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Theoretical perspectives on technology and society: implications for understanding the relationship between ICTs and family life

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Introduction

Recently there has been growing academic interest in the ways in which emerging information and communication technologies (ICTs) are changing family practices and relations. Particular focus has been given to the potential detrimental and/or beneficial effects of these technologies on family functioning across different dimensions, including family communication and cohesion; family roles, rules and intergenerational conflicts; relationship formation; intimacy patterns; and work-home and family boundaries (Arnold, 2004; Bittman et al, 2004; Carvalho et al, 2015; Hertlein, 2012; Hughes and Hans, 2001; Jamieson, 2013; Lanigan, 2009; Lanigan et al, 2009; Mesch, 2006; Nansen et al, 2009, 2010, 2011; Wajcman et al, 2008, 2010). There has been additional interest in how these effects vary according to age, gender, social class and nationality (Cuban, 2017; Lim, 2016). Underlying these studies are particular theoretical conceptualizations of the relationship between technological and social change, which implicitly or explicitly frame the specific ways in which ICTs are understood to relate to family dynamics. For example, ICTs might be seen as driving changes in family life or, conversely, family members' intentional uses of technologies can be understood as mediating their effects. In this chapter we examine how the technology-society relation has been theorized and consider how this has influenced research on ICTs and family life. We begin by outlining four conceptual approaches to understanding the relationship between technology and society. The first three – 'technological determinism', 'social constructivism', and 'actor network theory' – have left a clear mark on the field, while

the fourth, 'posthumanist', perspective is emergent and results from a recent 'posthumanist turn' associated with feminist studies of science (see Barad, 2007).[1] Drawing on recent research, we then go on to illustrate how these approaches inform theoretical and empirical investigations of ICTs and family life. We conclude by suggesting that these theoretical formulations are important resources through which people, families, organizations, governments, educational systems, the media, and much more, experience and make sense of the role of technology in contemporary life, and devise interventions accordingly.

Theoretical perspectives on technology and society

Technological determinism

Technological determinism is a way of thinking about the relationship between technological and social change that informs academic, policy and popular accounts about the place of technology in everyday life (Marx and Smith, 1994; Wyatt, 2008). Its foundations are generally traced back to the work of Karl Marx and his historical materialist analysis of the role of technology in labour processes.[2] Technological determinism is not a unified approach.[3] However, it is possible to discern some common principles.

Technological determinism conceptualizes technology as hard material objects. As Marx and Smith (1994, pp x–xi) explain, 'technology is conceived in almost exclusively artefactual terms, and its materiality serves to reinforce a tangible sense of its decisive role in history'. This understanding is present in Marx's definition of the machine as 'a mechanism that, after being set in motion, performs with its tools the same operations as the worker formerly did with similar tools' (Marx cited in MacKenzie, 1984, p 486). The idea of technology as a material artefact makes it possible to conceptualize it as an 'autonomous force or entity that is independent of social processes' (Marx and Smith, 1994, p xi). As Wyatt (2008, p 168) further explains, the assumption is that 'technological developments take place outside society, independently of social, economic, and political forces'. Moreover, these developments are understood to follow a particular teleological trajectory which is sequential in nature and which in turn prescribes 'a necessitous path over which technologically developing societies must travel' (Heilbroner, 1967, p 336). Elaborating on Marx's classical example of the move from the hand- to steam-mill, Heilbroner (1967, p 336) notes how 'the steam-mill follows the hand-mill not by chance but because it is the next stage in a technical conquest of nature

that follows one and only one grand avenue of advance'. Importantly, this trajectory is seen as naturally given, with its own logic, rationale and law-like properties. Technological determinism, then, is 'a view of history in which human will has no real role – in which culture, social organization and values derive from laws of nature that are manifest through technology' (Bimber, 1994, p 99). In this account, technology stands in as a proxy for nature, which determines history and culture, or provides the material constraints within which human agency and will are exercised. As Heilbroner (1994, p 69) notes, 'Machines make history by changing the material conditions of human existence'. Heilbroner (1994) argues that the 'acquisitive mindset' – which he defines as human economic behaviour or the principle of 'maximizing', and which he sees as a fundamental 'rule' or 'law' of behaviour in societies – is the 'mediating mechanism' through which technology acts as the primary causal agent in history and social change.

