

MANUSCRIPT – NOT FOR WIDER CIRCULATION

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A journey from domestication approaches to practice-based theories

Introduction

Rarely is a new commodity a simple response to some basic need (eg. Basalla, 1988; Petrovski, 1993). Typically new commodities either replace older products, e.g. when modern household margarine replaced butter, or new commodities enter into the life of consumers as objects with almost no practical purpose (Pantzar, 1997). In each case, normalization and diffusion processes require human labour and continuous care. The term "domestication" of technology fits well to the idea that there are commonalities between the ways new technologies get stabilized in daily life and the ways animals and crop were domesticated about 10.000 years ago: "The fundamental distinction of domesticated animals and plants from their wild ancestors is that they are created by human labour to meet specific requirements or whims and are adapted to the conditions of continuous care and solicitude people maintain for them" (Encyclopedia Britannica, 1990).

Domestication or market making of radically new technologies requires a lot of conceptual and institutional work as happened when the first automobiles at the end of the nineteenth century (Basalla, 1988), early computers in the 40s' and home computers in the 80s' (Ceruzzi, 1986), but also the first refrigerators in the beginning of this century (Cowan, 1983) entered everyday life. Less is written about the ways daily practices related to these novelties get activated in normalization processes,

and the ways better reproductive quality of new practices, is stabilized in behavioural patterns facilitating the emergence of new integrations, new combinations of existing element. This essay suggests that practice-based approaches are most useful (from a domestication perspective) in examining not only the integration of material objects and meanings attached to them, but also their maintenance, reproduction and occasionally evolution of new patterns in daily life and in society. Importantly, practice approaches assume no definite end-point in domestication.

Contrasting (comparing) domestication approaches and practice-based theories is certainly subjective in many ways for this author who has contributed in both traditions (see e.g. Hartmann, 2020; Pantzar, 1997, 2019). Another source of bias comes from the fact that a large diversity of views exist in each theory tradition. There is no such things as one unified domestication theory, neither is there a single practice theory. This article uses these theoretical labels as sensitising selective tools (Warde, 2014), characterizing changing academic views on society and everyday life.

Outlines of the domestication framework (e.g. Silverstone, Hirsch, Morley, 1992) originated in part from anthropology and sociology of consumption at the start of the 1990s in the UK (Haddon, 2011, see this Handbook...). At the same time related theoretical terms like 'social shaping of technology' or 'actor network' were introduced by various researchersⁱ (e.g. Bijker & Law, 1992; Latour, 1991). The ways consumption objects are introduced, appropriated, institutionalized and expanded, i.e. domesticated, reflect quite general human-related processes going on in modern market economies. Domestication studies tended to stress that characters and attributes of new commodities change in time. Many of the generalization based in anthropology and social histories of technology (e.g. Cowan 1983; Fischer

1992; Silverstone 1994) emphasize metamorphoses. Novelties move from "toys" to "instruments" (Levinson 1977), from "luxuries" to "necessities" (Douglas and Isherwood 1978), from "pleasure" to "comfort" (Scitovsky 1976), from "sensation" to "routine" (Löfgren 1990), or from "hot passion and fashion" to "rational choice and lifestyle" (Pantzar 1997).

Domestication studies has typically focused on changing meanings of goods and the stabilization of behavioural patterns. Practice-based theories, in their turn, see established habits and routines as a starting point for the emergence of new practices. For example, the proliferation and normalization of cold storage (fridge, freezer) in homes made the existence of nearby dairy and butcher shops unnecessary, while promoting the proliferation of shopping malls accessible by car. This article suggests that it is stabilization of behavioural patterns (predictability) that partly explains why recent practice approaches are so useful from the point of view of domestication theory. It is not only that technology provides ways of satisfying existing needs, but also that it creates novel needs and wants, constraints and practices through its diffusionⁱⁱ.

Domestication approaches corresponded closely (or fitted well) with the 'cultural turn' that took place forcefully in the 1980s' and 1990s'. Anthropologists, historians and sociologists started to emphasize qualitative aspects of everyday life instead of a more positivistic view on human behaviour (Evans, 2020; Miller, 1987, 1995).

There are important continuities, but also discontinuities, when a few decades later a philosophically heavy 'practice turn' (e.g. Schatzki, Knorr Cetina, Von Savigny, 2001) or more empirically focused practice-based views (e.g. Magaudda, Piccioni, 2019; Shove et al., 2012) were introduced to academic research (Evans, 2021; Warde, 2014).

