‘I’ve got you under my skin’ – the role of ethical consideration in the (non-) acceptance of insideables in the workplace

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S. Gauttier

Abstract
This study examines the press coverage of initiatives taken by three companies, in three different countries, to propose chip implants to their employees (‘insideable’ technology). The study sought to identify prevalent topics, the motivations and measures taken by the companies, the drivers and barriers of employees towards the chips, and the issues raised by experts in the newspaper articles. Content analysis was performed, with each Case being analysed separately. Then, overarching themes and differences are observed. The ethical considerations driving perception of technology have to do with privacy, the proportionality principle, harm and safety. People accepting the technology do not mention such constructs, they focus on the possibility of being pioneers and the convenience offered by the technology. Societal acceptance, through the gaze of others and the infrastructure developed in the different countries to use microchips, also plays a role to drive personal and work-related acceptance of insideables. A modelling to investigate the acceptance of insideables taking into account different dimensions of acceptability is proposed

Introduction

Anyone can get a microchip implant, buying the chip online for 50$. While the individuals aiming at becoming the first cyborgs have been proceeding to such implants for years (Heffernan et al., 2016). This practice is now becoming more widespread as companies suggest to their employees to get chip implants too. The chips are meant to give new abilities to employees and replace natural movements or other artefacts such as credit cards or keys. Indeed, implants allow users to automatically open doors, they can trigger computers or printers, and they can pay for purchases. Although these chips are linked to trivial activities, their growing use can be seen as a sign of the acceptance of *insideable* technologies, e.g. technologies put inside the skin. Future implementations could go as far as chips embedded into the brain for monitoring brain activity (Service, 2017). Their acceptance also highlights the idea of human enhancement, i.e. the willingness to use technology in order to make people more efficient and simplify their lives.

Proposing chip implants to employees raises questions about the role that technology is meant to have in society.

Firstly, it immediately opens up a new role for technology at work. Technology has always been an integral part of a workplace. However, technology used to take the form of an external artefact, and most of the time it would be activated by the expressed willingness of the user, who had at least a certain level of control on the technology (e.g. the ability to operate a machine functioning in the background). Moreover, the technological artefacts provided were used by individuals only for a given period of time during the day. Embodied technologies seem to be in opposition to the technologies described above: they are a priori characterized by a few features, namely their continuous presence and potential use, the lack

of control of the user, and forms of use that do not require express intentionality. They can also be open to hacking—that is, others may modify the functionalities of the chips or to access information through them. Most importantly, they could also eventually become an intrusion into the bodily functions of the individual.
Secondly, proposing chip implants to employees can have a long-term impact on the structure and functioning of society. Embodying work technology also changes an individual's relationship to work. It makes work become part of the individual. Initially, the employees lend their energy, time, physical and mental abilities to an employer, and they are compensated for this through salary. With the implant, the employees host work-related information and give out personal information on a permanent basis.
Thirdly, such a practice can transform the way individuals interact with the world around them, and it may make certain infrastructures obsolete while also creating needs for new ones. While the individual uptake of chip implants was limited to a few cases, it can be hypothesized that a more structured and organized use of these chips in the workplace can lead to a surge in chip-related services and uptake across different areas of society. Financial considerations and infrastructure changes might lead individuals to accept microchip implants without giving them a clear alternative, and this raises ethical issues. The practice of implanting chips can create a new market with companies developing these technologies, programming them, and guaranteeing their safety and security. Given the economic potential of microchip implants, it is expected that more and more applications will be developed.

With the above argumentation in mind, it is therefore important to examine how the first cases of employee chip implants are presented to society in general. Information support is a component of societal acceptance, and research on other emerging technologies has shown that analysing the content of news media allows to understand how risks and benefits are presented to society (Strekalova, 2015). This paper proposes an analysis of news content related to the experience of three different companies who have proposed chip implants to their employees between 2015 and 2018. The analysis focuses on identifying the drivers of acceptance and use—or lack thereof—of the chips at the organizational and individual levels, and it also identifies how the issue is framed by news media. Particular attention was given to the role of functional and ethical considerations so that beyond describing the phenomenon, this paper also questions the role of ethical considerations and acceptability in technology acceptance. In doing so, this study proposes to complete the technology acceptance model (TAM: Davis, 1989) and broaden the conception that the information systems community has regarding ethics. Finally, the paper contributes to the current body of knowledge by highlighting areas for future research, as well as areas to be considered by policy and management.

The paper is organized as follows. Firstly, this paper reviews the literature on acceptability and acceptance of technology by looking at how both can be framed by media. Secondly, the paper describes the methodology followed in order to proceed to the content analysis. Thirdly, the paper describes the cases by providing an overview of the topics and a more in-depth qualitative analysis. An initial modelling of what could be ethics-related drivers and barriers of acceptance of these technologies is presented and suggested for refinement in future research involving employees directly. Finally, the paper concludes with a discussion of the results in relation to theory, research, and the practical implementation of such technologies in the workplace.

1. Literature review

The idea of implanting chips into individuals in order to simplify their lives and make them more efficient can be regarded as an attempt at enhancing individuals. Enhancement has been extensively discussed from the perspective of ethics, bioethics, philosophy, and medicine. In particular, the moral and ethical acceptability of human augmentation has been largely documented (Chatterjee, 2007; Fukuyama, 2002; Kass, 1997), and discussions on human dignity and human enhancement have grown (Kirchhoffer, 2017). However, the acceptance of these technologies has not been a focus of research. Investigating acceptance is crucial as debates on acceptability are at an impasse; arguments for and against enhancement have been delivered, but there has not been a way to move to more practical suggestions to manage the introduction of enhancement technologies to potential users (Beland et al., 2012). With technologies being available, it becomes necessary to go from a theoretical argument to a more empirical one. The point of view defended in this paper is not that the previous abstract argumentations were not useful. On the contrary, seeing what the expert opinions, the societal framing of the issue, and the concerns of end users are, it is possible to understand how to shape the conditions in which enhancement technologies can be introduced to the market in a way that is acceptable and desirable for society.

1.1 Establishing the societal and ethical acceptability of technology

The rapid development of technology and the disruptive character of some of the technologies developed necessitate that individuals and society as a whole reflect on the acceptability of technology.

We define the *acceptability* of technology as the tolerated or allowed character of technology from a societal, moral, and ethical perspective. Acceptability is defined by and for society. It differs from the idea of being accepted—that is, receiving the intention to use or being actually used by individuals—in that technologies do not necessarily need to be acceptable to be accepted. By contrast, acceptance is determined from an individual, and sometimes also organizational, perspective; it is the result of considering risks, costs, benefits of using a technology in a given context. It might lead to using technologies that are not acceptable or using them in non-acceptable ways as one may not consider the impact of this action on society, nor what would be to happen if all were to use this technology (i.e., universality principle) but their specific context. Similarly, when a technology is acceptable for society overall, it may not necessarily be seen as desirable by individuals and accepted for use. Technology acceptability and acceptance could therefore be seen as constructs where one construct refers to society and the other to the individual. However, when individuals consider using a technology or not, they may incorporate their considerations to their decision-making process, such as the considerations of their own *perceived societal acceptability* and *perceived ethical acceptability* of a technology.

The term *societal acceptability* is defined by the tolerance for the impact that technology can have on society. A technology should be defined as unacceptable if is in contradiction with the values, interests, of society, and if it can harm society or its development in the current time or in the future.

Societal acceptability is sometimes referred to as social acceptance (Taebi, 2017; Van de Poel, 2016). This present paper follows the work by Van de Poel (2016), who tried to differentiate between what is accepted by society (i.e., social acceptance) and what is considered as

acceptable even though not accepted or used by a specific community (i.e., acceptability). We use the word *societal* acceptability to refer to the wide society instead of *social*, since the wording social acceptability is used to refer to the influence of the *surrounding* social circles on an individual's decision to accept and use a technology (Rico & Brewster, 2010). The term *perceived societal acceptability* is the judgment made by an individual of how acceptable a technology is for society. Perceived societal acceptability depends on the state of society in the here and now, at least for two reasons. Firstly, as time passes, values change in society, so that a technology might appear more or less acceptable. Secondly, the introduction of technology can change the values of society so that a technology originally seen as unacceptable becomes acceptable and accepted.

Ethical acceptability is broadly defined (Taebi, 2017) as a "reflection on a new technology that takes into account the moral issues that emerge from its introduction" (p. 1818). An ethical assessment of the technology can be realized at the early stage of its development, with Palm and Hensson (2006) suggesting that the assessment focuses on nine key areas for technology:

1) the dissemination and use of information;
2) control, influence and power;
3) the impact on social contact patterns;
4) privacy;
5) sustainability;
6) human reproduction;
7) gender, minorities and justice;
8) international relations; and
9) impact on human values.

Such an approach is not necessarily based on clear values that can be used for design—namely design of the technology and use case—as the nine categories are closer to opening topics for reflexion.

Perceived ethical acceptability refers to the judgment of the *individual* that a technology is seen as satisfying their *personal* ethical standards. This perceived ethical acceptability is expressed through the fit between values of the individual and the respect for these values following the use of a technology. This paper considers ethics in a wider way by looking at values, such as voluntary use, privacy, control, autonomy, well-being, fairness, non-harm, and freedom. No exhaustive list of values can be found, but rather values are identified in the discourse of potential users. Perceived ethical acceptability is conceptualized as dependent on the design of a specific artefact. For instance, micro-chips can be designed to accomplish different tasks and store data in various ways, so one should consider specific scenarios in order to be able to assess their acceptability. It is also dependent on how the artefact is implemented—that is, it is dependent on the measures taken by organizations who propose the artefact to consumers or workers. Finally, it is also dependent on how end users intend to utilize them. Instead of a judgment on the overall acceptability of an artefact, one can only lead to the identification of conditions in which a given technology, either by design or implementation, can be seen as acceptable.