Social constructivism

Social constructivist approaches to technology were developed in the 1980s in direct reaction to some of the assumptions underpinning technological determinism, and as an extension of a broader social constructivist movement in the social sciences (Berger and Luckmann, 1966). Examples of such approaches include 'social shaping of technology' (MacKenzie and Wajcman, 1985), 'social construction of technology' (also known as SCOT) (Pinch and Bijker, 1984) and 'technological systems' perspectives (Hughes, 1987). Social constructivist approaches contest the key assumption underpinning technological determinism that technology is an independent, exogenous and autonomous entity or force that drives social change. Authors such as Pinch and Bijker (1984) and Grint and Woolgar (1997) challenge the essentialist notion that technologies have inherent features that determine their nature, use and effects. They suggest that the attributes, workings and successes of technologies are not derived from their internal characteristics but rather from the broader sociopolitical contexts in which they are designed, developed and adopted. In his account of SCOT, Sismondo (2010, p 98) illustrates this with the example of the watch, which he suggests can be 'simultaneously constructed to tell time, to be attractive, to make profits, to refer to a well known style of clock, to make a statement about its wearer, etc.'. He furthermore explains that even the practice of telling the time serves multiple purposes such as keeping time, measuring length of time, or recording the timing of an event. Given this diversity of use, he contends that

'there is no essence to a watch. And if the watch has no essence, then we can say that it has systematic effects only within a specific human environment' (Sismondo, 2010, p 98). The argument then is that the social contexts in which technologies are designed and taken up determine their nature and effects. Consequently, the development and use of technology are understood as negotiated and contingent *social* processes rather than reflections of some inherent, natural, internal or teleological trajectory and logic. Bringing a feminist perspective to social constructivist accounts, Wajcman (2010), for example, argues that gender identities and power relations influence the development, design and use of domestic and workplace technologies. Equally, she suggests, 'our relationship to technology is integral to the constitution of subjectivity for both sexes' (Wajcman, 2010, pp 144-145). In this sense, technology and gender can be seen as mutually shaping one another. Another example comes from Pinch and Bijker (1984), who suggest that there is nothing inevitable about the development of the modern bicycle. Its design and uptake, they argue, is not due to its intrinsically superior design compared to rival models. Rather, it is the result of a negotiated process involving competing interpretations (what they call 'interpretive flexibility') by different 'relevant social groups' of what bicycles are, and of their purposes, problems and solutions. The eventual form of technological artefact that is stabilized – the modern-day bicycle in this example – emerges through a process of 'closure' in which certain interpretations of the bicycle, and the solutions that it is seen to provide to specific problems, come to be accepted. As Sismondo (2010, p 98) puts it, 'the development of technologies is the result of rhetorical operations, defining the users of artefacts, their uses, and the problems that particular designs solve'. On this account, the success of the artefact is not dependent on its effective design; rather, it is the very success of the artefact that allows us *retrospectively* to claim some designs as more effective than others. While social constructivist approaches consider technology to be a '*sociotechnological ensemble*' (Bijker, 1995) in which the social and the technical interact and mutually shape one another (MacKenzie, 1984), priority is given to human actors and their intentional meaning-making processes (Pinch, 2010). Technologies might shape and influence human actions, but ultimately human actors are the main locus of agency and drivers of sociotechnical change.