It was in 2005 that Alan Warde in his seminal article *Consumption and theories of practice* stated: “it is strange that theories of practice have scarcely been applied systematically to the area of consumption” (136). After this testimonial, a real “bandwagon” of practice-based studies has emerged in consumer research, but also in related fields such as organization and marketing studies (Evans, 2020; Warde 2014). The bandwagon has spread through pluralism of conceptual labels and ideas and different disciplines have their own versions of practice approaches: e.g., “Strategy as practice” or “Marketing as practice” (see Corradi, Gherardi and Verzelloni 2010).

One of the main contributions of different practice approaches is stressing institutional and material aspects of change instead of individual choices and meanings. In the cultural turn the emphasis was more on cognition and governing life with knowledge: ‘The material world exists only insofar as it becomes an object of interpretation within collective meaning structures’ (Reckwitz (2002a: 202) quoted in Warde 2014, 283).

Current practice theorists give detailed attention to various integration processes taking place when practices get accomplished (e.g. Reckwitz, 2002; Shove et al., 2012; Schatzki 2001, 2010). Theodore Schatzki, today probably the most influential representative of practice theory, defines practices as embodied, materially enabled sets of human activities organized around shared practical understanding. Practices are carried out by different body/minds and they exist as sets of norms, conventions, ways of doing, know-how and requisite material arrays. Andreas Reckwitz (2002, 250) in his turn defines a practice as “a routinized way in which bodies are moved, objects are handled, subjects are treated, things are described

and the world is understood.” One of the key question in practice based theories is what are the elements integrating when practices get accomplished. Shove et al. (2012) provide a seemingly simple ‘skeleton model’ assuming that there are three elements integrating in each practice: material objects, skills (competencies of doings) and image (meanings, symbols and ideals). Patterns of daily life are outcomes of synchronizing of social practices which persist over time and space.

Quite generally, practice-based views emphasize that technological and social systems exist only in and through their reproduction in various interactions. In abstract terms, practices are cyclic processes rather than stable entities. Emerging practices are limited and shaped by the intended and unintended consequences of previous social actions (practices). Seen this way, it is rather practices than human beings that constitute groups and organizations. The persistence of practices depends on their ability to recruit and retain cohorts of practitioners (Shove et al 2012).

Both practice-based theories and domestication views set traditional theories of consumption, technology and innovation in quite general frameworks emphasizing materiality, temporalities and multidisciplinary approaches. Accordingly, perpetual back and forth movement between empirical cases and conceptual frameworks is required. Practice approaches, in specific, assume that actual doings could change the very premises on the basis these doings are supposed to become actualized (Warde, 2005). Assuming two-way interlinkages between doings and thinking, or even more radically that doings precede thinking (Warde, 2014) clearly rejects the views of standard (old-fashioned) economics and sociology in which human behaviour is deduced from either given (exogenous) preferences (homo oeconomicus) or given norms and institutions (homo sociologicus) (Warde, 2005).

Neoclassical economists' tendency to operate with an atomized, "undersocialized" conception of human action and sociologists' tendency to have an "oversocialized" conception of (wo)man (Granovetter, 1985) are clearly problematic assumptions in both domestication and practice approaches both questioning givens in historical processes.

Indeed, opposing simple inner-directedness (rational calculation) or other-directedness (adaptation, socialization and lifestyle) was among the crucial idea when in the 1990s' new traditions explaining complex interactions between human beings and technology were introduced. From practice theory point of view developments in actor network theory (Latour, 1991) were crucial (Evans, 2021). Actor network theory criticized cultural theories for not being sufficiently mindful of the material conditions of society and in fact agency of non-human material elementsⁱⁱⁱ.

The version of practice theory presented here, in specific version by Shove et.al. (2012), borrows a lot from actor network theory, but also from general evolutionary thoughts when emphasizing the reproductive quality of behavioural patterns and emerging practice complexes. These ideas manifest a more general phenomenon, a cultural shift in perspective from a mechanical world-view (à la Hobbes) to a 'circulatory' conception of life and power (Clegg, Wilson, 1991). Indeed, many of recent practice thoughts are in line with older theoretical concepts like 'habitus' (Bourdieu), 'discipline' (Foucault) and 'structuration' (Giddens), stressing that structures (institutions) and agency are not separable from each other and the connection is fundamentally two-way. The recursive nature of societal development or the dialectic of structures and practices implies that humans can reproduce the

prerequisites for their own history and their own actions. We do not only adapt to developments, but we also produce our own history through our own actions.

These introductory remarks serve as a starting point for the following pages in which everyday life and consumption is approached in terms evolving interlocked practices and cycles of interdependence. This perspective complements well domestication theories speaking for different metamorphosis by adding special emphasis on integrations.