In introducing context through the idea of perceived societal acceptability and perceived ethical acceptability, it is possible then to consider methods such as case-studies.

1.2 Technology acceptance literature not being concerned with societal and ethical acceptability

The role of societal and ethical acceptability in shaping technology acceptance has been scarcely researched so far. Traditionally, technology acceptance has been conceived as the use of technology that resulted from a combination or trade-off between the perceived usefulness of a technology and easiness to use. Moreover, it is concerned with an individual's acceptance of technology. User acceptance of technology is questioned through the prism of the technology acceptance model (TAM) which was proposed by Davis (1986, 1989) and its further refinements by information systems scholars (Legris et al., 2003; Turner et al., 2010, Brangier et al., 2010). The TAM was grounded in an investigation of technology in the workplace, and it adopts a managerial perspective by looking at the barriers and motivations for the employees to use a technology given by the employer to perform their tasks. Concepts such as perceived performance, usefulness of the technology, and perceived ease of use are therefore at the core of the model. Although the TAM comes from studies that were conducted in organisations, it is also considered suitable for investigating the decision made by individuals for using a technology or not in other contexts as well.

Alternative conceptualizations to the TAM have also been proposed. Among the most fruitful, we can cite the expectation-confirmation theory (ECT) (Bhattacherjee, 2001; Bhattacherjee & Premhumar, 2004). The ECT derived from a number of approaches and models, namely the satisfaction approach (Oliver, 1980), the task-techno fit model (TTF) (Cane & McCarthy, 2009; Goodhue & Thompson, 1995), the structurationist approach (DeSanctis & Poole, 1994; Orlikowski, 1992), and the coping model of user adaptation (Beaudry & Pinsonneau, 2005, 2010).

These models also overlook more subjective variables that determine attitude and intention to use technology. The Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003) was developed to assess consumer use of technology, and it highlights a number of areas regarding attitude and intention. Some of these include the role of social factors, facilitating conditions, willingness to use, gender, age, and experience with technology. The variable *willingness to use* indicates a possible resistance to technology, which antecedents are left unrevealed. It should be taken into consideration that individuals can have direct former experience of a technology and also indirect experience of technology, which they use to decide in which situations technology can be useful. Facilitating conditions refer to the belief that there is an organizational and technical infrastructure to support the use of the system (Venkatesh et al., 2012; Venkatesh et al., 2003). Refinements of the TAM have been pursued through studies that look at *insideables*, and these studies suggest that acceptance could be explained by looking at both cognitive and affective elements (Reinares-Lara et al., 2016) as well as cognitive, affective, and normative elements (Pelegrin-Borondo et al., 2016). These models question the perceived ease-of-use, perceived usefulness, negative and positive emotions, anxiety, and social norms, all of which hint at the desirability of the technology. However, concepts of ethics and acceptability were not captured.

In the information systems literature, ethics is considered through the prism of privacy, as literature has developed around the concept of *dataveillance* (Connolly & McParland, 2012). The literature on wearables focusses on traditional factors of acceptance such as perceived usefulness and ease of use (Kim & Shin, 2015) and also integrates privacy as a factor of acceptance (Li et al, 2016). A reflection on ethics can expand acceptance models beyond usefulness, and critical literature can also be extended beyond the realm of privacy.

To be thorough, it is necessary to consider the non-use literature. Indeed, acceptability might not drive acceptance, but unacceptability might drive resistance and non-acceptance of technology.

Non-users have long been seen as individuals who do not have access to technology. Non-usage approaches including many digital divide studies, such as Rice and Katz (2003), and these studies represent a dynamic stream of research (Brandtzæg, et al., 2011; Cruz- Jesus, et al., 2012). The most classical predictors of digital inequalities are income or socio-economic status as well as gender, age, education, and family structure. Such approaches consider non-users to have no agency over their access to technology and are involuntary non-users. Other categories of non-users are emerging, defined by users' access to technology and intention to use:

1) resisters—those who never had access to a technology and never wanted it;
2) rejecters—those who tried a technology but gave it up voluntarily;
3) expelled—those who had access but lost it; and
4) excluded—those who have no access to technology but have not chosen it (Wyatt, 2003).

Research on non-use focuses on practices of non-use (Van House, 2015), while the reasons for non-use are still little understood. Motivation-focused research focuses on behaviour change goals (Sleeper et al 2015), and others look at a cost-advantages relationship (Selwyn 2003, Baumer et al 2015), while still focusing on individual gain.

Verdegem and Verhoest (2009) developed the ASA model, comprising Access, Skills, and Attitude; this ASA model is used to explain technology appropriation and thus e-inclusion or exclusion. This echoes the work by Selwyn (2003, 2006) who already underlined that the patterns of non-engagement in technology and media vary between technologies and feature different types of non-users. Typically, Selwyn distinguishes three reasons for non-usage: non-access (lack of economic, cultural or cognitive resources), technophobia, and ideological refusal. Resistance to new media developments can also be explained by a combination of assemblage and affect theory (Thorén & Kitzmann, 2015). Jauréguiberry (2012) focused more precisely on voluntary non-usage where non-use is not necessarily absolute but partial (i.e., certain usages are simply paused) and segmented (i.e., limited to certain periods of the day for instance). Ribak and Rosenthal (2015) show that this type of resistance, which they call *media ambivalence*, is directed at one technology, and its personal meaning and societal significance evolves over time. However, the idea that non-use could be driven by a technology's perceived unacceptability—either for ethical or societal reason—does not seem to have been investigated as such.

The status of non-user is not absolute. For instance, Neves et al. (2015) proposed a typology with resisters, rejecters, surrogate users (i.e., those using somebody else's device), and potential converts, who are considering or reconsidering technology use. Non-users can be seen as on a continuum (Wyatt, 2003), and they are seen to evolve alongside these identities based on the technology they consider (Gauttier & Gauzente, 2018) and on their personal context. Therefore, non-use is explained as the result of an examination of potential benefits of use vs. non-use in a given context—that is, as the result of an examination related to the improvement in performance given by the technology. Being a non-user is also relative to a specific potential or imagined use of technology (Ems, 2015). To explain technology acceptance or non-acceptance, it is necessary to look at how these imagined uses of technology are created and then consider methods accounting for context.

1.3 The case to consider ethical considerations in the acceptance of enhancement technologies

Societal and ethical issues have not been a focus either in the literature regarding use or non-use. Yet, there have been several cases where ethical breaches have led to public backlash[1] and to non-use;[2] these instances thus support the idea of investigating the role of ethical and societal considerations in technology acceptance. Given that enhancement technologies carry in themselves the proposition of a new vision of society where individuals may become cyborg-like, it is therefore necessary to look at societal acceptance. Similarly, given the intense ethical debates on the acceptability of such technologies among scholars (Patenaude et al., 2015; Béland et al., 2012), it is of interest here to see how these discussions are taken into account in the decision to offer or use enhancement technologies. The main issues linked to human enhancement which are highlighted pertain to the risk of extinction of the human species (Bostrom, 2001), risks for democracy (Fukuyama, 2002), lack of social justice, risks linked to constraints and freedom, as well as a threat to diminish an individual's personality and resistance to adversity (Chatterjee, 2007).

In the context of enhancement in the workplace, Gauttier (2017) refers to the issue of consent, as employees can be pressured by their peers and by the infrastructure to accept the technology. In addition, Gauttier also mentions managerial issues arising from the introduction of enhancement technology that pertain to justice (remuneration), bodily integrity, privacy, and data management.

To date, only a handful of studies have looked at acceptance and acceptability of wearables. Firstly, a recent study by Murata et al. (2017) showed low resistance from students to accepting and using wearables and insideables, while the morality of the insideables raised some questions, namely acceptability for family, for culture, justice, ethics, morality, and fairness. Secondly, a study by Reinares-Lara et al. (2018) found that an individual's ethical assessment of memory implant explains differences between the intentions to use and does not have an impact on other variables of technology acceptance. These variables include the perceived usefulness, effort expectancy, emotions, or social influences. Both these studies use a scale proposed by Reidenbach and Robin (1990; 1988) to survey ethics where a number of contrastive pairs were considered: unethical/ethical, unfair/fair, unjust/just, not morally right / morally right, not acceptable to my family / acceptable to my family, culturally unacceptable / culturally acceptable, not personally satisfying / personally satisfying, and violates an unwritten contract / does not violate an unwritten contract. While this scale allows the idea that ethics is a dimension of interest, several criticisms can be formulated towards it, which justify the need to develop new approaches. These can be formulated into three points as follows.

