Do Children Dream of Connected Watches?: How the connected citizens experience the world

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Abstract

As our society relies increasingly on artificial intelligence in day-to-day life, we have very limited knowledge and control of its uses and consequences on our representations, values, behaviors, lifestyles, etc. However, it deeply affects and shapes our relationship to the world: how we interact with others and our environment (e.g. *smart* devices that we wear or have installed in our home), how we perceive space and time, what control we have on our sleep, health, etc. Since AI designs and uses are developed by companies mainly economically motivated, the examination of the conceptual, anthropological, and moral impacts of the emergent experiences to which our interactions with AI contribute to generally overlooked. There is an urgent need to study these issues in order re-invest in the citizens the possibility to decide in which society they want to live, what values should be promoted, what relationships to the others and the environment should be favored. In this paper, I study the power relations between humans and connected objects.

I. Introduction

The idea of devices equipped with sensors and connected to the Internet has been developing since the 1980s. Although the Internet of Things (IoT) was originally designed for Machine-to-Machine communication, the greatest commercial success has been for smart consumer devices (Clarysse et al., 2022). Fridges, glasses, watches, door handles… The possibilities are endless; start-ups and GAFA compete in inventiveness. Connected objects (CO) for house are not new, but their development and deployment are still constrained by price, the lack of industrial standards, or the difficulties encountered in the implementation of ideas (Patil et al., 2016). Currently, there are mainly smart meters, security systems, health systems, household appliances, remote control devices for household equipment, and entertainment. They provide a variety of services, such as proactive monitoring of neighborhood health and activities for added security (X. Li et al., 2011). Home gateways (Arduino Ethernet server, router, firewall) establish a connection between smartphones and connected devices in the house to control light, temperature, etc. (Piyare, 2013).

For some researchers, this is undeniable progress: Neeraj Kaushik and Teena Bagga (Kaushik and Bagga, 2020) note, for example, that CO make it possible to improve control, foresight, security, organization, and information, particularly in the areas of health, home, and transportation. Regarding companies, the arguments generally put forward to sell their products are mainly related to the notions of security, freedom, performance, economy, comfort. This means, for example, improving your security by means of intercoms or connected cameras allowing you to see directly on your smartphone who is ringing the doorbell or what is happening at home, to go about your business while connected robots take care of cooking food, increasing their sports performance with the help of a personalized

coach integrated into a watch or a connected scale, saving money on heating by adjusting their thermostat remotely, or even gently waking up with gradual switching on and "natural" light.

Scientific researches and corporate ethics committees generally address the issues of trust, security and privacy (e.g. Covington and Carskadden, 2013; Al- Barazanchi, 2020; Kelly, 2020; Sivaraman, 2018). But beyond the accidental impacts (e.g. harassment, hacking) and abuses (e.g. taking health data into account by insurance companies to index the individual tariff, surveillance capitalism) that the deployment and use of these new objects can cause, the IoT has the ability to profoundly reshape our world (Manyika et al., 2013); in some areas, radical and rapid transformations are already observed. This is particularly the case for healthcare (Pang et al., 2015; Tuan et al., 2019), transport (Davidsson et al., 2016), logistics (Hopkins and Hawking, 2018), manufacturing (Birkel and Hartmann, 2019; Hasselblatt et al., 2018). CO are part of a profound upheaval in our relationship to the world, others and ourselves. Indeed, as the other objects we use, CO are invested with meaning, and it is also through them that our knowledge of our environment is developed (Conein et al., 1993).

A large number of research works focus on consumer resistance to CO, noting in particular the ambivalence they arouse, between desire and fear (Ardelet et al., 2017; Folder et al., 2017); but it is most often research in marketing and management sciences. These researches, treating these resistances as "brakes" and "problems" to be solved, seek a technical solution to remove them and not to take them into account for question the techno-economic orientations taken. In this regard, Morozov warns of the tendency in which these works fall to reduce citizens to mere consumers (Morozov, 2015).