Towards theorizing practice complexes and circuits of reproduction

The principal antecedents of practice theory lie already in early pragmatic philosophy of science, in which human practices integrating doing and thinking characterize life routines (See Buch, Schatzki, 2018; Miettinen et al., 2012; Warde, 2014). Famous philosophers such as Martin Heidegger, John Dewey or Ludwig Wittgenstein emphasized practical dimensions and the primacy of practice. Quite correspondingly influenced by various philosophers, but also developments in many sciences (e.g. human geographers and historians), Anthony Giddens suggested in the 1980s that the core subject of the social sciences “is neither the experience of the individual actor, nor the existence of any form of social totality, but social practices ordered across space and time” (Giddens, 1984: 2)^{iv}.

Strong versions of practice theories assume that doings precede thinking. In recent years milder (empirically oriented) versions have suggested that practice theory acts as a reminder of the importance of routines, practical understanding, embodied wisdom and materiality (Warde 2014: 285-286). A simplified list of new emphases in sociology of consumption sounds like this: “Against the model of sovereign

consumer, practice theories emphasise routine over actions, flow and sequence over discrete acts, dispositions over decisions, and practical consciousness over deliberation. In reaction to the cultural turn, emphasis is placed upon doing over thinking, the material over symbolic, and embodied practical competence over expressive virtuosity in the fashioned presentation of self” (Warde 2014, 286).

To sum up, metamorphoses and transformations stressed in many versions of domestication processes could be complemented (re-described) by looking through the lenses of practice-based views emphasizing formation of routines and required reciprocal attunements and matching of human skills, images and material objects. The following pages takes one simplified version of practice approach (Shove et al., 2012) as granted. The framework has strong connections to domestication theories in emphasizing both temporal and spatial changes. The perspective is emphatically on integration processes that condition change and less on decision-making or choices themselves

Shove et al (2012) manifest their evolutionary network perspective with two essential concepts: ‘circuit of reproduction’ and ‘practice complex’. By these concepts the authors refer to a two-way directionality between actions and consequences of these actions. Circuits of reproduction are performative actualizations which either restrict or facilitate practices. Emerging circuits of reproduction are hard to recognize and it is matter of empirical research to demonstrate whether circuits of reproduction, or cycles of interdependency, lead to stabilization, destabilization, growth, decay or even development of new practices. Without explicating (demonstrating) specific mechanism of reproduction there is a threat of tautological and functional reasoning (see Giddens, 1984: 229-243; Elster, 1998)^v.

Loose-knit patterns of between practices based on (shared) co-location, for instance, occasionally turn into stickier forms of co-dependence, i.e. practice complexes: “When practices do come to depend upon each other (whether in terms of sequence, synchronization, proximity or necessary co-existence), they constitute complexes, the emergent characteristics of which cannot be reduced to the individual practices of which they are composed” (Shove et al. 2012, 100-101). What is important, is that these complexes participate in processes reproducing the elements these complexes are made of. The idea of closing circuits comes from evolutionary thinking which emphasizes the effect of feedbacks and recursive dynamics^{vi}.

Quite generally, examining the various components of entities such as cells, organisms, practices, societies, it can be found that these entities exist, i.e. sustain themselves, by self-maintenance or self-production, that is by the continuous renewal of their own components. The components are associated and dissociated in various processes at the expense of a continuous energy and information flow going through the system. From the system's point of view, damaging components are wiped out, otherwise the system might disappear. This goal does not, however, mean that contradictory tendencies are absent but that in time these internal contradictions might be followed by reorientations required by the level of the system. A minimum requirement for any sustainable system is that its components by their interactions are not eroding the system. This condition is not fulfilled in modern society.

Indeed, modern consumer society, which as a whole contains Henry Ford's idea that even labourers can be consumers, could be viewed as a vast metabolistic

organism that perpetuates itself. As the integration of artifacts, symbols, skills and human beings proceeds toward larger entities such as lifestyles, communities of practice, neighbourhoods, cities or consumer society, the constituent components relinquish their relative autonomy to the networks which they themselves make up. Seen this way, practices such as domestication of mundane heart rate measurement (to be analysed in the next chapter) are open to radical re-orientations possibly only in their early stages. This tendency has been documented in the life cycles of many products and industries by Tushman & Romanelli (1985); in social habits by, e.g., Löfgren (1990) and; in 'biographies of things' by Kopytoff (1986).