1) Hyman (1996) pointed out a series of caveats pertaining to the scale development and factor structure. For instance, he points out the use of ambiguous terms (i.e., double-barrelled propositions, difficulty to attribute meaning, contradictions,

[1] The cases of Enron, BP, Nike, and Volkswagen show how attitude to a brand can be affected by ethical issues. This phenomenon could affect technology also. Further illustrations can be found in the following links https://www.forbes.com/sites/kensilverstein/2013/05/14/enron-ethics-and-todays- corporate-values/#26c3f90a5ab8, http://www.lawnow.org/lessons-learned-from-the-british-petroleum-disaster/ , https://www.theguardian.com/environment/green-living-blog/2012/jul/06/activism-nike, http://www.autopacific.com/news-app/story.248/title.volkswagen-s-reputation-takes-big-hit- with-vehicle-owners-autopacific-predicts-tough-road-ahead

[2] Users quitting Facebook after the Cambridge Analytica scandal can serve as an illustration: https://www.nytimes.com/2018/03/21/technology/users-abandon-facebook.html

incompleteness). This is crucial as ambiguous terms lead to the impossibility to interpret the results. For instance, researchers cannot be sure that the term *ethical* means the same to them as to the participant or that it means the same to all participants, as shared understanding cannot be established. Other elements could be discussed, such as the idea of *family*, which can be conceived differently across cultures.

2) Hycman (op.cit) also stressed omitted ethical rationales, which namely are missing utilitarian and egoism components, lack of normative principles, lack of religion and golden rule components, and lacks in terms of deontology. Some of these criticisms have been acknowledged by Reidenbach and Robin (year here), who claimed that the scale should incorporate elements about religion. This is especially relevant as religion informs ethical judgment (Clark and Dawson, 1996). The aspects linked to utilitarianism and egoism seem to be lacking, and these would be relevant in our context when we examine whether employees accept such implants because of what they allow to be in the company, of what they allow to do, or truly out of personal desire. Going further, it is possible to consider how those motivations relate to one another as they are not mutually exclusive and also to identify hierarchies or systems of values to be addressed.
3) The scale is meant to reveal how moral or ethical an object is perceived to be, but it does not allow individuals to understand what drives this subjective judgment. Therefore, it would be interesting to capture with more depth what drives the perception of technology as acceptable, given that the object of study is here the use of a technology at work and that both the technology (i.e., its format, its function, its affordances) and the policies that surround its implementation and use in the organization can be designed and changed. This paper suggests that looking at values and how they appear in the discourse on such a technology is a possibility.[3] It is therefore important to survey ethical considerations in a wider exploratory manner.
4) Finally, the items do not consider the use of a technology at work. Indeed, in our case more social groups influence what is seen as acceptable or not than family does, and thus social groups are perhaps more relevant when explaining private use of technology. Indeed, it could be that in the professional body an individual belongs to at large, there are a number of influences as well, such as the direct colleagues, the executive committee of the company, a boss, and team members. This mirrors the entanglement between individual and professional aspects of the use of microimplants—that is, the individual and personal aspect involves a device planted inside the body, and professional involves an individual possibly being motivated by work to receive the implant.

As a consequence, it appears that further studies are needed in order to be able to design insideable technologies and implement them in an ethically acceptable manner. The variety

[3] Approaches such as value sensitive design have been proposed for embedding values into information systems. For instance, one can design for privacy, for autonomy, or for control. Thinking in terms of these values and investigating ethical acceptability from this perspective allows for the identification of tangible dimensions that can be affected by design. This would in turn make the feedback more accurate than the one obtained by current studies, which are normally assessed as ethical or unethical. Achieving such an understanding of ethical acceptability is the intent of the author, so value sensitive design approaches could be used in a future step of the research. For further reading, the work by Friedman et al. (2002) is recommended as a reference for a description of methods and theories associated with value sensitive design itself.

of methods should reveal different insights, complementing the nascent body of work on insideables.

Considering ethical and societal issues can lead to a methodological difficulty. Indeed, ethical considerations become apparent and discussed mostly after a breach, and it is not clear yet whether these considerations are held by individuals when they decide on using a technology before any scandal is discussed in society. It is possible that individuals are not ethically aware of the scope of the issue.
News media play a significant role in shaping the possibilities perceived by individuals. They are a source of information to obtain an indirect experience of technology, seeing how others present their choice to use with a technology and their experience of it. They shape an individual's perception of a technology, the potential benefits of the technology, and its potential risks, both ethical and societal. Studying how a technology is presented in media and what the reported drivers and barriers of technology adoption are requires a constant reminder of the different levels of framing that occur to lead to journalistic pieces—the journalists present facts through their subjective point of view and through storytelling.

1.4 Research questions

This paper is a first step in exploring whether technology acceptance models should be revised to incorporate a societal and an ethical dimension in order to capture the acceptance or non-acceptance of technology, especially enhancement ones. The paper focuses on the case of microchips implants proposed by organizations to their employees and aims at answering the following questions to sketch a revised model of acceptance to be validated in further research:
Q1: What are the elements referring to the societal and ethical acceptability and the functional acceptance of technology that are put forward in the media when they present the cases of microchip implants in the workplace?
Q2: What is the role played by these elements in the decision of companies and of the individual staff to use the technology?
Q3: What are the measures taken by companies to facilitate the acceptance and use of implants by employees?

2. Methodology

This paper selected three cases of implementation of the chips, as these are the only cases known by the author of employee chip implant.[4] These cases were identified as the only three

[4] It is noteworthy that there is also a gym club in Sweden that uses chips for memberships and the Swedish railway company SJ stores ticket information on the chip. These cases of customer use of implanted chips are of interest, but they pertain to another discussion as they depend solely on the decision of the consumers to equip themselves with the chip and use it for purchases and to transmit information. However, it is important to keep in mind as the reader goes through this paper, given the questions that may be raised due to multiple uses of a chip or the necessity of several chips, as such these questions: How many chips will a person need if this technology is to replace other artefacts such as tickets, keys, and documents? By whom would they be operated? How secure are they? Aside from these, seeing that implanted chips can be used by consumers also leads to the consideration of the market created by this technology, and how its acceptability can grow from personal to professional use.
This paper also does not consider the case of individuals making their choice for personal reasons to get an implant and then using it in their workplace.

cases representing such a use of microchip implants so far to the knowledge of this study. These cases also showcase similar uses of technology, which makes them comparable.

This case study is built on publicly accessible data, namely news articles; these allow readers an access into how the initiative of implanting chips into employees is framed by journalists and companies. However, it does not provide an access into the actual measures taken by the companies and the reception of this initiative by employees. In this research, a snapshot case study was conducted; it investigates how chip implants for employees are discussed in the news at a time *t*, but it does not investigate retrospectively how this phenomenon came to be. It would have been desirable to have direct access to the companies and individual employees for answering the research questions on the motivations to use and not to use the technology, but this could not be secured. This research therefore takes a less traditional approach to identify the drivers and the acceptance of technology by looking at elements reported in the media.

The advantages of adopting a case-study approach for developing theories are numerous (Starman, 2013):

- The process tracing links causes and outcomes together.
- There is a detailed exploration of hypothesized causal mechanisms.
- The development and testing of historical explanation is taking place.
- The approach allows researchers to understand the sensitivity of concepts to a context.
- The approach helps to generate new hypotheses sparkled by deviant cases.

The case-study we provide offers a limited access to what has actually been happening; facts are uncovered through the subjectivity of the companies, the journalists, and the journals, and the researcher presents them back to the reader in this paper. Having said this, there is not only value in comparing the three cases and in identifying the patterns and differences between them, but also in identifying how public opinion is shaped by the media discourse. This allows us to see whether there is an evolution in how the cases are described through time. It also allows to see the perspective of different geographical areas (e.g., cases and news sources from different countries) and sectors (e.g., newspapers in finance, general, local, and international).

Case-study approaches are often criticized for leading readers to a confirmation of the researcher's bias and prenotions, and therefore there is a lack of reliability with the approach, which is a critique addressed to qualitative research methods overall (Starman, 2013). Sturman (1997) suggested that different mechanisms can be put in place to increase the transparency of the process; for instance, data should be available for reanalysis and research design. Moreover, Sturman said these mechanisms can record the prenotions before data is analysed, such as a diary or self-reflection; these would clearly explain the relationship between the data and interpretive layers, namely the evidence versus assertions, and primary versus secondary data. It is possible to have a double coding of the data in order to check for accuracy. Another critique to case studies is their lack of generalizability, especially in comparison to quantitative methods. In case studies, generalization occurs at the analytical and inductive level, not a statistical one. Therefore, the reason why three occurrences of the phenomenon are surveyed in this paper is not related to an attempt at quantification and generalization. Having the three cases merely allows us to see whether the issue is framed in

a similar fashion through time. The three companies did not start to provide the service at the same time, and they are spread across the globe; two are European cases and one is American.

In this paper, the case study methodology was chosen in order to start documenting how microchip implants are discussed in society. It allows for the identification of gaps between the reported opinions of the employees in the involved companies, the journalists, and experts. This gap sometimes signals a need to educate populations on the technology or on its impact from an ethical point of view. It should be noted that this gap could not be identified by focusing only on users as in applications of the TAM and its refinements.
The following measures were taken in order to address the critiques made towards case-studies mentioned above:

1) In order to avoid bias in the data collection, this research selected news sources covering as many perspectives as possible until saturation, so the choice was made to prioritize the sources using various types of news sources rather than focus on readership.
2) In order to increase the reliability of the coding, a routine was set up for reading and coding the news articles twice with a three-week interval, and errors were also checked for.
3) In order to decrease bias in a data analysis, the research documented the prenotions of the researcher so as to be able to identify the effect of the researchers' subjectivity on the data analysis and knowledge construction.