In this article, I am particularly interested in the power relations that are established between CO and humans. I adopt at the same time a broad vision of "what is being done" in the CO field to identify trends and a precise approach that aims to understand the type of relationship that is established between the human subject and the CO by focusing on a few objects. These objects support different aspects of daily life, and arouse marked interests on the part of the general public: watches for monitoring physical activity, pillows for monitoring sleep, cameras for environmental control. Thus, in section 1, to understand what distinguishes the connected object from the non-connected technical object, I first review, in a broad way, what objects are developed and what are the uses of these objects, then I examine what determines the establishment of roles between the CO and the human, based on a few specific examples. In section 2, I study the power relations that are established between the human and the CO.

II. The human-object relationship: uses and roles

1. The connected devices

Technical objects have a political content insofar as they participate in organizing the relationships between individuals, and between individuals and their environment, assign roles, exclude individuals or groups of individuals, determine modes of action, etc. The technical object should be considered both as a material device and through all the uses it allows (Akrich, 2013). However, concerning the material device, many CO resemble, at first sight, existing autonomous objects; their name takes up that of the autonomous object, to which the adjective “connected” is attached. These are connected mattresses, pillows, watches, etc. Concerning the uses, it generally fulfills the function of the autonomous object, and includes new functionalities so that it is not just an improved version of the original object. These new functionalities are independent of the initial functionalities of the object, and are sometimes of a very different nature. A connected watch does not only give us the time: it counts the number of steps taken during the day, measures the heart rate, etc. The connected mirror does not just send our image back to us: it loads the content corresponding to the areas of interest indicated by its user, wakes them up gently, or establishes a diagnosis of their skin to infer their state of health. From now on, when the user leaves their house, the light is automatically switched off, the heating decreases in intensity, the surveillance cameras start up. The material device and the intended

uses are closely linked since the connected object has sensors and an interface adapted to these uses. This interface can be integrated into the object (e.g. screen, alarm) or supported by other objects, with which it is networked (e.g. mobile application, voice assistant). Some new objects integrate everyday life, such as the connected headband to wear around the head at bedtime to induce sleep and improve sleeping. They therefore have a material device and original uses. These additional functionalities introduced by the connected object compared to the original non-connected object allow new uses, which I call here sediment uses.

Regarding the way in which these objects determine the actors, several observations can be made. First of all, sediment use of an individual connected object is generally reserved for individual use, or the use by a small group such as a family. Some CO can be easily used by exogenous individuals, but this is not always the case. Indeed, since CO are designed to adapt to their user and their environment, some require prior configuration. For example, a guest leaving a house after their hosts would have no difficulty using a device based on motion detection and connected to the connected lock: the blinds and the thermostat could thus be lowered automatically. On the contrary, the connected mirror is configured according to the interests and habits of its main user, connected to their mailbox, etc. and would not be adapted, without prior intervention, to the characteristics of a guest. Thus, for certain CO, exogenous individuals are excluded from their uses because the sediment uses of these objects are based on personalization mechanisms.

For most CO, the relationship is established between the object and its user. This is the case of the watch, the toilet, the mirror, the mattress, etc. In some cases, they include a third party: the connected diaper must be installed on a baby, the connected panties are worn by the user's partner who makes it vibrate remotely, some connected pillows light up when the user's partner lies down on their personal connected pillow, the connected cameras alert the user in the event of an intrusion.

In order to study more precisely the attribution of roles, it is interesting to examine the different sediment uses. I have identified four main categories:

- Receiving alerts (e.g. notifications, vibrations, ringtones, etc. sent to users to notify them of an event, such as a threshold reached during a sporting activity or an intrusion into the home, etc.
- Obtaining information about one's environment or oneself. Two types of information may be involved:
    - Information, generally of a qualitative nature, that the user could obtain alone, by going to check themselves. For example, connected diapers indicate the state of the baby's diaper.
    - Information, generally quantitative, hardly accessible or inaccessible by the user alone: the number of steps taken during the day, the distance between two strides, etc.
- Receiving recommendations. For example, watches and scales establish sports programs adapted to the user's objectives and physical characteristics.
- Organizing the remote environment, either automatically or on command. For example, the mirror emits progressive luminosity at the scheduled time of waking up.