In nature, the standardization of microscopic forms, such as cells or base pairs, allows for creativity at the macroscopic level. One may ask whether there would be similar dynamics in the development of society, the economy or technology. Seen this way, the evolution of commodity networks can be described with the following hypothesis: as commodities become increasingly widespread and firmly anchored in our lifestyle, human 'needs and activities' begin to take second place, and the priority shifts to "the mutual interdependency of the commodities in their own right". These networks, in other words practice complexes with reproductive qualities, become tighter and more solidly fixed.

To further open the ways domestication and practice-based approaches relate, the next section focuses on a specific case, that of domestication of the heart rate meter (Morozova, Gurova, 2021; Pantzar, Ruckenstein, 2015 & 2017; Ruckenstein, Pantzar, 2017). The theoretical interpretation is based on Pantzar's and Shove's simplified evolutionary/integrative model of practice (e.g. Pantzar, Shove 2010; Shove et al. 2012) suggesting that arrangements of entities are among the principal compositional features of social life. Here it is important to recognize that two almost opposite views about the site and focus of social practices exist (Schatzki,

2001): First, theories of practice focusing more on the conditions for actions and performances; second, theories of arrangement (networks, apparatus and assemblage) emphasized by e.g. actor-network theory. The latter view, to be emphasized in here, focuses more on conditions of various integration processes eg. of ideas, material objects and competencies, and less on performing the very act of measuring. Seen this way health and wellbeing could be approached in a non-individualistic way, where biologies and socialities are seen as thoroughly intertwined, and partly translatable to each other. At the same time, dualistic thinking, which manifests in such dualisms as mind-body, action-structure or human-non-human, is rejected.

Case: Domesticating mobile and mundane heart rate monitoring

“In the future, we are told, a wearable will know its user better than she knows herself, being able to act preemptively on her behalf” (Viseau, Suchman, 2010: 164)

The first wireless portable heart rate monitor (the Polar PE2000) was introduced by a Finnish company Polar Electro in 1983. It consisted of a chest belt transmitter and a wrist worn receiver (Laukkanen, Virtanen, 1998). By using an elastic electrode belt, the transmitter was attached to the chest of a person. The receiver was a watch-like monitor worn on the wrist. At first it was not at all clear why ordinary people should buy such a gadget other than out of curiosity or as a form of social distinction. In the early years retail outlets were also unwilling to put the product onto their shelves. Polar Electro had to build its own distribution channel, marketing a brand around heart rate monitoring and enable the shop presence with its own displays. Airports were important places for the sales of heart rate monitors from the very beginning,

perhaps because of images self-achievement and self-improvement that they are suggestive of (Pantzar, Ruckenstein, 2015).

Before the stethoscope was invented 200 years ago, pulse monitoring involved placing an ear on the patient's chest. The real turning point came, however, in the beginning of the 20th century, when the Dutch physiologist Willem Einthoven developed the first electrocardiograph (ECG). Soon afterwards, a portable version – the Holter monitor, capable of monitoring individual ECG for 24 hours - was introduced (Achten, 2002). Today, heart rate monitors have moved out from hospitals and doctor's surgeries to the lives of millions of people around the world.

Still in the 1990s, Finnish Polar Electro was the dominant supplier of portable heart rate monitors globally. Today the middle-sized company from Northern Finland is no longer the dominant player in this field. Several commercial wearables rely on combinations of on-body sensors, mobile displays and web-based applications. As heart rate metering (HRM) has shifted from a medical concern to a sporting environment, so has the nature and significance of measurement changed. The technology is more intelligent and interactive, and therefore the manufactures' representatives prefer to speak about, activating ('activity meters') and coaching rather than metering.

The device, which was initially developed as a means of recording information about health status and critical medical conditions, has become an increasingly important symbol of healthy living and a piece of sport equipment that has agentic power (even as a coach). This is, in brief, a story of a metamorphosis where a product originally developed for hospital purposes transformed to body sensor, facilitating developments where an individual body becomes a knowable, calculable and administrable object. Seen from a domestication perspective, the story seems to end here.

A practice-based approach would tell a **more nuanced story**. Today measurement practices, practices of exercising or practices of socializing by sharing data constitute wider constellations and practice complexes, e.g. evidence-based weight management programmes. Wearables, clothing-like equipment based on various meters, permit specific forms of feedback (and feed forward) in time and space. At the same time, they export ideals such as the (evidence-based) cult of performance from one practice to another one. From a practice theory point of view everyday metering is interesting (and crucial), because self-measurement activities have a role in sustaining, defining and reproducing various practices, and their elements, such as required competence to interpret reasons behind changing heart rate.