2.1 Three cases of companies organizing staff chip implants

The first case is of the company Epicenter, which is based in Stockholm, Sweden. Employees can choose to be equipped with a chip under their skin in their hand so they can pay at the cafeteria or open doors from a simple wave of chip detection. Using chips started in 2015, and the chips were implanted during events.
The second case is the one of the company Three Square Market, which is based in River Falls, Wisconsin, U.S. The company offers employees the possibility to use the chip and make purchases in the break room, open doors, operate copy machines, log into computers, unlock phones, share business cards, store medical information, and pay at Radio Frequency Identification (RFID) terminals. This company proposed to their employees to get the implant. The chips are implanted into employees during parties on a stage. Implants started to be realized in 2017, and employees who do not wish to get the implant can opt for another device to carry around on their wrists.
The third case is the one of New Fusion, a company based in Mechelen, Belgium. There, the chips can be used as ID badges to access doors and computer system. The chips started to be implanted in 2017.
These three companies are medium or small size companies, and all three are in the business of innovation or digital marketing, that is, in a technology-friendly environment.
Given that the technology, as well as the company size, background, and present significant similarities, these cases can be easily compared.

2.2 Data collection

Data were collected through three queries on Google News—that is, one query was made for each case, and it looks for elements containing both the name of the company and the word *implant* in combination. This means the algorithm in itself was a filter of what articles could

be retrieved and in what order. Each result was reviewed against the following exclusion criteria:

- Articles published at the period when the implants were first proposed were retained. The articles that were retained were in majority published in the days or weeks after the companies had started to implant chips into employees; related papers published in magazines were retained as well. While this created a difficulty in retrieving articles, it does provide the possibility to see how initial reactions were framed and presented before first acceptance and use. It should be noted that experience and appropriation are outside of the scope of this paper.
- Articles that were published before the implants were suggested or implanted were not considered, as they did not provide the employees' point of view, and they would cover only public relation communications. In the articles retained for this study, the researcher could note the perspective of (1) the marketing of the companies which proposed the implants to their employees, (2) the company providing the microchips, and (3) the body hacker implanting the microchips. This point was continually revisited and considered during the analysis of the study, and the point is later raised in the discussion of the material.
- Entries from blogs or non-professional websites were not retained. Each article retained had to be signed by a journalist affiliated to an official news source or online magazine characterized by its reach and the possibility for readers to subscribe to the media outlet. Anything outside of this criterion is considered a non-professional website.
- Entries in a language other than English were not retained. This is explained by the fact that Swedish and Belgian cases are investigated, but the researcher has not mastered all these languages. The selective inclusion of a language over the other could have skewed the cultural analysis, and therefore it was decided to proceed without sources from another language.
- The study did not consider generic articles not exploring the cases outlined above and opinion pieces related to the larger issue of microchips and individual uses. This is done in order to keep the focus on company uses of microchips.
- Web pages that feature articles in the form of videos were not considered.

The researcher read the articles one after one another and stopped looking for new articles when a saturation point was reached; when multiple articles refer to the same interview or press conference given by the companies, there was a moment when new readings did not bring any new insight. Also, some newspapers republish articles published elsewhere, conducting the researcher to exclude articles. At that moment, a decision was made to stop the data collection.

As a result, 10 were included for Epicenter, 22 for Three Square Market, 6 for NewFusion—a total of 38 articles referring to the practice of chip implants in the workplace. The list of articles can be consulted in Appendix A. These articles come from a varied pool of sources (e.g., international, national, local newspapers, specialized in economics, and technology), which makes it possible to maximize the number of perspectives that might transpire in the news. Some of them are opinion columns while most are direct reporting articles. Two articles have been written by journalists who decided to get the microchip implant during one of the parties organised by companies where they implant their own employees (see Appendix A, numbers 7 and 25).

2.3 Data coding

The data were coded following the approach used by Strekalova (2015), who performed a similar study on the coverage around nanotechnologies. The code she proposed is meant to cover the key topics regarding the general discourse on emerging technologies. The code used by Strekalova looks at (1) technology development and applications, (2) economic impact, (3) policies and regulations, (4) public accountability and debate (or lack thereof), and (5) ethics and morality. The information featured in these categories was analysed from namely three different perspectives.

Firstly, there is the *time perspective*. Strekalova (op. cit) suggested analysing the topics in relation to time—that is, to look at whether these dimensions are discussed in relation to the past (i.e., previous applications of the technology), present (i.e., the three cases and what is meant to happen in the short term, to a horizon of 3 months), or future (i.e., long-term potential developments and applications).

The second perspective concerns the *source of information.* This study follows the coding of the frames suggested by Strekalova and adapts it to consider all the agents who might have been involved in the newspapers' articles, namely (1) employees; (2) organization through their executive members; (3) experts, whose opinion is solicited by the journalist; (4) stakeholders such as the company producing the microchips and the body hacker implanting them; (5) politicians who voice out their opinions; and (6) journalists. The journalistic frame is present by default overall as the journalist chooses which aspects of the topic to include in the paper. The journalistic frame here refers to the descriptive text found in articles which does not attribute an opinion or quotation to anyone.

Lastly, there is the *tone of the article.* This study examines whether the newspaper article is mostly factual, positive, or negative, or whether it offers the same space to positive and negative aspects of the microchip implants (see Appendix B).

As mentioned earlier, only one researcher proceeded to code the data, but the articles were read and coded twice at an interval of three weeks to minimize the risks of errors.

2.4 Data analysis

A qualitative analysis of the corpus was performed, and it led to a description highlighting the meaning of the different code categories for the case of chip implants in the workplace. Attention was also given to how these topics, risks, and benefits are constructed by the different agents mentioned in the newspapers. It is noteworthy that the articles focus on the implant and not on the functionality of the other devices that could be used as alternatives in companies (Case 2); this suggests that the idea of having technology under the skin, or one that one cannot switch off—or even both—is in itself problematic.

The interpretation of the researcher is seen throughout this paper and in the way the data was coded. Hopefully, by documenting the process through which the research questions and the data were constructed, the reader can identify where subjectivity and interpretation lie. When it comes to the analysis, this paper follows the advice of Sturman (1997) and separated the evidence from the assertions and interpretation by the researcher in a few ways, namely by (1) clearly explaining how the narrative around the results was constructed, (2) making the prenotions transparent, (3) sharing some summarized coding elements (Appendix B), and (4) leaving theoretical interpretation to the discussion section of this paper.

The topics and frames that the researcher expected to find are summarized in Table 1. They focus on the individual and organizational layers, as well as the subjective opinion of the researcher.

There were few prenotions or preconceptions in relation to individuals as the researcher could not understand why they would agree to use the technology; this reveals the researcher's sceptical point of view on microchip technology. However, from a more theoretical perspective, the researcher wondered whether the responses related to individuals would achieve the following:

- highlight elements of the TAM (Davis, 1989; Davis, 1986) or extensions (UTAUT, Venkatesh et al., 2003),
- feature verbatim that can allow to assess the role of expectation-confirmation theory (Bhattarcherjee & Premhumar, 2004; Bhattarcherjee, 2001), or
- report any ethical or moral issue employee might have.

At the organizational level, the researcher expected certain points of views to be offloaded onto individuals, namely the views on the lack of moral issues due to privacy being presented as a non-question and the responsibility to use the technology. The researcher expected that there would be no mention regarding a possible pressure to accept the technology given the background of the organisation, the size, or group effects. Finally, the researcher expected a focus on the benefits presently offered by the technology at the expense of a reflexion on how to manage the technology in the long run.

It was expected that the journalistic approach might be the only one to mention moral and ethical issues, even though the market opportunity of the chips was also expected to be discussed in future applications. The issues linked to managing the data and the chips were not expected to be covered much. However, it was the opinion of the researcher that certain questions of concerns would not be covered much by the newspapers. For instance, it was not expected to read about issues linked to the ownership of the chips, who manages the data (especially when the chips are used for more than convenience), and what happens if the employee leaves the company. In other words, it was expected that there would be a focus on present likely gains at the expense of a reflexion on the possible long-term issues.

Other expectations and prenotions of the researcher can be found in the framing of this paper and the introductory elements. These are repeated in the table, and they are classified as short-term or long-term issues.

Table 1. A summary of the expectations and prenotions of the researcher

Individual	**Organisational**	**Journalistic**	**Issues perceived by the researcher before data analysis**	
			Short term	**Long term**
Theories and their relevance: TAM, UTAUT, ECT	Dismissing privacy issues, assimilating them to tracking disabled in technology or existing regulations	Tendency to highlight advantages of the technology without thinking of issues with data management	Security (e.g., hacking)	Issues when leaving the company

Moral issues	Displacement of responsibility onto individuals (i.e., their willingness, no obligation), no recognition of the pressure to say yes	Focus on market opportunities rather than on management issues	Issues due to lack of control on how the technology function	A threat to health
Individual-use driving acceptance (vs. work use)	Lack of concerns for what happens with the chip after the employees leave the company	Possibly the one layer to mention ethics		Multiple chips in the body due to the proliferation of services might cause risks to health and in terms of governance
				A change in the relationship to work (work is inside the individual)

3. Results

This study analysed the data for each company case separately. The results that are presented show the cases as they occurred in chronological order—namely Epicenter first in 2015, followed by Three Square Market and New Fusion in 2017. Summary tables contain the coding made regarding topics and actors; a table accounting for time perspective is found in Appendix B; both were the basis for writing the cases summaries in the following subsections. The number attached to citations from the newspapers refers to the corresponding newspaper article number as mentioned in Appendix A.

