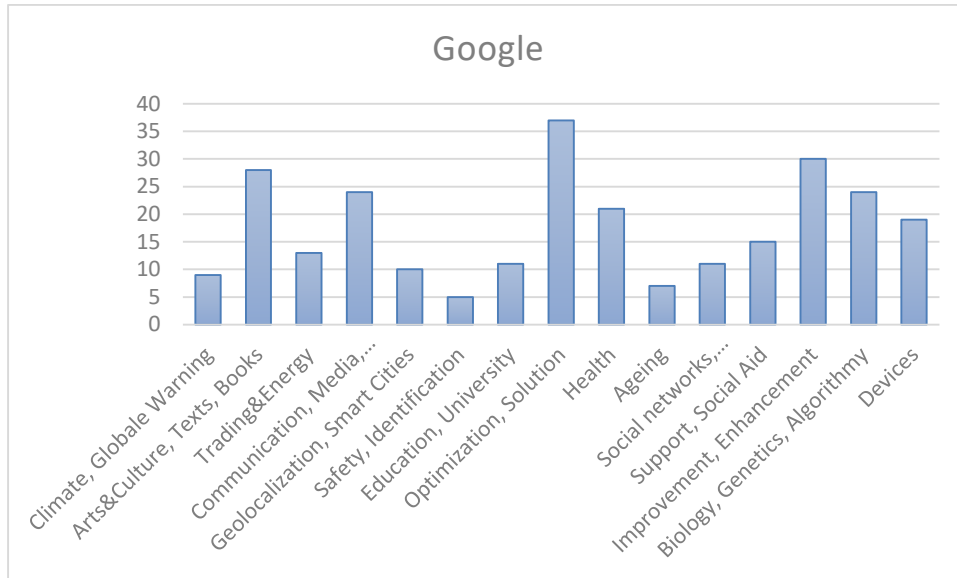


Figure 2 – Google’s themes and acquisitions

Apple or the digitized body

In the case of Apple, the over-representation of the services, supports and new concepts category illustrates its desire to create new devices that meet the expectations of its users and to present itself as the champion of innovation in terms of use and design. The second main category concerns robotics, biology, electronics, mathematics, followed by connected objects, connected homes, etc. (Figure 10). These observations are consistent with Apple’s investments in this area. For example, Apple recently launched a software update for its iPhone that includes a feature called Health Records, which will allow users to view, manage, and share their medical records with hospitals and clinics.

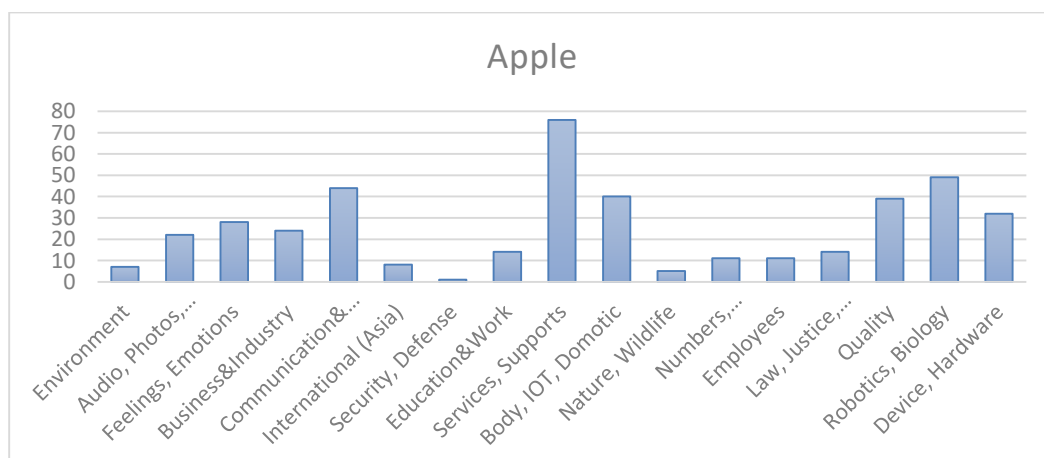


Figure 3 – Apple’s themes and acquisitions

Facebook or the disciplined body

As regards Facebook, the over-representation of the “communication, media, social networks” category is consistent with its core business. More surprising is the number of occurrences related to sport (Figure 11). In fact Facebook is increasingly making available live transcripts of sports events and has acquired a number of start-ups related to this sector. The disciplined body (involving social sharing) emerges as a priority development axis. At the same time, intensive communication is taking place in relation to privacy, in an attempt to recover from the various scandals that have affected the company in recent years.