The developments of heart rate monitoring have been conditioned by diachronic (historical) and synchronic (spatial/simultaneous) continuities. With practice-based views it is possible to identify emerging monitoring practices with the seemingly simple schematic structure. Based on Shove et al (2012) and Pantzar and Ruckenstein (2015) table 1 draws together the developments described above, and suggests important historical continuities when ECG meant for hospitals moved to daily use by non-experts.

Table 1: A schematic presentation of the normalization of heart rate measurement meter (mainly based on Pantzar & Ruckenstein (2015))

	Material/"Stuff"	Image	Competencies/Skills
1) Electrocardiograph in hospital use 1900-	Fixed machine in a hospital context	Only for medical experts, scientific instruments for observing patient-objects	Observing patients' vital signs in controlled environment, accumulating data and diagnosing illnesses

			(‘mechanical objectivity’)
2) Heart rate meter for sport purposes 1980-	Wireless portable heart rate meter with sensory belt and wrist display unit	“Target heart rate”, controlled performance metering in physical exercise: “Turn information into speed”	Self-monitoring and self-coaching, systematic tracking of data and accumulating experiences in “exercise diaries”
3) Tracking devices, general purpose “polymeters” for many activities and groups of people 2000-	Heart rate measurement instruments, training computers with various sensors, accelerators, GPS-trackers, PCs with displays.	With more intelligence and interactivity, the activity is not only metering but monitoring and coaching, “Black belt in fitness”, “Every body tells a story, you should listen to your body”	Circulating and sharing data, recording and diagnosing everyday life, interpreting the data in terms of stress, fitness etc. (“quantified-self”: self-theorizing, peer to peer theorizing. (‘situated objectivity’)

Seemingly separate spheres influenced and transformed by new material objects, existing skills and competences, symbolic aims and social desires have been linked together, when mundane heart rate measuring has normalized and become an everyday life routine and a method of continuously cultivating the body. Once links between material, image and competencies have been made, practices have started

to strengthen and become reinforced in repeated doings. With stabilized and predictable routines it is possible that new (socially shared) larger scale practice complexes emerge.

In the case of missing elements (e.g. image of trust), or in case of missing links between, say, new devices and images, it would be less likely that the analytics of everyday life would ever develop and circulate widely. For instance, ECG scientific studies were needed to strengthen the image of trustfulness of the first portable devices. In the early days, Polar Electro had to demonstrate that portable heart rate monitor produced reliable data. Over 500 research trials later, measuring heart rate with a wireless portable device have become a standard practice (Laukkanen, Virtanen, 1998)^{vii}.

As noted many times, practice-based views' focus is on associations and integrations. How did a practice such as mundane heart rate measuring emerge, exist and die? What are the elements of which this practice is made of? How did regular measuring of heart rate recruit its practitioners? In which way do larger socio-material practice complexes such as sporty lifestyles get accomplished and reproduced? In which way are the lives of these complexes conditioned by the same elements (e.g. cult of exercise, activity meters etc.) they tend to reproduce? Questions like these suggest that practice-based theories could minimally work as an 'instrument of selective attention' (Warde, 2014: 280).

Feedback is critical for the endurance of practices over time and for their diffusion and aggregation. Seen this way, there should be some positive connections between a practitioners' first exposure to device and her later contact of that item, and that resources exist which make this possible. For instance, in a way, an "accidental" exposure to HRM took place for many Finnish business executives in the 90s in sport institutes offering training for top managers. For some people, the pleasant or

rather curiosity-driven exposure to the activity of following heart rate produced a more enduring, second stage preference (comfort/routine). This two-staged process exposure-liking, might explain the emergence of the circuit of reproduction, and thus the continuity of new items in single practitioner's life (Pantzar, 1989).

Following exact heart rate could produce excitement in the first stage, but in time the excitement fades away and it is translated primarily into increasing comfort.

Comfort, however is like addiction: we become accustomed to it and soon take it for granted (Scitovsky, 1976). Thus, once made choices replicate themselves.

In time, practices related to pulse measurement have integrated with other practices (e.g. physical exercise), and the emerging 'ecosystem' of performance metering has captured the new practitioners. In the case of (mundane) "proto-practice" (Polar PE2000 in 1983) we can talk about a pre-formation stage of a practice, where the elements exist, but links between measuring devices, procedures and images were not yet stabilized. Only a minority of people (or retail outlets) could imagine what this device or technique was good for. The shift from proto-practice to an existing practice took place when the links between various elements became increased, stabilized and strengthened. Sport activists' experiences linked the device to serious exercise and coaching competence with the result that heart rate measurement developed into new directions of serious (even neurotic) self-monitoring and self-theorizing (e.g. biohacking, see Ruckenstein, Pantzar, 2017; Swan, 2012).