3.1 Epicenter: Pioneer of chip implants in 2015

Nine articles from 2015 were retrieved, and they mostly referred to one article by the BBC. This indicates that the press coverage was following one main direction and not describing other points of view.

The different articles provided short descriptions of what the technology allows to be done at the present time and also perspectives for the future (Articles 1, 2, 3, 5, 7, 8, and 10). Executives of the company mentioned the potential for health care and payment services, as well as futuristic ideas such as being able to download Chinese onto the chip before a meeting in China. The main driver for the organization was presented as the need to see what products and services could be made, and also see what can be done before bigger corporations make it necessary to have these implants (1, 2, 4, 6, 8, and 9 for market orientation). In addition, the articles mentioned how convenient the technology is expected to be. The articles mentioned the experience of a person receiving the implant, and a lack of convenience was implied due to how the individual must twist their arm to make devices function (6 and 7). Other stakeholders putting in the implants mentioned hoping to discover possible uses.

Ethical considerations were hardly disclosed. Potential issues linked to privacy and to the voluntary character of the implants were briefly mentioned by journalists (1, 2, 5, and 10). Concerns amongst civil liberty groups were also reported; these were all related to ethical issues such as consent (2, 6, 8, and 10), privacy (1, 2, 5, and 10), security and risks of hacking (2 and 10), and data ownership and use (10).

3.2 Three Square Market, the first American company to propose chip implants

The case of implants at Three Square Market has been rather largely discussed with media coverage by U.S. national newspapers, regional ones, and European outlets. The view promoted by the articles is a balanced one where risks and benefits are both discussed. These articles often featured the opinion of consultants or scholars as experts.

The articles were focused on a description of current application of the technology, and risks were related to ethical issues (11, 12, 14, 15, 16, 18, 20, 21, 22, 23, 26, 28, 29, 31, and 32 for privacy; 11, 12, 14, 15, 18, 19, 20, 23, 27, 29, 31 and 32 for free choice; 12, 15, 23, and 25 for body integrity; 15, 16, 21, 23, 25, and 29 for health and safety; 11 and 12 for implied coercion). Drivers and barriers to adoption include issues such as the aforementioned ethical concerns or convenience as a driver. They mentioned briefly public debate (20), as well as regulations or policies from companies using not implants but RFID chips in the workplace (11, 17, 18, 23, and 29).

Almost all articles featured a description of what the technology can do along with a mention of the passive character of the technology in order to dismiss worries (12 and 25). A great number of articles described future uses of the chips proposed by Three Square Market, with an emphasis given on the potential future individual uses of the technology. A certain confusion was detected as the president of the company mentioned the possibility to carry files (including personal data) on the chip, which concerns the question of private use versus company use. Future uses were described, such as the use for other jobs (e.g., teachers to enter classes), individual use (e.g., starting the car), and healthcare (e.g., preventing heart attacks).
The technology has also been compared to other devices such as smartphones, which was said by representatives of Three Square Market to be a bigger issue than the implants in terms of tracking. Articles mentioned the fact that the technology is used for other purposes such as tagging pets, as well as a number of other deliveries such as cases of a use of RFID chips to carry medical records at the beginning of the 21st century.
In addition, the articles also pointed out the painless experience of the implant procedure (15, 17, 18, 23, and 24), as well as the possibility to remove it upon request (12, 18, 23, and 32).
The technology has also been discussed as being a payment system compared to Apple Pay and smartphone payments (24 and 25), and it was supposedly more convenient.

The motivations of the company to start the implants was presented as a marketing strategy—that is, creating a market and the image of being an innovative company (11, 12, 13, 18, 21, 25, 27, 29, and 32). This seems to be the result after the executive of the company visited the VP of Epicenter, as his narrative of what he saw in Sweden raised high enthusiasm. In the articles reviewed, there was no mention of the chip in being linked to increased performance, which would have linked the technology back to enhancement. There was also an important

rhetoric around the idea of changing the world and being part of the future, which speaks more of the attitude to technology and innovation that is present within the company. The chip represents a market and appears as an asset when talking to customers, and thus one of the motivations is reported as trying in on personally before bringing it to customers. The technology was also presented as making things more convenient for employees who do not have to remember passwords and keys, and this is seen as a perk for employees (11, 13, 15, 16, 18, 19, 20, 23, 25, 26, 28, 29, and 32).

There were at least six ethical issues reported by journalists; these are listed here in order according to the number of mentions. The most mentioned issue is *privacy and surveillance*, which deals with tracking employees. The second issue with highest number of mentions is information security, namely that the misuse and hacking can happen. The third issue concerns *health and safety*, since the effects on the body are not known. After this, there is the issue of *data ownership*, namely who owns the data and how is it used. One issue found that did not appear in the coding itself, but rather as the result of the holistic analysis performed by the researcher is the (non-)respect of the proportionality principle. This appears as a result of the confrontation between intrusiveness in the body, the existing other technologies, and the affordances of the technology. This issue was not a component that the researcher had in mind at the beginning of the research; rather, it emerged from the two readings of the corpus of newspapers articles. Finally, there was the issue of *free choice* which was raised by an expert interviewed by a journalist. This "free" choice of employees to get the implant might be seen as a pressure to say yes (12 and 29); it may involve asking someone during a job interview whether they would accept the implant. There is also the idea that people who accept the implant create a culture where employees are expected to do so; while the technology becomes necessary from a social perspective (11), its parameter of use and functions can evolve towards less acceptable things (18).

The company explains being transparent and not linking the use of the chip to employment (15). It also offers an alternative form of technology for those who do not want an implant (14, 17, 22, and 25).

There is a certain form of overlap between these issues and the barriers mentioned by employees. Namely, one employee reported being wary of having something under her skin, not knowing what the long-terms effect might be on health (15). The company reported that employees worry about privacy and safety as well amazement and fear (12).

The most cited driver is convenience. Representatives of the company were also said to mention the security and peace of mind (21) that the chip brings to employees. One employee mentioned the importance of catching the wagon, as chips will be used; this echoes the idea of being part of the future that is promoted by the company (13). Another employee was seen to be proud of having a part in testing an emerging technology (27). Finally, one expert reported that "There was kind of this implicit narrative that if you don't want to go along with this, you're some kind of backwards luddite who doesn't understand technology" (29). This comment on the company shows that educated people who understand technology received the implant.

The public debate seems to be driven by Christian groups; a few articles mentioned these activities in reaction to a technology that appears to be "the mark of the beast" as presented in the Bible (20; 25). It is also driven by politicians who emphasized the inappropriate nature of current regulations or the fact that these are not national.

The regulations mentioned pertain to the approval of the Food and Drug Administration (FDA), or the policies put in place in the companies which use similar technologies. Examples were brought up to show the need for conversations between users (i.e., employees) and managers about how they appropriate the technology and use it. Experts and politicians who were mentioned in the newspapers asked for more regulation; this was also seen in the comments left on social media and in the writing by journalists.

3.3. New Fusion: Second European case

The case of implants at New Fusion appeared in the media as an opportunity to discuss the development of chip implants in the workplace in general. They mostly referred back to the Epicenter case as well rather than discuss the specific case of this company.

The articles focused on the description of the current application of the technology, risks related to ethical issues, and drivers and barriers to adoption. These three elements are described in detail here.

Firstly, the technology was discussed in an extensive manner (33, 35, 36, and 38). Details on what the chip can and cannot do were provided. Often, a description of other cases of use of micro-chips implants for individuals or groups (e.g., the army) was provided, or the chips were compared to other existing technology such as smartphone payment (35). In particular, the security aspect of these technologies was discussed with some seeing the chip as more secure. The emphasis is on present cases. The whole initiative is seen more as a personal use of technology rather than corporate by the company (35).

Secondly, the benefits are framed as *convenience* (33, 35, and 36), while risks were seen to be equivalent to ethical issues, such as security (34, 36, 37, and 38), privacy (33, 34, 35, 36, and 37), bodily integrity (35 and 37), and the doubt on the limits one can put to technology (control) (37). Both the voluntary aspect of the implant and the fact that a person cannot be punished for not accepting it are seen as conditions for acceptability. Risks are seen as long-term, with one of the articles questioning the slippery road that the use of microchips represents (32).

Thirdly, there were a number of drivers reported by the executives of the companies proposing chip implants and the employees. For the executives, the drivers are namely convenience as chips replace other technologies and facilitating payments, as well as the opportunity to understand how these technologies work before big companies make them compulsory or almost. For the employees, they reported the driver of being innovative (35).

The articles also stated reasons for resistance. For employees, these include not wanting work under one's skins (35) and the anxiety raised by the technology (32 and 35). Bodily integrity and not being willing to have work under their skin was the only ethical issue reported as a reason to refuse the technology (35 and 37).

For journalists, there are risks of hacking. They mentioned possible resistance from Christian groups who warned about the "mark of the beast" in the Bible (35 and 38); this suggests a possible loss in dignity linked to the use of microchips.

Other categories including in the initial coding grid were not much discussed. The economic aspect of microchip implants was mentioned as the cost of the technology and its non-lucrative aspect (36). Public accountability was mentioned only once, and this underlines the

backlash that New Fusion has faced online after announcing the use of the chips (35). Regulation was mentioned in a broader discussion; articles point out a difference between the discussion and propagation of such ideas in Europe and in the USA. It was noted that the American public is usually more worried about employers tracking staff; there are laws stating that employees cannot be required to be chipped, and such laws have been passed in several states. Regulations linked to employers and staff rights, privacy, and data handling, are not mentioned.