Most CO combine several of these sediment uses. For example, the thermostat can be controlled remotely and provides room temperature information; the connected diaper alerts the user when the diaper is full and details the state of the diaper in real time, in particular by indicating the humidity level. The objects that provide personalized recommendations and sometimes the automatic organization of the remote environment must integrate machine learning algorithms making them able, by collecting and processing data related to the user behavior, to automatically adapt to them. They differ from CO that only allow requests to be managed remotely through an application, a voice assistant, etc. CO equipped with such systems are increasingly developed: a digital kitchen board can suggest recipes resembling those that the user has already liked or, when the latter is building up their shopping list, ingredients that are found regularly in the same list as other ingredients that they have

already listed. A pillow can provide its user with personalized advice on how to improve their sleep (e.g. recommending that they go to bed at a fixed time, or earlier, based on the data it collects on their bedtimes).

The various sediment uses that a connected object allows can sometimes be deactivated (disable a ringtone, a notification, the sending of personalized recommendations, etc.) or ignored (e.g. the user can never go to the tab allowing this use) but it is not always possible (e.g. it is not possible to disable step counting on a smartwatch, so the number appears when you look at your watch). Thus, CO encourage, sometimes force, new uses.

The functions performed by CO, in connection with these sediment uses, are varied and closely related to the roles performed by the objects. Thus, in the case of a watch or a connected scale establishing personalized sport and nutritional programs, their functions, and therefore their roles, vary according to the use made of them. If the user uses it mainly to consult messages and emails, its main function is to facilitate social exchanges of its user by collecting the messages they receive and notifying them; the object thus has the role not only of messaging, but of messenger. On the other hand, if the user assiduously uses the personalized programs of their CO, their main function is to motivate and advise the user, and have a coaching role. As for the connected layer, it mediates the relationship between humans and relieves the attention to be given by the parent to the baby by taking on a monitoring role. The connected cameras allow the user to watch at any time what is happening in their home, alert them in the event of an intrusion, and can even directly notify a police station. Some are equipped with a facial recognition system. If the user uses them to remotely oversee what the other inhabitants of their house are doing, these cameras will not have the same role as if they are used only to alert them in the event of an unwanted intrusion: in the first case, we can consider that they have an informer role, and in the second a sentinel role. The case of the cooking robot is interesting: depending on whether the user follows their own recipe, imposing the cooking time on the robot, or whether they only apply the recipe presented to them, step by step, by their robot – the latter being responsible for alerting the user when they have to intervene – the roles can be reversed: in the first case, the human directs and the robot executes; in the second case, the human executes and the robot directs. Similarly, when a third person is involved, the connected object defines the actors and its use modifies their roles and their relationships; for example, there will be the one who wears the panties and the one who has the power to remotely make them vibrate at any time, or the baby who wears the diaper and the parent who no longer needs to monitor the state of the diaper and comes to change it when the alert sounds. It participates in the establishment of hierarchies and standards. For example, connected speakers and lights can be powerful instruments of control, if a user decides to harass their partner remotely by unexpectedly turning them on during the night – there are many cases of marital cyber-harassment through CO.

Thus, the object has various functionalities, associated with its materiality, and according to which a more or less wide range of possible uses is deployed. The relationship between the human and the object and the roles are established through the uses.

Moreover, given the materiality of the object, these roles are assumed in an extended space-time. Admittedly, the connected pillow only adapts its temperature when the user lies on it, but the personalized recommendations it provides appear on the user's application, which the user can consult at any time. This effect is even more obvious with connected watches: worn on the wrist, they can, at any time and in any place, call their user to order if they consider them to be too sedentary. It is also remarkable that, when the interaction takes place through an application, this relationship can go beyond the sphere of the house: through their connected cameras, the user can see all the rooms of their house when they wish, even when they are on vacation. The connected object and the user do not always need to be present to exercise their respective roles.