Actor network theory

Actor network theory (ANT) approaches to technology and society are both a continuation of, and a break from, social constructivist accounts. They continue to see technology as embedded in social relations and processes. However, they try to overcome the separation between technology and society by rejecting the notion that these are two separate, yet interacting and mutually shaping, spheres. In this regard they are trying to move beyond both technological determinism and social constructivism. ANT rejects both the idea that technology is a given fixed material entity that drives social change, and the notion that technology is simply a socially constructed effect. Instead, ANT conceptualizes technologies, social institutions and relations as comprised of both material and cultural elements. As Latour (1991, p 110) argues, 'We are never faced with objects or social relations, we are faced with chains which are associations of humans and non-humans'. Or, in Law's (1992, p 381) words, the material and the social are nothing other than networks of heterogeneous elements. Callon (1986) illustrates this point through the example of the electric car. On his account, the existence of this 'technical object' is reliant on the construction of 'its concomitant actor-world', understood as a combination of many associated and heterogeneous entities including 'consumers, social movements and ministries… accumulators, fuel cells, electrodes, electrons, catalysts and electrolytes' (Callon, 1986, p 22). ANT therefore takes as its starting point these networks of human and nonhuman 'actants' (Latour, 1994) and investigates how these sociotechnical assemblages are established and their relational effects. Importantly, this approach seeks to treat the human and the nonhuman in a symmetrical way as equal participants in the world, refusing to privilege one over the other. For instance, in his example of the gun and the gunman, Latour (1994) draws attention to the way in which human and nonhuman actants are brought together in specific actions in which they share and exchange their properties, and are thereby modified to become '*someone else*, the hybrid actor composed… of gun and gunman' (Latour, 1994, p 33). Latour therefore redistributes actions within human-nonhuman or sociotechnical networks: 'action is a property of the whole association, not particularly of those actants called humans' (Latour, 1994, p 36). Callon and Muniesa (2005, p 1236) further illustrate this point in their analysis of economic markets as dependent on 'distributed calculative agencies'. As they argue, these agencies 'are not human individuals but collective hybrids', where 'knowledge and action are never individual', but 'distributed between humans and nonhumans', including – in the case of financial markets

– such tools as double-entry bookkeeping or computer assisted trading systems (Callon and Muniesa, 2005, pp 1236-1237). ANT is therefore sometimes conceptualized as grounded within a 'relational materialist' ontology, which is regarded as one of its distinctive features compared to other versions of materialism within sociology (Law, 1992). As well as rejecting the dualist tendency to treat the material and the social (and related binaries such as agency/structure and micro/macro) as essentially different, ANT treats all kinds of entities 'people, machines, "ideas" and all the rest – as interactional effects rather than primitive causes' (Law, 1992, p 389). Agency is therefore located with interactions of heterogeneous elements, and the capacity of these elements to modify each other through their associations. On this account, reality is made up of sociotechnical networks which continuously reconstitute themselves and are therefore the prime agents of change. As Law (1992, p 389) suggests, 'to the extent that "society" recursively reproduces itself it does so because it is materially heterogeneous. And sociologists that do not take machines and architectures as seriously as they do people will never solve the problem of reproduction'.

ANT seeks to treat nonhumans (the technological) and humans (the social) symmetrically and refuses to accord analytical importance to the difference between the nonhuman and the human (Law, 2009, p 147). Its key theoretical concern is to extend agency to nonhuman entities in the same way that humans have been granted agency. To engage in this project, it necessarily designates (and therefore differentiates) various actants in the world as either 'nonhuman' or 'human' in order to consider how these come together in heterogeneous networks. For instance, in Latour's (1994) example of the gun-and-gunman 'collective', the gun is taken to represent the 'nonhuman' while the gunman stands for the 'human' element. Similarly, in Callon's (1986) study, the production of the electric car is seen as dependent on an assemblage of elements that are described as 'human' (for example, consumer markets, social movements, ministries) or 'nonhuman' (for example, accumulators, fuel cells, electrodes, electrons, catalysts and electrolytes). ANT conceives itself as a 'posthumanist' project (Law, 2009, p 147) in that it seeks to dismiss ontological differences between human and nonhuman actants, thereby allowing their equal participation in the world. This is just one specific understanding of 'posthumanism'. In the section that follows, we discuss a distinctive posthumanist approach in which the key focus is not so much on how to eradicate analytical distinctions between the nonhuman and the human, or the technological and the social, but rather on understanding

how nonhuman and human entities, and the divisions between them, come into being.

Posthumanism

A number of feminist science studies scholars, such as Haraway, Barad, Suchman and Castañeda, are putting forward alternative 'posthumanist' approaches to understanding the relationship between technology and society. Whereas ANT investigates how technology and culture come together in heterogeneous human-nonhuman networks to produce reality, these feminist authors are interested in the ontologically prior question of how 'technology' ('the nonhuman') and 'culture' ('the human') come to be constituted as ontologically distinct entities and domains *in the first place* (Barad, 2007; Castañeda and Suchman, 2014; Haraway, 1989, 1991, 1994, 1997, 2008, 2016; Suchman, 2007). It is in this sense that we consider these approaches to be 'posthumanist', following Barad's (2007, p 136) understanding of posthumanism as 'the practice of accounting for the boundary-making practices by which the "human" and its others are differentially delineated and defined'.