4. Discussion

The coverage of the first case from 2015 and the coverage of the two other cases from 2017 is essentially different. The few articles from 2015 that were retrieved presented the fact that these implants were possible and offered remarks on possible futures. The articles from 2017 offered more lengthy descriptions of the technology, the reasons to use it, and the attached ethical issues; remarks on where this technology can go in the future were also found. In any case, the greater coverage might be explained by the number of cases increasing, both for individual and work-related uses. The articles from the last two cases appear more polarized.

In answer to RQ1, the following ethical and societal issues have been identified (see Table 2); these issues cover market, personal, societal, and religious interests.

Table 2. Summary of ethical and societal issues

	Ethical considerations	**Societal considerations**
Companies	Giving choice (consent opportunity), not using devices tracking users	Building the future; creating markets and services
Employees	Lacking proportionality between intrusion and usefulness Lacking understanding of long-term effects (health, safety) Lacking privacy Lacking bodily integrity (i.e., work in one's body)	Building the future
Journalists	Lacking privacy Lacking security Lacking consent	Leading to changes in society (e.g., cyborgs, transhumanism) Employees receiving pressure to be part of the company group/culture and the lack of a true voluntary aspect of choice
Experts	Enforcing privacy Enforcing consent Having future developments Having data management	Needing regulation
Other stakeholders in society		Seeing technology as "the mark of the beast"

These considerations have a role in accepting the technology. In answer to RQ2, the motivations and barriers of companies and employees are presented (see Table 3) and discussed in relation to technology acceptance and the responsible development of technologies. Some of the motivations and barriers are related to the above-mentioned ethical and societal considerations.

The considerations presented above, as well as the motivations and barrier to acceptance, only partially overlap with the prenotions of the researcher. Indeed, this study anticipated the issues of privacy, the management of the chip, market opportunities, and lack of policies. However, the study did not foresee the idea of accepting the technology to be a pioneer or the idea of testing the technology to have a competitive advantage or before large companies make it necessary. The idea of proportionality between the intrusion of the technology and its functionalities was also not anticipated, but it appeared implicitly in the responses of those who refused the technology. Some other dimensions such as the disclosure of expectation-confirmation phenomenon simply also did not appear in the dataset.

Table 3. A summary of the motivations and barriers to the use of microchips

	Motivations	**Barriers**
Companies	Image Products and services to be imagined Trying the technology before other big corporations make it compulsory Convenience	
Employees	Being part of the future (innovative image) Convenience	Having discomfort of thinking of having technology under the skin Proportionality between intrusion and usefulness Lacking understanding of long-term effects Having worries on health and safety Privacy

The motivations mentioned in the articles are rather homogenous amongst the cases, which might be due to a few reasons. First, the companies build on each other's experiences, as seen with Three Square Market proposing the use of the chip after meeting with Epicenter. Secondly, the same company and body hacker to provide the microchips was used. Before proceeding to an analysis of the motivations of the companies and the employees, it is helpful to have a look to the marketing of the chip-providing company (see Figure 1), which had presentations using taglines such as, "opportunity to be part of exploring this exciting technology" and "you are the future!". The rhetoric around the future, exploration, and innovation was largely conveyed in the news articles as well. The main driver of acceptance for employees is to explore the potential of the technology and be part of the future, and this corresponds with the rhetoric given, which suggests some influence. The *propensity to*

innovation is a variable that has been partially captured by technology acceptance models such as voluntariness to use (UTAUT; Venkatesh et al. 2012; Venkatesh et al., 2003), and it represents the core idea defended by the theory of diffusion of innovation (Rogers, 1983). This appears as an important variable to take into consideration when studying the acceptance of insideables. The impact of marketing in creating such a perception needs to be considered.

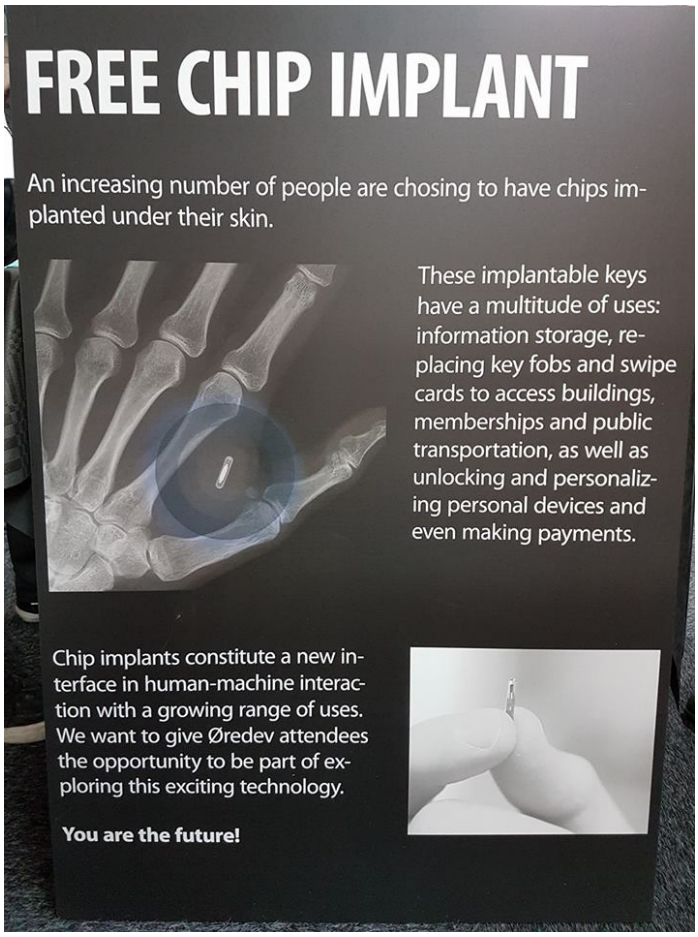

Figure 1. Example of marketing material of the company providing the microchips, publicly published by Biohax / Facebook

As mentioned, another driver is convenience, which is similar to the idea of perceived usefulness or benefits present in the TAM model (Davis, 1989; Davis 1986).

The resistance to technology is seen to be driven by considerations of an ethical nature, which are not equally represented in TAMs. **Privacy** has been mentioned, which was already investigated in acceptance models of banking systems (Lallmahamood, 2007). *The proportionality between the intrusion of the technology and the benefits from it* was also mentioned as a barrier. The idea behind the task-technology fit (Cane & McCarthy, 2009; Goodhue & Thompson, 1995) does not consider the proportionality but rather the functional fit between the task and what the technology does. Considering proportionality as such could help in designing and promoting technologies; for microchip implants, it means that the functionalities of the chips are not yet well enough developed or that side benefits. For example, better security for the same functions as other technologies has not been demonstrated yet. The idea of proportionality can also be used not as a race to complete the

technology but rather lead companies to question why they should or should not offer the implants to their staff or customers so as to advance the diffusion of the technology as in a more responsible manner. *Well-being* was also mentioned as a barrier; this is related to a potential threat to physical health in the future as well as the uneasiness felt at the idea to have technology under the skin. Worries linked to the future seem to play a significant role. While technology acceptance models consider the future through the concepts of expected performance of a technology, they do not consider the *expected risks or bad consequences stemming from the use of this technology.* Further research should look more closely at the importance of this factor in technology acceptance. Indeed, it could help to have companies perform societal, ethical, and technology assessments, and thus possibly drive the development of more responsible research and innovation (Von Schomberg, 2012).

Other factors appear as important in influencing the way technology is presented, namely the *spread of individual cases* (in and outside companies, with social pressure effect) and the existence of *facilitating conditions* (when companies will cater for these implants only). Both have an impact on the quality of the *consent* given by individuals

The proliferation of individual uses moves the presentation of microchips from being used for pets and deliveries to being used by a growing number of individuals. This means the simple existence of this technology for humans is not questioned; the discussion focuses rather on which technology is used and how it is managed in order to respect safety and privacy. It is therefore necessary to have research conducted that looks at the correlation between technology spread, knowledge of individual cases, and acceptance. This is especially important in the workplace; for instance, if some employees agree to the implant, they can set the trend for others, thus decreasing scepticism towards the technology. This can also open the way to more functions being added to the chip by employers. Social pressure should be taken into account.

It is also important to have facilitating conditions in place; this refers to the infrastructure that supports the use of the technology inside and outside of the workplace. This would support the perceived usefulness of the technology and can make it seem necessary. It can also be that workplaces decide to support only one form of technology, as they do today with smart RFID cards; in such a case the infrastructure leads the individual to consent to use the technology.

Based on these cases, the following framework can be sketched, where ethical and societal considerations are considered as a driving resistance to technology (Figure 2). Given that there is a continuum between use and resistance to technology (Gauttier & Gauzente, 2018), it is important to consider how ethical and societal considerations might be outweighed by the functional considerations and the willingness to at least partially adopt the technology in a given context. Therefore, we present a modelling that accounts for drivers of both the resistance and acceptance described above. Societal considerations appeared to be related to communities and ideology, such as from religious groups. Considerations pertaining to an individual's identity also mattered; these considerations include the idea of being a hybrid with technology, fitting in social group, and being a pioneer.