2. The not connected technical devices

This is where the main difference between CO and non-connected objects lies. Indeed, many roles could be taken by the object, depending on its use by the user. It is generally expected that an object has a passive role, being simply a tool or an instrument. There are various levels on the scale of activity, so that an implementer object (which executes a humans' orders) is more active than a tool object (which does not receive orders and requires to be handled by the human to be set in motion). Because of its materiality, a connected object can take more active roles than the usual technical objects. The usual technical objects are used and confined to their space - they can be moved, but for the most part they do not extend beyond the space they occupy: you take a pen, use it, and put it down; we use our computer, and we move away from it.

Of course, connected devices are not the only type of objects which can emit alerts, provide information, or allow the environment to be organized remotely. As shown in Table 1, these uses are also found in certain not connected technical objects. Receiving alerts is the most widespread use among everyday objects, whether for the main use (e.g. being warned in the event of a fire) or a secondary use (e.g. being warned when the microwave task ends, the main use of a microwave being the reheating of a dish). These are most often ringtones or light signals (diodes, light symbols, etc.). Obtaining information is also a widespread use and, for the objects concerned, this is generally their main, if not only use (e.g. a cuckoo clock rings every hour, but it is mainly used to know time). This is probably the oldest use: weather vane, clock, etc. Finally, the organization of the remote environment is an expanding use. More and more, among the uses of non-connected technical objects, we find the sediment uses noted in CO (e.g. the food processor able to cook food, weight it, give instructions, ring when the task is complete) . CO make it possible to introduce, with the development of machine learning and the massive collection of data, a new use: the so-called "personalized" recommendation.

Uses	**Exists in non-connected technical objects**	**Non-connected technical objects concerned**	**Fonction**
Receiving alerts	Yes	Electronic objects (elevator, charger, …) Household and kitchen objects (microwave, washing machine, etc.) Clock Surveillance object (fire device, cameras, car dashboard…) Communication objects (telephone, horn, headlights)	Reporting a state of standby, charging, on, an activated feature, a selection, etc. Notifying of the end of a program Waking Alerting of a dangerous or undesirable event Transmitting a message or alert of a message to be transmitted
Receiving personalised recommendations	No		
Obtaining environmental information	Yes	Measuring instrument: thermometer, scale, …	Giving precise information inaccessible to the individual
Organizing the remote environment	Yes, short distance	Objects equipped with a remote control or detectors (movement, smoke, etc.): television, shutters, ……	Allowing the user to activate an object, control a movement (automatically or on command) remotely

Table 1. Uses of CO among non-connected objects

They are many possible roles since these objects are widely different and intend to respond to various problems. We find roles similar to those that are divided between CO and users, but their scope remains limited, circumscribed. Thus, CO do not introduce a break in uses and roles. They are rather part of a continuum; the upheavals they bring about are linked to the systematization of these uses and roles in everyday life and their extension beyond the home, thus participating in a total and perpetual impregnation in the environment. The addition of the use "obtaining recommendations" is correlated to this total impregnation: it is from their expert knowledge of their user that it draws its legitimacy to make recommendations adapted to their particular situation.

III. CO and human subjects: who holds the power?

1. Power exercised by humans

The question of power does not just concern the human-object relationship, but also the relationship of the human to their environment: the use of CO is supposed to give humans more control over themselves and their environment. CO invest in more space and time of their user because of their particular materiality. Often equipped with sensors and other measuring instruments, they provide the user with information about themselves, their environment, or a member of their entourage. They exceed the space occupied by the material object (watch, scale, toilet seat, toothbrush, etc.) since they transmit the collected data to another digital device (computer, tablet, phone) via the Internet. These results can therefore be consulted anywhere at any time. With CO, humans are continuously informed of data related to their activity, their metabolic constants, the temperature of their home, the quality of their sleep, the effectiveness of their children's tooth brushing, the location of their spouse, etc. The proliferation of indicators and their constant accessibility increase individuals' sense of control on their environment and themselves as well as the control opportunities and means. Some of these objects are worn (clothes, glasses, watches); others communicate with each other to form the networked infrastructure of the smart home.