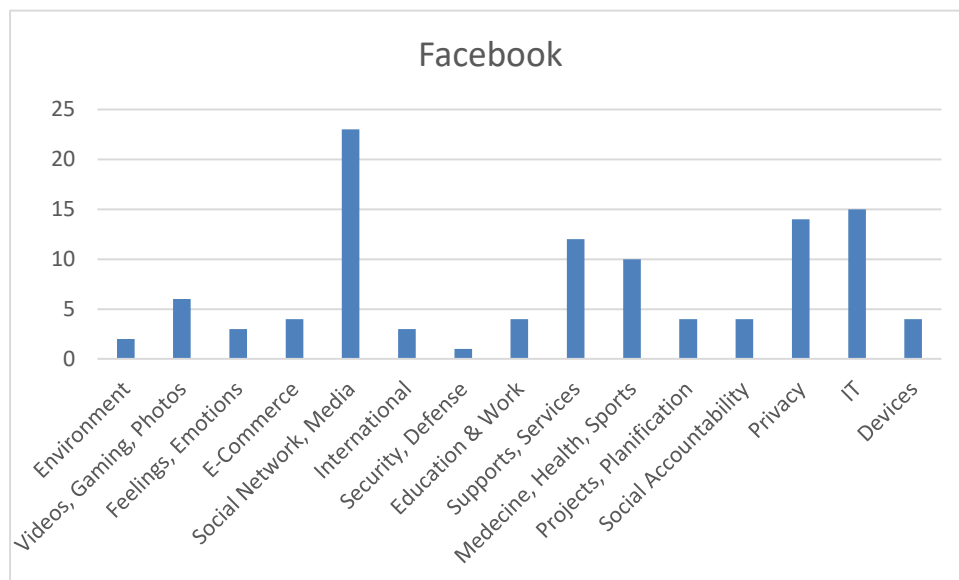


Figure 11 – Facebook’s themes and acquisitions

Amazon or the augmented body

Amazon’s over-representation in the “services, media” and “product quality and performance” categories are in line with its positioning, which is focused on the quality of services and products, while the salience of the “computer, robotics and AI” category demonstrates its ambitions to become one of tomorrow’s leaders with regard to the augmented body (Figure 12).

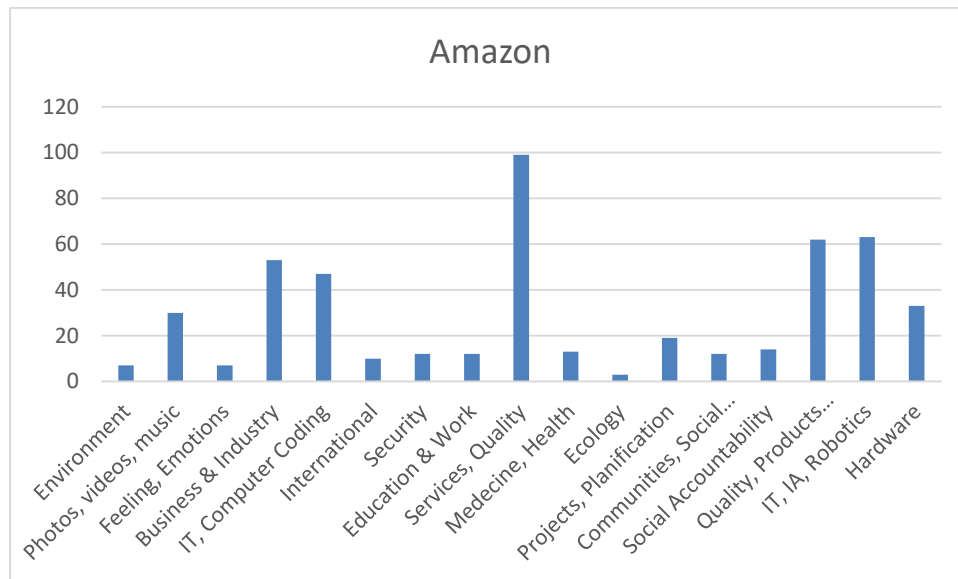


Figure 12 – Amazon’s themes and acquisitions

Microsoft or the disciplined body (education and games)