On this posthumanist approach the project of understanding the relationship between technology and society consists in investigating how it is that 'the technological' and 'the social' come to be configured as separate and separable. No a priori dualistic distinctions are made between technology/society, nonhuman/human, object/subject, nature/culture, and so on. Rather, the nature of the world is taken to be ontologically indeterminate outside of specific practices. As Haraway (1997, p 62) explains: 'The bifurcated categories themselves are reifications of multifaceted, heterogeneous, interdigitating practices and their relatively stable sedimentations, all of which get assigned to separate domains for mainly ideological reasons'. Importantly, these practices (for example, those that constitute the division between 'technology' and 'society') are also conceptualized in a non-dualist way as 'material-semiotic' (Haraway, 1988) or 'material-discursive' (Barad, 2007). Crucial here is the specific conceptualization of materiality and discourse as mutually constituted and articulated. The former is not seen as a fixed substance, or an inherent property of independently existing objects, but rather as referring to ongoing processes of materialization; while the latter is not considered as synonymous with language, but as constituting 'the material conditions for making meaning' (Barad, 2007, p 335). Just as discursive practices are always already material (they are an ongoing materialization of the world), so too materiality is discursive: material phenomena come into being through, and are

inseparable from, discursive practices. As Barad (2014, p 175) explains: 'Meaning is not an ideality; meaning is material. And matter isn't what exists separately from meaning. Mattering is a matter of what comes to matter and what doesn't'. Material-discursive practices, then, dynamically enact specific objects, meanings and boundaries that are constitutive of the world.

Posthumanist approaches focus neither on the ways in which technology and society mutually shape one another, nor on how technology and society come together in relational networks that include interacting heterogeneous elements. Rather, they investigate how the entities 'technology' and 'society', 'nonhuman' and 'human', and the boundaries between these, are dynamically produced and reproduced through historically, culturally and materially contingent and specific material-semiotic practices. Suchman (2007) illustrates this approach through her work on human–machine relations. She explores the development of 'humanlike machines', also known as 'humanoid, android, social, and personal' robots (Castañeda and Suchman, 2014, p 316) as fertile ground for investigating the ways in which human/nonhuman and social/technological entities and boundaries are constituted. For example, she shows how these artificial intelligence robotics projects already enact the human/machine binary, as they seek to develop and study 'models of human intelligence by constructing them on a physical robot' (Menzel and D'Aluisio, 2000, p 58, cited in Suchman, 2007, p 235). The starting point of these projects is that there exist certain qualities, attributes and capacities (such as intelligence, the ability to interact with the environment, embodied sensory-motor interactions, learning through interaction, sociality, development) that are understood to be *essentially* 'human', and that these can be grafted onto what is regarded as 'nonhuman', inert and inorganic matter. Suchman's point is that these robots are not so much bringing together human/social and nonhuman/technological properties and capabilities. Rather, the development of these robots, and their underpinning dualist assumptions, are actively implicated in the very constitution of human/nonhuman and social/technological entities and binaries.[4] On this posthumanist understanding of the relationship between the human/social and the nonhuman/technological, agency resides neither with one of these binary terms, nor with their interacting associations, but rather with the materialization and making of these binary entities and boundaries. On this approach, both 'persons' and 'machines' are understood 'as entities achieved only through the ongoing enactment of separateness and always in relation with others' (Suchman, 2007, pp 257-258), where this relation with 'others' is understood as

'intra-active' (Barad, 2007, p 33). Barad's concept of 'intra-action' is key to understanding the relationship between the social and the technological that is being proposed by posthumanist approaches. Unlike 'interaction', which assumes the existence of separate individual agencies prior to their relation, 'intra-action' recognizes the inherent inseparability of entities from one another and from the specific practices and relations in which they are constituted. Entities do not pre-exist these practices and relations, but are their constitutive effects. Therefore, on a posthumanist account, the world makes and remakes itself through dynamic materializations of differences – such as the human/society and nonhuman/technology distinction – where these differences and boundaries are open to ongoing reconfiguration.