In marketing speeches, the fact that CO allow more control over oneself or the environment is a recurring selling point. It is interesting to examine what kind of control is increased here. Control may refer to:

1. Verification and monitoring activities

2. A state of mastery, of domination.

The 2. may require the 1., but it is not always necessary. In particular, the work of Michel Foucault has shown that domination can be exercised through the dissemination of norms instead of the implementation of surveillance devices. Similarly, the 1. does not automatically lead to the 2. For example, watching over their child does not guarantee that the parent is in control of their behavior. These two points should be carefully examined because, precisely, CO are constituted as surveillance devices and as instruments that enable the user, through the knowledge that they allow them to acquire, to control their environment. The first observation that can be made is that the sediment uses "receiving alerts" and "obtaining information on the environment" make it possible to strengthen surveillance. 2. is closely linked to the question of power; it is therefore important to distinguish between the concept of "power" and that of "domination". I rely here on the definition of Max Weber (Weber, 1971):

Definition 1. "Power means any chance of imposing one's own will within a social relationship, even against resistance, no matter what this chance is based on. Domination must mean the chance of finding obedience, with certain people, for a command of certain content. »

To a certain extent, the object allows humans to increase their power over themselves and their environment: by intensifying surveillance, they increase their knowledge of themselves or their

environment thus their chances of imposing their will. Their dominance can be reinforced too. For example, their child, knowing that they are being watched, may be more led to obey than if they were not. The categories of information that the user can obtain deserve special consideration here. CO provide the user with information in different forms:

a. Sensory data (images, sounds, location, etc.) that the user can obtain remotely on an object distinct from them.
b. Quantitative data: with watches, scales, mattresses, etc., the user has access to data evaluating their activity or physical condition, or that of a third party.
c. Alerts (sound, light, etc.) signaling the reaching of a threshold (inactivity threshold, activity threshold, saturation threshold, etc.)

This information therefore makes it possible to increase the monitoring of a given object (distinct or not from the user). In some cases, they also promote control. For example, knowing who is at the door of your home allows you to decide whether you want to let the person in or not. On the other hand, knowing where your partner is does not guarantee that you will be able to control their moves. It would seem that the effects are even, sometimes, the opposite: studies have shown, for example, that individuals equipped with CO aimed at helping them lose weight had worse results than those who did not have them (Jakicic et al. 2016), which can be explained by different factors. For example, when incentives differ radically from the user's perception, they are likely to increase anxiety and dependence on the device, resulting in loss of motivation in case of absence. Studies have highlighted notably that, in the case where the perception that the individual has of their body or their behavior differs from the results provided by the object, the tension can hinder the construction of meaning and the ability to human to learn from their experience (Giordano, 2003), thus generate acts of coercion, or even cause psychological disorders (Arruabarrena, 2022). To increase control, monitoring must meet several conditions:

1. Allowing an understanding of the situation based on true and sufficient information: distorted, approximate, or too partial information can disrupt the assessment of a situation and decision-making through the constitution of an adapted problem-solving strategy.
2. Having the means necessary to apply these decisions (e.g. power of persuasion, coercive power)

Thus, video surveillance of one's apartment makes it possible to increase control of it because being able to observe an undesirable intrusion is sufficient to adopt a behavior allowing to solve the problem, such as notifying the police. Similarly, with the connected bowl, the human retains control over the food of their cat: the user is the one who defines the programs (times and quantities delivered to the cat by the bowl). Weight control is a more complex issue, insufficiently understandable through the collected data (which is neither sufficient nor always true) and which monitoring can itself be disturbing. In addition, many factors (social, psychological, etc.) can hinder the individual's ability to carry out their decisions. Thus, if CO can significantly increase verification and monitoring activities, they do not guarantee the control and domination of states, and can even have opposite effects. In particular, it seems that:

- The sediment use "organizing the environment from a distance" makes it possible to increase the power of humans over their objects, at least when it is done "on order" (e.g. the human activates the heating of the toilet seat before to settle there).
- The sediment use "obtaining information" can allow humans to increase their power over their environment (e.g. it allows them to confirm that there is no intrusion into their home), particularly when the controlled object is inert. This sediment use may also not allow to increase control, or even decrease it, in particular because a tenfold surveillance exercised over a living individual can lead to the adoption of resistance behaviors on the part of this individual.