Microsoft’s corpus is by far the smallest since most of its acquisition are simply absorbed, and lose their social personality and the ability to communicate on their own outside the Microsoft galaxy. In this respect, Microsoft’s acquisition strategies are less tentacular and suggest a decoupling of this group from the other GAFAM companies, rather like what IBM experienced some thirty years ago. Nevertheless, the corpus analysed shows that Microsoft focuses on the disciplined body through education and video games (Figure 13).

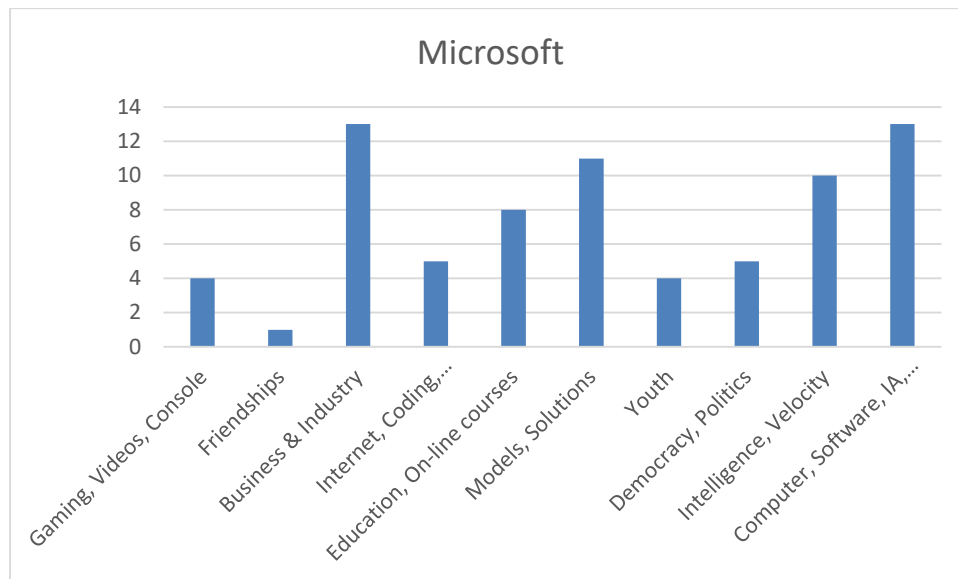


Figure 13 – Microsoft’s themes and acquisitions

Discussion and conclusion

New information technologies give rise both to fascination and to concern. On the one hand, they free people and enable them to be more efficient. The key word is “free”:

- as in free of charge, since customers are not obliged to pay for seeking information online, because their doing is indirectly profitable through advertising;
- as in unrestrained, since in theory customers are able to emancipate themselves from all previous forms of control.

On the other hand, these technologies alienate people and make them dependent by controlling them further (Mick and Fournier, 1998). Lupton (2016) emphasizes the non-consensual aspect of much of digital surveillance, through cameras and productivity tools in the factory or office, which are surveillance tools imposed on people. However, in this age of connected objects and smart cities, the literature places much more emphasis on the Internet’s ability to free individuals (Porter and Heppelmann, 2014) than on how they can be controlled by means of algorithms. In drawing on Foucault’s thinking, our study shows that the digital age has not abolished the surveillance mechanisms used in 18th century society, but has, on the contrary, perfected and industrialized them.

Theoretical implications

This research provides a better understanding of the mechanisms and types of surveillance used in the digital world.

Although for Foucault the body is disciplined very much by coercion, in the digital world it is a matter of voluntary constraint, through play, social sharing (and therefore mimicry) and a variety of applications, some of which provide entertainment. This essentially hygienic surveillance nevertheless gives rise to questions. For example, the alliance of Big Data and insurance revolutionizes this market and, paradoxically, endangers it. Indeed, Big Data allows for better pricing of insurance products because the asymmetry of information to the detriment of the insurer is reduced by a mass of information on customers' behaviour. But prospective behavioural algorithms challenge notions of segmentation and pooling, in favour of "actuarial pricing" of risk (Thourot, Nessi and Amet  p   Folly, 2015). Risk is theoretically no longer insured, either because it disappears or because bodily failure is predicted and measurable.