Instead of being anchored in the realm of mechanical objectivity, or trained judgement, typical to scientific enterprises (Daston, Galison, 2010), experiences and aspects of mundane self-measurement are possibly different. The concept of 'situated objectivity' (Pantzar, Ruckenstein, 2017) refers to the self-trackers' way to approach life less systematically or logically – but, rather, combining knowledge in

an eclectic manner from past experience, depending on the social context and life situation^{viii}.

In the beginning, heart rate monitor users were approached as ‘information processors’, eager to gather evidence and engage in self-observation. The assumed interactive role of a measurement device and users was articulated in the following headings taken from Polar Electro’s 2005 booklet. “Tune up your engine”, “Black belt in fitness”, “Turn information into speed” and “Everybody tells a story, you should listen to your body”. Indeed, this is an image in which modern ideals of control were taken to a new level: the ‘natural’ body was treated as incomplete, falling behind the demands and potentials of the information age (c.f. Viseu and Suchman 2010, 179). With the aid of the new technology the body was supposed to be increasingly controlled by reason; it can be used, transformed and improved in order to attain perfection through self-improvements.

Practice-based approaches sensitize one to see that the linking of computer-generated knowledge to body performance do not necessarily erase or downplay emotions; the victory of reason over body will remain incomplete. A measurement device can also intensify emotional attachments related to body processes. The current “age of data” (Bowker, Baker, Millerand, Ribes, 2009), “sensory revolution” (Swan, 2012) or “quantified self movement” (Ruckenstein, Pantzar 2017) resembles the end of the 19th century, when graphic recordings of the state of the body challenged and radically changed how patients and illnesses were understood in medicine (Bert, Harterink, 2004). Yet, the history of finance provides an even more fitting correspondence. The stock market ticker invented in 1867 introduced a new language and mode of abstract representation and it changed the ways in which financial markets operated (Preda, 2002). The ticker reinforced affective ties between investors and the objects of their actions. The stock ticker required permanent presence and keen attention of investors. It generated emotional

reactions that could run counter to rational responses based on maximizing profit (Preda, 2002)^{ix}.

In a similar vein, one may suggest that with heart rate monitoring, the heart became not only an object of permanent monitoring, but – and exactly because of permanent monitoring – it increasingly transformed into an object of emotional attachment, too. With new mobile measurement devices hearts and their beating started to matter more to people. Possibly it was visible outcomes, graphs and illustrations that were essential in making the reproductive quality of a practice emotionally more involving. Representing something is describing and, possibly, prescribing it (Bert, Harterink, 2004; Edwards et al., 2010; Latour, 1986).

We can imagine different psychological, social or material cycles such as those that took place when the stock ticker generated new emotions and relations into the world of investment. Exactly like the stock ticker started integrating investors into a network of investors in the 19th century, heart rate measurements nowadays integrate social realms to bodily functions. With shared visualizations (of exercises) in social media sites, hearts have become more and more public.

In distinguishing between promoters and practitioners, Shove et al. (2012) emphasize that practices tend to have two dimensions. Promoters (e.g. manufacturers and advertising companies) as market makers shape and influence the elements of which practices are made. In other words, promoters' role is to provide and promote elements of practice. Indeed, in the case of heart rate measurement, Polar Electro made careful and deliberate moves to cultivate a specific identity and proper image, also re-designing the devices and offering new 'affordances' for future populations of practitioners. Practitioners, in their turn, are responsible for the routine and recurrent integration of elements, i.e. for 'doing' and so reproducing the practice in question. When heart rate measurement as a new

practice was domesticated, each individual started to link stuff, ways of doing (skills) and symbolic purposes in her own ways. New technical HRM inventions transformed to market innovation only through widely distributed activities of practitioners. Seen this way, what looks like the diffusion of heart rate measurement device is therefore better understood as its successive, but necessarily localized, (re)inventions (Pantzar, Shove, 2010a).

Conclusions

During the last few decades temporalities, processual changes and material aspects of everyday life have become objects of interest in many social sciences. This article suggests that (academic) continuities exist between domestication views of the 1990s and practice-based approaches of more recent origin. The succession from cultural studies to practice theories is manifested in greater attention to objects and technologies as material forces (Evans 2020; Warde 2014). In addition, practice-based views sensitize scholarly thinking about reproductive aspects of everyday life. Visible and non-visible practices require constant and active reproduction.