Other mechanisms can also affect the power exercised by humans over their environment and themselves. Indeed, the study of roles has shown that the object could acquire power over the human (e.g. object giving orders, executed by the human). It therefore seems relevant to wonder what type of power is held by the object. For example, we observe that the sediment use “obtaining information” can increase the power of the object over the human” (e.g. the human takes more steps when equipped with a watch that counts the steps), a fortiori when coupled with the sediment use “receiving recommendations”. The sediment use "receiving recommendations" can allow the object to increase its power over the human, and never the opposite (e.g. the object recommends the human to go for a walk. The human can follow the recommendation or ignore it). This is what is to be examined now.

2) Power exercised by objects

According to the Gartner report (Panetta, 2021), CO capture and use data whose granularity is increasingly fine in order to influence individual behavior. The report reinvests the term "Internet of behavior" developed by Nyman (Nyman, 2020). The development of infrastructures and Big Data make it possible, by means of the collection and analysis of behavioral data, to motivate the actions of individuals "through feedback loops" (Burke, 2021) to optimize them according to objectives of growth (Zuboff, 2022). Others speak of the Internet of bodies in terms of objects exploiting bodily data to facilitate the control of bodies (Rand Corporation, 2020). My hypothesis is that the power exerted by the object on the human is correlated with its sediment uses: the more it would have sediment uses, the more it would impose itself as an organizer of the behaviors and the body of its user. This hypothesis proceeds from a generalization of specific cases. Indeed, in the case of the connected bowl, the object only applies the program decided by the human and, depending on the model, warns the user when the kibble tank is empty. It allows humans to exercise control over their cat's diet even when they are away. The sediment use of the object is to organize its environment, or even to receive alerts. The object here is a simple performer. If the alert sent to the user motivates their behavior, it is insofar as the latter recognizes a concrete utility in the object: 1) the object fulfills its role of performer, 2) allows its user to discharge of the task of feeding their cat, 3) the user considers positively the fact of being relieved of this task. The object remains subordinate to its user, who controls its behavior by programming it. In the case of the connected watch, which allows the user to receive alerts, information, and so-called personalized recommendations, the object not only accompany them on a daily basis: collecting their data, it provides answers and imposes itself as the narrator of their behaviors, their physiological reactions, and their needs (Rettberg, 2017). It is in particular the objects allowing these three sediment uses that interest me here, because this ability to make a retroactive account of the activities of its user and to offer them "personalized" advice according to this account grants them a power on the human. This is not a power that the object whose only sediment use is to organize the environment seems to have.

The power of the object over its user does not appear, at first sight, to be coercive: it is able to offer rewards to its user, but does not punish them. The object does not have the material capacities to constrain its user; it is rather an incentive system. The nature of this power therefore seems to be authority: authority is generally considered by sociologists as a legitimate power, which needs only a minimum of coercion to gain respect. Authority (of a person, an institution, a message) is based on the confidence that those who are submitted to it have in the holder of power, so that they "welcome their opinion, their suggestion or their injunction, with respect, favour, or at least without hostility or resistance, and that they are willing to comply” (Boudon and Bourricaud, 1982). Authority is therefore a relational concept articulated around the notion of trust, because it is from this trust that it derives its legitimacy. The legitimacy of the authority of the connected object is based on three elements, highlighted in marketing speeches :

1. It is presented as capable of providing humans with reliable information, inaccessible to them and with a precision that they cannot claim to obtain by themselves;

2. This information is deemed to relate to the determining factors for mastery of the measured object (sleep, weight, etc.).
3. Mastery of the measured object is desirable (even necessary).

As long as these elements are considered true by the user, the authority of the object can be exercised: the belief of 1. is fundamental part of the user's confidence in object; belief in 2. and 3. allows the object to acquire recognition of its usefulness by humans: by virtue of its supposed expertise (point 1.) and the importance of having access to this expertise for control (point 2.) a value deemed important in maintaining or increasing individual well-being (point 3.), the object acquires human recognition and its recommendations are perceived as having to be followed. The object therefore does not need coercive mechanisms to exercise its power: it is the desire to increase their well-being, even the feeling of duty, which drives humans and inclines them to follow the recommendations of the object. The more the human considers that it is a duty (i.e. the more the measured quantity is considered important for well-being, health, social recognition, etc.), the more the authority of the object is strong. The authority of the connected object therefore enables it to acquire a preponderant role vis-à-vis humans: as soon as these three elements are recognized by the user, the object is established as a mediator between the humans and their environment, others, and themselves. It is not just a one-off transformation, because these objects have penetrated the daily life of their user, blended into their environment, and, in a way, into themselves since it is through them that these users perceive the world.