The digitized body encompasses security surveillance based on biometric recognition. Digital identity is subdivided according to the different bodily attributes. As Foucault points out (p.156), "Disciplinary power has as its correlative an individuality that is not only analytical and cellular, but also natural and organic". In our study, the predominance of items pertaining to recognition of the emotions seems to correspond to Foucault's account and represents an important stage in the digitization of bodies.

For the time being, the documented body is mainly practised by companies that derive their revenues from advertising and e-commerce. The aim of commercial surveillance is to make people purchase more by systematically transforming the individual into a consumer. In this respect, it differs from the prison society described by Foucault, which combatted illegalism while preserving the commercial and industrial apparatus of fraud, theft or violence, which could hamper it. Note, however, that commercial surveillance is an integral part of the media industry and appears to be global. Work on information brings GAFAM closer to the world of politics, as Edward Snowden's revelations of NSA practices have convincingly shown.

The augmented body is a body whose *raison d'  tre* could, in the long term, be threatened by robotization. Indeed, the replacement of occupations and jobs by artificial intelligence aligns itself with Foucault's portrayal of the advent of biopower, which is already visible today in bioinformatics companies that are working on the immortal body.

Nevertheless, in Foucault, control is inherently imperfect because it is partial. This relative weakness of the capacity to control is complemented by the notion of governmentality, which is why some digital entrepreneurs are promoting models of liberal society based on self-

regulation and total individual autonomy, and even on the end of the state itself. Loveluck (2015) speaks of a new governmentality that would free itself from capture by platforms such as Google or Amazon and would practice dispersion (the deconcentration of information flows) and self-regulation (stimulation of collaborative forms of exchange and open-source code). However, in the digital society, control is becoming ever more effective and governmentality is increasingly in partnership with states, but without taking into account their legislation, or even while opposing these very states. The different forms of surveillance intertwine politics, commerce and security in a unified management of the traces that individuals leave on the Web (Sadin, 2015). In the apt words of Tristan Harris, creator of the NGO Time Well Spent, “a handful of people influence the opinion of a billion people.”¹⁴ However, the political project is still very much related to the actors’ area of specialization: communitarianism for Facebook, linking people and transmitting information for Google, entrepreneurship and liberalism for Apple, advocacy of total deregulation for Amazon, and the use of data to manage and forecast the state of the world for Microsoft.

Practical implications

Our empirical study clearly highlights this body-centric specialization by the GAFAM actors, including in their acquisition strategies. Thus some groups seem to be investing primarily in activities that contribute to a single type of surveillance (the digitized body for Apple, the disciplined body for Facebook and to a lesser extent Microsoft, the augmented body for Amazon), while Google appears to have the most diversified strategies (the digitized body and the immortal body). In any case, all their acquisition strategies are totally focussed on control of the customer, and not on control of the product.

Our research allows us to decode and, to a certain extent, to predict future acquisition strategies. In both these respects, it can help research around strategy, which seems somewhat at a loss when analysing and predicting GAFAM strategies, in that these appear to be unstable, dependent on their stage of development (Gawer and Cusumano, 2014; Lairo, 2018), opportunistic in warding off threats (Uhlenbruck et al., 2017), and mimetic.

GAFAM acquisition strategies are often viewed as motivated by the elimination of future competitors and mastering major innovations in the new technology market (Berrebi and Lorenzi, 2017). They focus on companies that have strong technological assets, so as to enrich their portfolio of existing offerings (Benitez-Amando and Ray, 2012), stimulate the innovation process by integrating promising engineers (Puranam and Srikanth, 2007; Coyle and Polsky, 2013; Sawicki, 2016; Lairo, 2018) and enter new markets.

Their strategies, which we term body-centric, extract a set of data from their customers that they reprocess, monetize or use to improve not only human beings (Wang et al., 2018) but also machines by means of artificial intelligence.

They also make it possible to construct a closed ecosystem around the individual. The objective of monitoring and modifying bodies is, however, never mentioned by GAFAM management, who put forward many other arguments to justify their acquisition frenzy. Yet the empirical study that follows shows that GAFAM acquisition strategies are unquestionably body-centric.