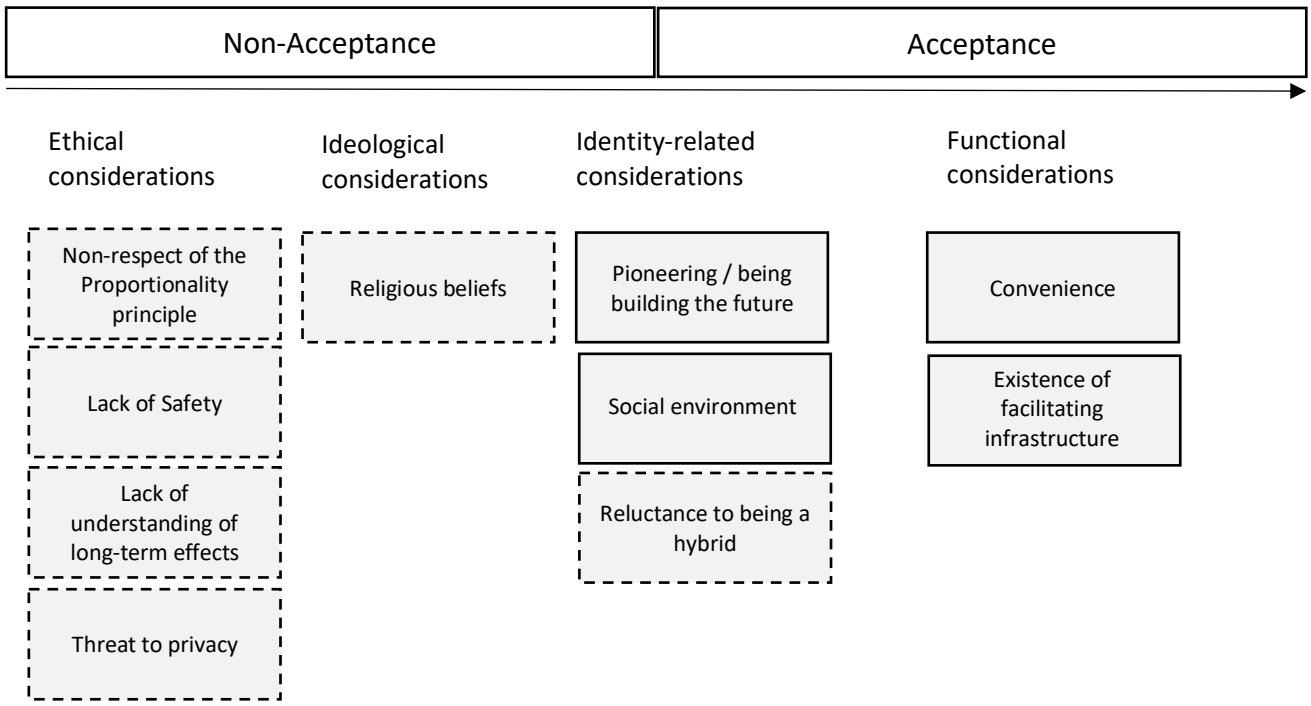

Figure 2. An initial modelling of drivers of either acceptance or resistance to insideable technology. The discontinued box outline refers to the elements present in non-acceptance

Such a modelling can be enriched through a further qualitative exploration of the drivers and the hindrances of employees in getting the insideables, seeing that the news media do not offer the guarantee of covering the topic in an exhaustive manner. The modelling presented here can also be used to identify the significance of each element in the decision to use or not use the technology through qualitative or quantitative approaches. Methods involving direct users of the implants should be considered, as these should provide a greater insight into how the choice of getting the implant or not is actually experienced. Finally, relationships between these elements can be tested with quantitative methods. This modelling is therefore offered as an initial step towards understanding acceptance of microchip implants.
However, based on the evidence gathered, it cannot be said that respecting the ethical principles highlighted above drives acceptance. It could be hypothesized that they do drive acceptance or that alternatively people accept technology do so either without considering ethical aspects or without letting these aspects drive their decision to use and accept the technology. The role of ethical factors in driving acceptance needs to be investigated in future research. In particular, it should be considered how the issues raised by experts and journalists are perceived as relevant for individuals to make their choice of getting an implant or not. This is important given the emphasis made by the European Union regarding the stream of responsible research industry (Gauttier et al., 2017), and ethics is considered one of the pillars of this responsibility. If ethical considerations drive acceptance, there is then a clear incentive for technology developers and providers to act in a societally and ethically responsible manner.

Regarding the third question, no specific regulation or policies have been mentioned in the dataset aside from offering employees the choice in terms of technology used (i.e., implant or

another RFID device and not using the implant in hiring and firing situations). For employees to truly have choice, companies should also provide the infrastructure supporting the use of different technologies. The microchip can be removed should users decide so, either before or after leaving the company. The companies refer to the passive character of the microchips and the fact that no tracking is allowed in order to reassure that privacy rights cannot be infringed. Finally, safety and health concerns are dismissed as the technology has been said to be safe. Other policies mentioned include the approval of the chip and the fact that, at least in Wisconsin, a company cannot require an employee to get an implant. No further assessment or policy is put into place, and the policies that are needed should the futuristic scenarios of microchip use described by the companies materialize are not discussed. Areas for self-regulation and areas where the legislator should act might need to be identified. These could deal with a number of issues, such as privacy, which is a major concern for stakeholders; with the proportionality principle, so as to identify when an organization could expect its members to get implants; or finally with establishing procedures to assess the impact of technology, especially concerning long-term health and well-being.

The findings presented in this paper need to be assessed critically. It is based on an analysis of a corpus of news articles, but the articles did not allow the researcher to ensure the breadth of the concerns of employees and companies are presented. Rather, the concerns identified are those that appeared relevant to journalists to be presented to society. Additional studies surveying the drivers and hindrances to the adoption of microchip implants in the workplace should be realized with direct access to the employees in question.

Nevertheless, this analysis allows the study to confirm the need to further explore the role of ethical considerations in resistance or acceptance of technology, building on the work of Murata et al. (2017). The analysis already provides much insight on a variety of ethical principles that were not necessarily considered in previous acceptance models or explanations of resistance, or ways of exploring the role of ethics (Reinares-Lara et al., 2018; Murata et al., 2017). Following this paper, it appears that a more granular understanding of what *ethical* and *moral* means is required to enrich our understanding of how to develop and implement technologies that more acceptable and accepted. A series of future research opportunities can be derived from our findings, in relation to prior literature.

Several directions can be taken for future work. Firstly, future research could consider the relevance of the Multidimensional Ethics Scale (MES) to study the ethical aspects of acceptance of microchip implants, or how to refine the scale in order to integrate more specific values into it. Capturing the meaning behind these values and their role in shaping acceptance and effective use of technology opens a methodological challenge. Secondly, the role of media in shaping users' reflexions should also be further considered, as the ethical dimensions that were identified here do not always result from users' reflexions only but may also integrate what journalists and experts are concerned about. It could also be considered that while there are claims that ethical issues are present, these issues are not the determining factors for the decision to use or not use the microchip implants, even though the issues appeared to be positioned as drivers of resistance in the news articles reviewed risks for privacy and safety. Thirdly, the type of employees who are sensitive to potential ethical issues should also be identified. From the research here, it seems that a high personal propensity to innovation might lead to dismissing ethics as a reason to reject a technology.

Conclusion

The three cases described in this paper allowed for ethical considerations to be identified, as well as some societal considerations driving resistance to technology and also more functional considerations driving the acceptance of microchip implants in the workplace as reported in the media. Doing so, the study highlighted how current approaches to acceptance and resistance of technology need to be adapted to assess the technologies promoted to enhance individuals.

In going deeper than focusing on the announcement effect of having employees chipped at work, this case-study assessed how far enhancement is from the workplace. Indeed, the cases described a technology replacing others, and in so doing individuals are not given new abilities. Moving on to that next step might reveal other dimensions of resistance and acceptance to be considered, as well as regulations. The microchips are also designed for personal use in the context of the workplace, rather than for work-related tasks themselves. This dual use of technology is not necessarily reflected in current models, although there is already a phenomenon of personal and professional use of technology (e.g., smartphones and laptops). It might become more important as technologies are implanted inside the body. The Considering the role of ethics and what is so specific to technologies such as insideables offer new challenges not only for information systems researchers, but also to more interdisciplinary research looking at how technology is used by and in society, as well as transforming society.

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Appendix A. List of the newspapers articles included in the analysis

The list of newspapers that have been included in this analysis is given here so the reader gets a sense of the origin of the data.