Domestication approaches that have so often focused on metamorphoses of meanings in normalization processes will be reoriented if on-going reproduction of technological and institutional systems are taken into more careful and serious account. Importantly, the concepts 'circuit of reproduction' and 'practice complex' do not imply that daily routines and patterns are always stable or fixed closures. In a living system of interdependence there is also possibility of evolutionary, historical and irreversible change. Possibly stabilized, normalized and standardized practices facilitate innovative integrations with other practices and even emergence of new regimes, as happened when heart rate measurement moved from the realm of hospitals to sport and leisure time.

Successful practices recruit people. To answer why radio listening, for instance, is still today so persistent, over 100 years after its invention, practice-based views would ask about the ways the whole ecosystem of radio listening recruits its practitioners, and the ways participation in the reproduction of the continuously living elements such as material objects, positive images and needed practical skills is taking place. Radio listening is probably so persistent because it is keenly attached to other self-evident, almost transparent and slowly evolving daily practices, but also larger constellation of various institutional practices.

Although the mechanisms which guide the invention, adoption or rejection of new commodities and technologies are widely diverse, there is a surprising degree of similarity in the way that different commodities become entrenched in our lifestyle. Consider, for example, diverse views of the infiltration of the water pipe and the automobile. In the initial stages, both were viewed with a considerable degree of scepticism. Cars were thought to disturb the peace and they were regarded as a general nuisance to horse-drawn traffic. Water pipes were dismissed as a superfluous luxury, and even as an outright health risk - particularly when the outdoor privy was replaced by the indoor lavatory. Similar doubts were met when the first portable heart rate measurement devices (or mobile phones) were introduced to wider public and retail outlets (Pantzar 1996).

In contrast to many domestication approaches, the practice-based view emphasizes that the mechanisms that lead consumers to repeat their earlier choices must be studied in the same depth as those, which prompted the consumer to make that choice in the first place. Choices we make today will guide and restrict the choices we make in the future. Fridges and freezers, when normalized, facilitated and generated new forms of shopping and supply of food. Or choosing a certain form of eating can lead to a certain type of lifestyle, which in turn increases demand for the form, say of transport, which originally shaped that lifestyle.

Practice-based views add (complement, substitute) psychological views with a more general idea of the circuits of reproduction. Microscopic practices are cyclic processes within more extensive circuits rather than given stable entities. When a practice (or practice complex) is identified as a cyclic process, i.e. as a circuit of reproduction, rather than a stable entity, technological and social systems are seen to exist only in and through their reproduction in micro-social interactions. These interactions are in turn limited and shaped by the intended and unintended consequences of previous social actions.

The seemingly radical idea of emphasizing doings instead of (or preceding) thinking has also challenged standard economics or sociology that emphasizes given preferences, norms and institutions. Needs and wants are consequences of practices or practice complexes rather than their determinants (or sources). Or, put somewhat differently: activities generate wants, rather than vice versa (Warde 2003).

Rather than teasing apart layers of change (macro, meso and micro), the focus of practice-based views is on critical situations in which microscopic choices/acts are transformed into macroscopic processes (e.g. materialization and commodification of needs), and similarly on moments when macroscopic phenomena are translated to the level of everyday life (e.g. circulation of behavioural norms and preferences). In macrosocial phenomena feedbacks and effects are spatially and temporally larger than in the case of microsocial phenomena. Seen this way the difference between macroscopic order and microscopic order is arbitrary. Microscopic practices as (possibly self-enforcing) circuits or cycles constitute and co-determine macroscopic practices, and vice versa.

Seen this way, practice approaches invite to reiterate between two basic movements: on the one hand, to zoom in on the accomplishments of practice; on

the other hand, to zoom out of their relationships in space and time (Nicolini 2012). In other words, and translated to research operations this view suggests that there should be empirical access both to spatial but also temporal dimensions of practices. Seemingly different and separate transformations, e.g. naturalizations and cultivations (Wilk, 2009)^x, become understandable only when the perspective is shifted from single commodities and needs to systems of commodities and evolving networks, but also vice versa from macroscopic to microscopic phenomena.

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ⁱ **The social shaping of technology perspective (or 'social construction of technology')**, argued for the interpretative flexibility of scientific findings and technological inventions, and thus non-deterministic model of technological change (Bijker, Hughes, Pinch, 1987). Its' focus was on the legitimation processes and social mechanisms by which different commodities become constituted and socially constructed. At the same time anthropologist terms like **biography of thing** or **'social life of things'** referred to qualitative perspectives aiming to describe and understand the ways different commodities become integrated to the sphere of our daily life, the ways meanings attached to specific goods transform from experience of uncontrolled chaos to ordered cosmos (see eg. Kopytoff, 1986; Löfgren 1990), and the ways anonymous commodities with objective exchange value transform into personal possessions (Carrier, 1994).