Future research and limitations

Although this study has its limitations – possible stretching of analogies in relation Foucault's theoretical work, the limited number of acquisitions studied –, it has the merit of making links between surveillance, data and the body. It thereby opens up three promising fields of investigation.

The first of these concerns the privatization of control. A genuine power to sanction is ever more directly provided by the actors of the Web, which are in effect taking over from government, which itself has become powerless to combat advertising fraud or fake news and to protect intellectual property. This scenario raises the question of the pre-eminence of the individual in relation to platforms. If control, which hitherto was the prerogative of government, has today become the prerogative of the private companies, this situation is, according to Lupton (2016), necessarily temporary and will lead to another model of surveillance. Such a model would then be a hybrid combining the state, platforms and citizens.

The second line of research concerns digital coercion, which gives the illusion of being soft and controlled by individuals themselves. By analysing the surveillance mechanisms drawing on Big Data, Brayne (2017) shows that the tolerance thresholds below which people's actions are deemed to be substandard are constantly being lowered. The partisans of the quantified self, known as data-fetishists, who fully entrust the management of their bodies or time to applications, have surrendered their free will (Dormehl, 2014). In any case, even the most successful algorithms fail to fully record the complexity of the different reactions of the human body. Measurable categories – weight, physical activity, time spent asleep – include a large measure of subjectivity, because they are linked to normative objectives such as losing weight, running, sleep, etc. In contrast, Sharon and Zandbergen (2017) describe resistance mechanisms developed by quantified self-enthusiasts, who want to construct communities of individuals sharing the same passions (e.g. running) and seeking to navigate, arrange and give meaning to an increasingly datafied world.

The third track concerns digital surveillance and bio-capital. Bio-capital (Rajan, 2006) is a concept in the process of clarification that needs to be more clearly distinguished from bio-value (Waldby, 2000) and bio-economics (Rose, 2001), in that it takes into account the data produced by the human body. As Lupton (2016) points out, data assemblies configure an ideal body while constantly finding out more about the observed body. The value of data increases with the emergence of the capitalization of the human body. This track needs to better integrate Foucault's thinking around bio-power (Rabinow and Rose, 2003). Indeed, this bio-power will take charge of the life, no longer of souls, but of humankind, with on one side the body (in order to discipline it) and on the other the population (in order to control it), the feature common to both the body and the population being the statistical norm. However, in the digital age, the norm is manifestly the site of conflicts between platforms, states and citizens.