Case 1 – Epicenter

1. https://www.ibtimes.co.uk/stockholm-office-workers-epicenter-implanted-microchips-pay-their-lunch-1486045
2. http://www.euronews.com/2015/02/11/implanted-rfid-chip-controls-office-access-for-stockholm-workers
3. http://www.nydailynews.com/life-style/health/swedish-company-offers-employees-implantable-chips-article-1.2104851
4. https://www.independent.co.uk/life-style/gadgets-and-tech/swedish-firm-microchips-employees-10075400.html
5. https://www.washingtontimes.com/news/2015/feb/6/swedish-offices-implant-employees-with-microchips-/
6. https://www.popularmechanics.com/technology/news/a13970/swedish-company-microchipping-employees/
7. http://www.bbc.com/news/technology-31042477
8. https://www.medicaldaily.com/adventures-biohacking-hi-tech-swedish-building-complex-implants-rfid-microchips-321180
9. http://www.dailymail.co.uk/news/article-2934241/Swedish-company-implants-microchips-staff.html
10. http://www.dailymail.co.uk/sciencetech/article-4375730/Cyborgs-work-employees-getting-implanted-microchips.html

Case 2- Three Square Market

11. https://www.inc.com/geoffrey-james/your-corporate-chip-implant-is-entirely-voluntary-.html
12. https://www.paymentssource.com/news/chip-and-skin-implantable-rfid-gives-payments-its-matrix-moment
13. https://www.techrepublic.com/article/three-square-market-becomes-first-us-company-to-offer-implanted-microchips-to-all-employees/
14. https://www.snopes.com/fact-check/three-square-market-microchip/
15. https://www.cnbc.com/2017/08/11/three-square-market-ceo-explains-its-employee-microchip-implant.html
16. http://www.wbur.org/hereandnow/2017/08/25/three-square-market-microchip
17. https://www.trtworld.com/americas/us-company-throws-chip-partyto-implant-microchips-in-staffers-414651
18. https://www.marketplace.org/2017/07/26/tech/sitting-down-three-square-market-microchips-its-employees
19. https://www.dallasnews.com/opinion/commentary/2017/07/26/employees-getting-microchip-implants-mildly-alarming-sign-apocalypse

20. https://www.washingtonpost.com/news/wonk/wp/2017/08/01/some-feared-hackers-and-the-devil-others-got-microchipped/?utm_term=.394d965215ae
21. http://www.nbc15.com/content/news/Company-president-pleased-with-microchip-implants-470817013.html
22. http://host.madison.com/wsj/business/opening-doors-with-the-wave-of-a-hand-president-of/article_e6ca194c-52c9-5512-acc4-e00c8993e177.html
23. http://www.govtech.com/blogs/lohrmann-on-cybersecurity/where-next-for-microchip-implants.html
24. http://kstp.com/news/only-on-5-wisconsin-ceo-gets-microchip-implant/4559533/
25. https://www.theguardian.com/technology/2017/aug/02/microchip-contactless-payment-three-square-market-biohax
26. http://abcnews.go.com/US/companies-technology-monitor-employees-sparking-privacy-concerns/story?id=53388270
27. https://www.fastcompany.com/40447938/watch-these-workers-get-rfid-microchipped-at-their-companys-chip-party
28. https://www.usatoday.com/story/opinion/2017/08/07/microchips-bad-idea-please-do-not-let-your-employer-implant-one-you-christian-schneider-column/540610001/
29. https://chiefexecutive.net/microchipping-employees/
30. https://thenextweb.com/insider/2017/04/04/a-real-life-company-is-implanting-microchips-in-employees/
31. https://gizmodo.com/company-offers-free-totally-not-creepy-microchip-impla-1797190619
32. https://www.sciencealert.com/for-the-first-time-a-us-company-is-implanting-microchips-in-its-employees

Case 3 – New Fusion

33. http://www.dailymail.co.uk/sciencetech/article-4203148/Company-offers-RFID-microchip-implants-replace-ID-cards.html
34. https://mashable.com/2017/02/07/belgian-company-microchips-employees/#kZ_9cxXuBSqK
35. https://www.fastcompany.com/40444110/why-would-anyone-let-their-employer-stick-a-microchip-into-their-body
36. https://www.nanalyze.com/2017/08/who-makes-rfid-chip-implants-humans/
37. https://www.worldcrunch.com/opinion-analysis/perils-and-convenience-of-a-microchip-implant-in-your-hand
38. https://sputniknews.com/science/201702051050367706-belgium-workers-microchips/

Appendix B. Tables resulting from the data analysis

Table Appendix B.1 Content based coding

The reader must consider that this table does not represent the sentiment expressed by the different agents (journalists, experts, companies), often in contradiction. The table also does not allow to show what are the elements each newspapers article was insisting upon. It is merely an invitation to access the articles on the topics of interest.

Topic	Who	Source
Ability to switch off	Journalist	11
Active vs Passive character of technology	Journalist	10; 12; 25
Alternative to implant as ring or wristband	Journalist, Company	14; 17; 22; 34; 35
Biohacking	Journalist	8
Bodily integrity / invasiveness of the technology	Employee software engineer, Journalist; CEO	5; 10; 12; 15; 23; 25; 35; 37
Chipped person living like an asset for the company	Layman	23
Comparison to other technology	CEO other company	33, 38; 17
Convenience	Company; Journalist	1; 9; 10; 11; 13; 15; 16; 18; 19; 20; 23; 25; 26; 28; 29; 32; 33; 35; 36
Criticism from public	Journalist	1; 20; 35
Culturally acceptable	Journalist	1; 23
Dark sides	Layman; Journalist	23; 28
Data to be gained	Expert, Journalist	10;12
Dependency on digital technologies	Expert	5
Disadvantage	Employees (reported)	12
Dystopian future	Journalist	35; 39
Employee turn over		34
Excitement	Company	15; 25; 32
For security	Employee; Expert	27; 29
Free choice for individuals (rather than company, questioned)	Journalist,	2; 6, 8; 11; 12; 14; 15; 18; 19; 20; 23; 27; 29; 31; 32; 34; 35; 36
Health and safety	Journalist; Employee; Company, Child	10; 15; 16; 21; 23; 25; 29; 35
Ill intentioned manipulations	Layman; Journalist	23; 28
Impact on hiring / firing	Company; Expert	12; 29
Implied coercion with choice	Journalist, Expert	11; 12
Individual other initiatives	Journalists	1; 9, 20; 34; 36; 38

Innovative image	Expert, company, employee	10; 13; 27; 29; 32; 35
Internet of things	Biohacker; Journalist	4; 11
Lack of Intuitiveness	Journalist, Company	1; 6; 10
Limits to be put to technology	Expert	37
Long term effects	Employee; Expert, Child	15; 18; 23; 32
Low perceived usefulness	Reported, Journalist	2; 5; 7
Market orientation (services, test before others)	Stakeholders; Company; Journalist; Employee	1; 2; 4; 6; 8; 9; 11; 12; 13; 18, 21; 25; 33; 36;
Medical use	Journalist	9; 23
Military use	Journalist	16; 38
More trustworthy than smartphone	Child of employee	35
Need for standards	Employee	27
Negative emotions (nervosity, fear)	Employee	3; 4; 12; 15; 32; 35
Objects and technology it replaces or could replace	Company; Journalist; Child of employee	1; 10; 35; 36; 38
Obsession with digital technologies	Expert	5; 9;
Ownership (tech, data)	Company	11; 15; 23; 31
Pain	Employee and journalist chipped; Company CEO	6; 9; 15; 18; 23; 24
Payment system of future	Epicenter, CEO	24; 25; 35
Peace of mind	Company	21
Personal information security (hacking, malware)	Journalist; Expert; Civil liberty groups reported by journalists	2; 10; 11; 16; 17; 20; 23; 29; 31; 32; 33;; 34; 36; 37; 38
Policy (needed or existing)	Journalist, Policy-maker; Expert	1; 11; 17; 18; 23; 29; 35
Possible applications	CEO; Journalists	1; 2; 3; 4; 5; 10; 11; 13; 14; 16; 17; 18; 20; 21; 22; 23; 24; 25; 27; 29; 31; 33; 34; 35; 36; 37; 38
Privacy - Tracking when implanted by employer (possible or not, as a danger source 1 and 3 or a non-danger source 2)	Experts, journalists; Civil liberty groups reported by journalists; privacy advocates as reported by journalists, companies	1; 2; 5; 10, 11; 12; 14; 15; 16; 18; 20; 21; 22; 23; 26; 28; 29; 31; 32; 33; 34; 35; 36; 37
Proaction	Layman	23
Process	Journalist	3; 5; 6; 8; 10; 12, 17, 18, 25
Religious barriers	Journalist	20; 25; 35; 38
Removal possibility	Journalist, Layman	12; 18; 23; 32
Replacing learning skills	Journalist, Companies	3;
Similar cases in companies	Journalist	12; 31; 33; 35; 36; 37; 39

Tech description (from size to difference between NFC and RFID)	Journalist, Company (once)	1; 2; 4; 3; 5; 8; 9; 10; 13; 15; 19; 23; 25; 33; 35; 36; 38;
Transhumanism	Journalist	34; 37
Transparency	Journalist	11; 15; 26
Upgrade and maintenance	Journalist	36
Who pays	Journalist	31; 32

Table Appendix B.2 Content based coding

	Past	Current	Future
Case 1	9	1; 2; 3; 4; 5; 6; 7; 8;9; 10	1; 2; 3; 5; 7; 8; 10
Case 2	20, 31	11; 12; 13; 14; 15; 16; 17; 18; 19; 20;21; 22; 23; 25; 26; 27; 29; 31; 32	12; 17; 18; 22; 23; 25
Case 3	36; 33; 38	36; 33; 34; 35; 37; 38	36; 37

Table Appendix B.3 Content based coding

	Mostly Positive	Mostly Negative	Mostly Factual	Balanced
Case 1	4; 9	1, 6	8	1; 2; 3; 5; 7; 10
Case 2	11; 16; 21; 22; 23; 25; 26	17; 19; 28; 29; 31; 32	13, 14; 24	12; 15; 18; 20; 27; 30
Case 3	35	36; 37; 34	38; 33	

Mostly positive = the articles that show a majority of arguments for the use of the microchip implants
Mostly negative = the articles that show a majority of arguments against the use of the microchip implants
Mostly factual = articles which describe the initiative of getting micro chip implants without discussing pros and cons
Balanced = articles which give equal space to arguments for and against the use of microchips