ⁱⁱ **IS THIS NEEDED?** Possibly transforming potential of new technologies could be identified only retrospectively (Gershuny, 1992; Norman, 1993; Rosenberg, 1995) because motives and needs behind buying and using technology transform in use. In the first stage the fascination (need) of popular movies or television was its novelty as such. New media technologies, for instance, gained first admittance into society as "Trojan horses, with their physical presence clearly visible, but their potentialities poorly understood" (Levinson 1977: 154). Television, radio, movies and recordings have witnessed a metamorphosis of meanings: from toy, through mirror, and toward art (Levinson, 1977).

ⁱⁱⁱ) Is this clarification needed: It is impossible to separate social and technological: "...instead of asking 'is this social', is this technical or scientific', or asking 'are these techniques influenced by society', or is this 'social relation influenced by techniques' we simply ask: has a human replaced a non-human? Has a non-human replaced a human? Has the competence of this actor been modified? Has this actor-human or non-human been replaced by another one? Has this chain of associations been extended or modified? Power is not a property of any one of those elements but a chain" (Latour, 1991:110). The problems as to what is coordinated, human beings, tasks or practices, and who is coordinating, lead to the question whether it is only the human being that can provide agency: "Like a network it is composed of series of heterogenous elements, animate and inanimate, that have been linked to one another for a certain period of time" (Callon, 1987: 93). An actor-network approach explains both the first stages of the invention and the gradual institutionalization of the market: "It is applicable to the whole process because it encompasses and describes not only alliances and interactions that occur at a given time but also any changes and developments that occur subsequently" (Callon, 1987: 100)

^{iv} Recent approaches to practice have emphasized unconscious adaptation to new situations and opposed representational accounts of knowledge and meaning. The focus has increasingly shifted from inquiry, reflection and reasoning towards preconscious background knowledge, embodied skills and practical understanding, but also distributed cognition (Miettinen et al., 2012; Warde, 2014). This article focuses more on aspects of evolving practice networks and reproductive dynamics (see Shove et al. 2012). Therefore many important debates about the forms of knowledge creation and internal learning processes (e.g. Brown, Duguid, 1991; Crabu, 2019; Blue, Shove, 2016) is skipped.

^v **(IS THIS NEEDED???) Structural arrangements should not be explained through some sort of intention/reason/function without demonstrating. This is exactly what also Giddens (1984, 229-243) has criticized in evolutionism explaining social change as a purely endogenous (or unfolding) process.**

^{vi} The practice theoretical model developed in Shove et al (2012) draws many conceptual ideas from general evolutionary models (e.g. Pantzar 1989, 1991, 1993). An alternative term to circuit of reproduction would be an 'autocatalytic cycle' (Maturana 1981), i.e. a concatenation of positive influences, where one item in the chain catalyzes another. In evolutionary terms a group of practices must belong to an autocatalytic system of positive feedbacks in order to expand or exist. These causal loops are embedded within larger networks of causalities. In other words, if practice A increases the probability of genesis and maintenance of practice B, and practice B does the same to practice A, then in this autocatalytic cycle the two practices mutually enhance each other's rates of replication and gain an advantage over other practices.

^{vii} Most studies had reported that portable electronic monitoring is in fact more accurate than manual pulse palpation (detecting the mechanical pressure changes in blood vein due blood flow), or methods of detecting heart rate at the earlobe or fingertip via photo-optic techniques (La Forge and Kosich, 1996: 25).

^{viii} One important aspect practice-based views bring is combinations of internal learning processes taking place in everyday life (c.f. *Crabu, 2019*): “The central issue in learning is becoming a practitioner not learning about practice... Learners are acquiring not explicit, formal “expert knowledge,” but embodied ability to behave as community members ... Communities are emergent, meaning that their shape emerges in the process of activity, as opposed to being created to carry out a task” (Brown; Duguid, 1991, 48- 49). In other words. ‘living practices’ tend to constitute knowledge bases on which their own continuity depends.

^{ix} IS THIS NEEDED? In abstract terms, the ticker was “a nexus of mutually reinforcing language and representation modes, cognitive instruments and rules, and teleo-affective structures” (Preda 2002, 2). Teleology refers to orientations towards certain ends, while affectivity gives things value and emotional depth. This fits well with Schatzki (2001, 52) who identifies a mix of teleology and affectivity an important factor of practice.

^x “Cultivation refers to the processes which bring unconscious routines and habits forward into consciousness, reflection and discourse... Naturalization describes the processes which push conscious practices back into the habitus, or keeps them from surfacing into consciousness in the first place” (Wilk 2009, 149-150).