References

- Ahmed, E., Yaqoob, I., Hashem, I.A.T., Khan, I., Ahmed, A.I.A., Imran, M., Vasilakos, A. V. (2017), "The role of big data analytics in Internet of Things", *Comput. Networks*, Vol.129, pp. 459– 471
- Benitez-Amado, J., & Ray, G. (2012),"Introducing IT-enabled business flexibility and IT integration in the acquirer's M&A performance equation", *ICIS 2012 Proc.*
- Bennett, C. J., Haggerty, K. D., Lyon, D., and Steeves, V. (2014), "Transparent lives: surveillance in Canada", Athabasca University Press, pp.7-20.
- Berlant, L. (2016), "The commons: Infrastructures for troubling times. Environment and Planning D", *Society and Space*, Vol. 34 No.3, pp.393-419.
- Berrebi, M., & Lorenzi, J. H. (2017), *L'avenir de notre liberté: Faut-il démanteler Google... Et quelques autres ?*, Editions Eyrolles, Paris.
- Bigo, D. (2006), "Security, exception, ban and surveillance" in Willan (Ed), *Theorizing Surveillance*, New York, NY, pp.60-82.
- Brayne, S. (2017), "Big data surveillance: The case of policing", *American Sociological Review*, Vol. 82 No. 5, pp. 977-1008.
- Browne, S. (2015), *Dark matters: On the surveillance of blackness*, Duke University Press.
- Cowen, D. (2014), *The deadly life of logistics: Mapping violence in global trade*, University of Minnesota Press.
- Coyle, J. F. and Polsky, G. D. (2013), "Acqui-hiring", *Duke LJ*, Vol 63, pp. 281.
- Day, M. (2018), Amazon's Alexa Recorded and Shared a Conversation Without Consent, Report Says. The Seattle Times, available at <https://www.seattletimes.com/business/amazon/amazons-alexa-recorded-and-shared-a-conversation-without-consent-report-says/> (accessed May 2018).
- Dormehl, L. (2014), *The Formula: How Algorithms Solve All our Problems ... and Create More*, Penguin, New York, NY.
- Foucault, M. (1995), *Discipline & Punish. The birth of the prison* (Translated by Alan Sheridan), Second Vintage Books Editions, Random House Inc., New-York, NY.
- Gawer, A. and Cusumano, M.A. (2014),"Industry platforms and ecosystem innovation", *Journal of product innovation management*, Vol. 31 No. 3, pp.417-433.
- Gillespie, T. (2010), "The politics of 'platforms'", *New media & society*, Vol. 12 No.3, pp.347-364.
- Graham, S. and Thrift, N. (2007), "Out of order: Understanding repair and maintenance. Theory", *Culture & Society*, Vol. 24 No.3, pp.1-25.
- Grandinetti, J.J. (2019), "Welcome to a New Generation of Entertainment: Amazon Web Services and the Normalization of Big Data Analytics and RFID Tracking", *Surveillance & Society*, Vol. 17 No.1/2, pp.169-175.
- Greengard, S. (2012), "Advertising gets personal", *Communications of the ACM*, Vol. 55 No. 8, pp.18-20.
- Haggerty, K. D. and Ericson, R. V. (2000), "The surveillant assemblage", *British Journal of Sociology*, Vol. 51 No 4, pp. 605–622.
- Haggerty, K. D. and Gazso A. (2005), "The public politics of opinion research on surveillance and privacy", *Surveillance & Society*, Vol. 3 No. 2/3, pp.110-120.
- Jardat, R. (2005), "Stratifier / modéliser. Une archéologie française du management stratégique 1959-1976", *Étude par la méthode archéologique de Michel Foucault*, Thèse présentée en vue de l'obtention du Doctorat en Nouveau Régime en Science de Gestion Conservatoire National

des Arts et Métiers, Paris.

Johnson, M. (2013), *The body in the mind: The bodily basis of meaning, imagination, and reason*. University of Chicago Press.

Larkin, B. (2013), "The politics and poetics of infrastructure", *Annual review of anthropology*, Vol. 42, pp. 327-343.

Luiro, A., (2018), "Why do platform leaders acquire? A multiple case study of Google, Apple, Facebook, and Amazon", working paper, Aalto University, School of Science Degree Programme in Industrial Engineering and Management, 2018.

Lupton, D. (2015), "Quantified sex: a critical analysis of sexual and reproductive self-tracking using apps", *Culture, Health & Sexuality*, Vol. 17 No. 4, pp. 440-453,

Mick, D. G., & Fournier, S., (1998), "Paradoxes of technology: Consumer cognizance, emotions, and coping strategies", *Journal of Consumer research*, Vol. 25 No 2, pp. 123-143.

Nemorin, S. (2017), "Post-panoptic pedagogies: The changing nature of school surveillance in the digital age", *Surveillance and Society*, Vol. 15 No. 2, pp. 239-253.

Parks, L. and Starosielski, N. (2015), *Signal traffic: Critical studies of media infrastructures*. University of Illinois Press Editions.

Partin, W.C. (2019), "Watch Me Pay: Twitch and the Cultural Economy of Surveillance", *Surveillance & Society*, Vol. 17 No 1/2, pp.153-160.

Pezet, E. et Sénéchal, J. (dir.) (2014), "Normes juridiques et normes managériales, Enjeux et méthode d'une nouvelle internormativité", *Droit et société*, No 29, LGDJ.

Porter, M. E. and Heppelmann, J. E. (2014), "How smart, connected products are transforming competition", *Harvard business review*, Vol. 92 No. 11, pp. 64-88.

Potte-Bonneville, M. (2012), "Foucault's Bodies", *Journal of the British Society for Phenomenology*, Vol. 43 No1, pp. 22-44.

Puranam, P. and Srikanth, K. (2007), "What they know vs. what they do: How acquirers leverage technology acquisitions", *Strategic Management Journal*, Vol. 28 No. 8, pp. 805-825.