To continue operating, these objects must stabilize the assigned roles and therefore introduce causality mechanisms (see 2.: "defining the information provided as decisive in mastering the object measured"), introducing new interpretations of reality, which they are considered as the only one able to provide (see 1.: “presenting the object as capable of providing humans with reliable information that is inaccessible to them”). The normative effect of the measures also makes it possible to reinforce the belief in the usefulness of the object (see 3: “control of the object is desirable, even necessary”). The first two essential elements for establishing and maintaining user confidence in their CO are rooted in what José Van Dick (Dick, 2014) calls "dataism", and which he defines as being "a widespread belief in the objective quantification and potential tracking of all kinds of human behavior and sociality through online media technologies". The fact that objects provide quantitative information reinforces their authority: as numerous studies have shown, numbers are associated with precision, competence, and objectivity; thus, when decisions, even difficult ones, are taken by authorities, the fact that they are based on numerical data contributes to making them regarded legitimate (Denis et al., 2006).

These beliefs in the objectivity of figures seem to be part of the Platonic tradition of considering reality as intrinsically mathematical. According to this representation, science and technology would aim to discover this reality by revealing its mathematical mechanisms. In this respect, it differs from the Aristotelian thought according to which mathematics would be a human tool to interpret reality in an imperfect, approximate way. For Aristotle, mathematical properties exist in natural objects but not as they are described by human thought. According to Plato, mathematics would make reality intelligible; in the same way, the *datification* of the world pretends to describe it by precisely measuring its numerous parameters to remove the uncertainty inherent in the sensible. This is why, very often, user confidence does not require the epistemic value of the information provided by CO to be demonstrated: this confidence is rooted in a belief in numbers, which are deemed capable of objectively describe reality. Objects are also equipped with a variety of sensors, a large part of which echoes representations associated with the scientific world, and in particular the medical world, although they are not medical devices: sensors temperature (not thermometers), heart rate measurement, measurement of sleep cycles, etc. They are based on simple and apparently coherent models, shared by a large part of the population: the weight depends on the number of calories eaten and the number of calories expended (Hamid, 2009), the quality of sleep linked to the duration cycles, etc. All this contributes to a general impression of reliability, seriousness, scientificity that reinforces

the confidence attributed by the user to their CO. It is therefore on the appearance of scientificity of the measurements and models involved that confidence in the results and recommendations provided by CO is based. In this way, proceeding from a quantification of the world, CO are deemed capable of revealing the naked mathematical truth.

IV. Conclusions et perspectives

CO are increasingly embedded into the daily lives of individuals until they become extended parts of themselves. However, although they are deemed to entirely serve humans, they intermediate their users' relationship to the world and are actually able to take some control over their objectives and decision making, in particular when the connected object is deemed to offer "personalized" recommendations. The knowledge they produce, based on models determined by its designers, causes changes in human behavior and is not neutral either in the construction of knowledge or in its effects. It is part of an ever-increasing search for control, and contributes to a loss of free will and agency on the part of users, with CO taking on a growing number of tasks and introducing new normative frameworks for behaviors and human bodies. Additional research could be carried out, notably concerning the epistemic value of the recommendations. Moreover, in the fields of psychology and sociology, it would be interesting to describe the transformations these objects induce in the representations associated with freedom, property, identity, or even commitment. For example, in order to examine more precisely the issues related to the political and social commitment of individuals in relation to their use of CO, further work could be done to compare the concerns of CO users and those of individuals showing resistance to CO. Of course, for this purpose, it will be necessary to study the evolution of these concerns over time, in order to avoid any confusion between cause and consequence.

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