Rabinow, P. and Rose, N. (2003), "Thoughts on the Concept of Biopower Today" available at [http://www.molsci.org/files/Rose Rabinow Biopower](http://www.molsci.org/files/Rose%20Rabinow%20Biopower) (accessed 12 October 2003).

Rajan, K. S. (2006), *Biocapital: The constitution of postgenomic life*, Duke University Press.

Rose, N. (2001), "The politics of life itself", *Theory, culture & society*, Vol.18 No. 6, pp. 1-30.

Sadin, É. (2015), *La vie algorithmique. Critique de la raison numérique*, L'Échappée, Paris.

Sawicki, A. (2016), "Motivation of Y generation employees", *World Scientific News*, Vol.44, pp. 279-290.

Sharon, T. and Zandbergen, D. (2017), "From data fetishism to quantifying selves: Self-tracking practices and the other values of data", *New Media & Society*, Vol. 19 No. 11, pp. 1695-1709.

Thourot, P., Nessi, J-M. and Ametépé Folly, K. (2015), "Big data et tarification de l'assurance", *Risques*, Vol. 103, pp. 46-53.

Tucker, I. (2012), "Deleuze, sense, and life: Marking the parameters of a psychology of individuation", *Theory & Psychology*, Vol. 22 No. 6, pp.771-785.

Uhlenbruck, K., Hughes-Morgan, M., Hitt, M. A., Ferrier, W. J. and Brymer, R. (2017), "Rivals' reactions to mergers and acquisitions", *Strategic Organization*, Vol. 15 No. 1, pp. 40-66.

Van Dijck, J. (2014), "Datafication, dataism and dataveillance: Big Data between scientific paradigm and ideology", *Surveillance & Society*, Vol. 12 No. 2, pp. 197-208.

Waldby, C. (2000), "Virtual Anatomy: From the Body in the Text to the Body on the Screen", *Journal of Medical Humanities*, Vol. 21 No. 2, pp. 85-107.

Wang, Y., Kung, L. and Byrd, T.A. (2018), "Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations", *Technol. Forecast. Soc. Change*, Vol 126, pp. 3-13.

West, S.M. (2019), "Data capitalism: Redefining the logics of surveillance and privacy",

Business & society, Vol. 58 No.1, pp.20-41.

Wu, T. (2018), The Tyranny of Convenience. The New York Times, available at <https://www.nytimes.com/2018/02/16/opinion/sunday/tyranny-convenience.html> (accessed Februar 2018).

Zuboff, S. (2019), The age of surveillance capitalism: The fight for a human future at the new frontier of power, Profile Books.

Appendix 1: Main panel companies created or acquired by GAFAM

| Google | |
|--|---|
| Calico | Biotechnology, fight against degenerative diseases and aging. Transhumanism. |
| X | Artificial intelligence and neuroscience Bracelet detecting cancer through ingested nanoparticles Google Wing , delivery by drone Automated cars Augmented reality glasses Loon project , coverage of white areas without Internet Neural recognition network (voice, faces, etc.). Replicants |
| Moodstock | Development of face and object recognition algorithms. |
| Nest | Home automation (protection, surveillance) |
| Sidewalk Labs | Smart City, urban innovations, connected city |
| GV | Investment company: cybersecurity, artificial intelligence, robotics, agriculture |
| Fiber | High speed Internet (1000 megabits). Using fibre optics for a number of selected cities. |
| Verily | Life sciences research. Bringing together technology and biology to treat disease. |
| Deepmind | Automatic learning and neuroscience, neural networks and health. Has incorporated Dark Blue Labs (artificial intelligence) and Vision Factory (visual recognition, deep learning). |
| YouTube | Video hosting website |
| Google | Search engine |
| AdSense | Advertising products |
| Google Maps | Online map service |
| Android | Mobile operating system |
| G suite | Office and cloud applications and tools (Drive, Gmail, Chrome, etc.) |
| ATAP | Advanced technology and projects, incubator on projects such as Tango: mobile geolocation without GPS, Spotlight Stories: immersive 360° video technology, Project Soli: gesture recognition technology, Project Jacquard: smart jacket connected to mobile via Bluetooth, Project Abacus: biometric data. |
| DNN Research | Machine learning specialist. Study of biological neural networks and replication on machines. |
| Google Books | Online bookstore, digital library. |
| Google Arts & Culture (Google Art Project) | Virtual tours of museums, digitization of collections |
| Apple | |
| Regaind | Photo analysis through artificial intelligence |
| SensoMotorics | Instruments, equipment and software for monitoring the eye |
| Siri | Voice recognition software |
| Shazam | Music and image recognition |
| Vrvana | Augmented reality HMD |
| Beddit | Sensor and sleep analyser |
| Lattice | Data, artificial intelligence |
| Wifislam | Detection and geolocation of the user |
| Indoor Survey | Mapping of the places visited by the user |
| Glimpse | Collection, personalization and sharing of health data |
| LinX | Miniature cameras |

| | |
|-----------------|----------------------------|
| Coherent | GPS geolocation technology |
|-----------------|----------------------------|

| | |
|---|--|
| Metaio | Augmented reality (facial recognition, geolocation, eye tracking) |
| Mapsense | Mapping tool |
| VocallQ | Voice person-machine interfaces and machine learning. Improves the performance of Siri voice assistants. |
| Perceptio | Automatic learning, image recognition |
| Faceshift | Motion capture |
| Learnsprout | Education software |
| Turi | Artificial intelligence tool based on Pandora Internet radio music recommendations or on price prediction system. |
| Emotient | Analysis of facial expressions to determine human emotions. |
| Facebook | |
| Wit.ai | Speech recognition application allowing phone to be controlled by voice and interface with objects connected to the Internet. |
| Instagram | Social network |
| Whatsapp | Social network |
| Moves | Fitness and activity tracking application |
| Oculus VR | Virtual reality |
| Sport Stream | Analysis of social references related to sport, data provider |
| Onavo | Application to compress its data and save packages, collecting information from its users such as the type of package and downloaded applications. |
| Jibbigo | Voice translator |
| Face to Facebook | Specialist in facial recognition and tools to identify people in uploaded photos |
| Acrylic Software | Designer of personalized digital newspapers and secure digital wallets |
| Threadsy | Tool for evaluating the attention triggered by its production on social networks |
| Atlas | Tool for targeting and tracking advertising via "Facebook Id". |
| FAIR (Facebook artificial intelligence research) | Research laboratory specializing in artificial intelligence. |
| Amazon | |
| Harvest.ai | Cloud service specializing in cybersecurity |
| Graphiq | Artificial intelligence assistant of the Alexa voice assistant for increasing efficiency in answering customer requests. |
| Blink Home | Domestic alarm linking camera and smartphone. |
| Body Labs | Tool creating 3D body models for the clothing and fashion industry. |
| Goo Technologies | Graphic development used in video games and interactive 3D experiences. |
| Nice | Desktop Cloud Visualization tool that provides remote access to 2D and 3D applications for engineers and game designers. |
| Curse | Site providing add-ons (extensions) to help or improve video game players' performance. |
| Orbe.us (Rekognition) | Specialist in deep learning, and facial recognition. |
| August | Specialist in smart locks. |
| Garageio | Specialist in connected portals. |
| Amazon Robotics | Producer of mobile robots used in warehouse logistics. |
| Anapurna Labs | Mid-range network chips for data centres that can transmit more data and consume less power. |
| Microsoft | |
| AlspaceVR | Virtual reality. |
| Hexadite | Company specializing in cybersecurity. |

| | |
|--|--|
| Maluuba | Artificial intelligence. |
| Genee | Virtual assistant, artificial intelligence. |
| Solair | Internet of Things platform. |
| Teacher Gaming | Educational software. |
| Metanautix | Data analysis, Big Data. |
| Secure Islands | Technologies, data protection. |
| Mobile Data Labs | Tracking application, geolocation. |
| Adallom | Cloud security |
| Volometrix (workplace analytics) | Company specializing in the analysis and improvement of staff productivity.. |
| Revolution Analytics | Predictive analysis |
| Wunderlist | Project and task manager. . |
| Rosetta Biosoftware (Biological Computation) | Solutions linking biology and computer science, life sciences. |
| GeCad Software | Antivirus. |
| Active Views | Reporting system. |
| Frontbridge | Email protection. |