These distinctive theoretical perspectives on the relationship between technological and social change provide important conceptual resources for studies investigating interactions between ICTs and family life. In the following section we explore how the first three positions (technological determinism, social constructivism and actor network theory) have implicitly or explicitly shaped empirical research on ICTs and family life, and we outline possibilities for using the fourth, posthumanist, approach as a framework through which to investigate this problematic.

Implications for research on ICTs and family life

Technological determinism

While few studies explicitly align themselves theoretically with technological determinism, many carry deterministic overtones in their concern with the specific effects that ICTs have on different aspects of family life. One example is research conducted by Lanigan and colleagues (Lanigan, 2009; Lanigan et al, 2009) in which they explored the impact of home computer use on family communication, cohesion and adaptability. Results from their online survey indicated that:

> Most participants (68%) said computer use increased their sense of connection to friends and family, resulting in improved communication and cohesion. One third said e-mail encouraged more frank communication, which was perceived as good for the family. Family time increased due to efficiencies gained through computer use. The computer was seen as an enticement to keep children home as well as a source of mutual interest, interaction, and tool to plan

> family activities. Several respondents used the computer to pursue education, enhance personal growth, and support important life roles such as spouse or parent. (Lanigan, 2009, p 603)

Their conclusion is that 'The computer altered adaptability by functioning as a change agent' (Lanigan, 2009, p 603). The relationship between ICTs and the family is conceptualized in a deterministic way to the extent that the computer is understood as an autonomous material device carrying inherent 'technology characteristics with the potential to influence family usage patterns' (Lanigan, 2009, p 597). These properties of technology include accessibility (user friendliness and convenience of use), scope (multifunctionality), obtrusiveness (physical properties and pervasiveness), resource demand (financial cost) and gratification potential (fashion, style and entertainment of the ICT in question) (Lanigan, 2009). By virtue of these fixed and given features, technology is seen as providing 'alternative means of fulfilling existing family functions and needs' (Lanigan et al, 2009, p 27), thereby affecting the ways in which families operate. It is in this sense that technology is understood to act as a key 'change agent'.

Social constructivism

Wajcman's research on the role of ICTs on the work/home boundary is an example of a social constructivist approach to conceptualizing the relationship between technology and society (Wajcman, 2008; Wajcman et al, 2008, 2010). This project is a continuation of her pioneering work in science and technology studies challenging technological determinism (MacKenzie and Wajcman, 1985), and of her longstanding interest in theorizing the interaction between gender and technology (Wajcman, 1991, 2004, 2010; Bittman et al, 2004). In this recent research, Wajcman and her colleagues reject the technologically deterministic notion that 'people have little control over the effects of technology and must largely accept its impact' (Wajcman et al, 2010, p 258). Instead, they are interested in exploring 'user decisions about the way they incorporate the Internet in their daily lives, specifically in relation to the purpose – be it for work or personal purposes – and time of use' (Wajcman et al, 2010, p 259). In their discussion of Australian households' use of ICTs to manage the division between work and home, they emphasize that people are not passively accepting the capacity of technologies to blur temporal and spatial boundaries between these two spheres. Rather, they are 'actively

making decisions about how they incorporate the technology into their lives in ways that are beneficial to them' (Wajcman et al, 2010, p 271) and that allow them to manage work and home life. For example, while some employees in their study interpreted the internet as 'a tool that may assist them to attend to personal matters while at work' (Wajcman et al, 2010, p 270), or – on the other hand – as 'a work extension technology' (Wajcman et al, 2010, p 270), most participants appeared to maintain the boundary between work and family life, despite the specific technical capabilities, or affordances, of the technology to connect work and home. This study is an illustration of a social constructivist approach to the relationship between ICTs and family to the extent that it rejects the notion of technology as a determinant of family life and work-home boundaries and conceptualizes it as the effect of human intentional actions and interpretations.

Actor network theory

Actor network theory is a further theoretical resource for researchers studying interactions between ICTs and family life. For example, Arnold, Davis, Gibbs and Nansen (Arnold, 2004; Nansen et al, 2009, 2010, 2011) draw on insights from ANT and material culture studies in sociology, anthropology and cultural geography to explore the proliferation and use of ICTs in domestic and familial everyday life in Australian homes. Their interest is in developing a 'symmetrical approach to the study of home life through analysis of the physical encounters and cultures formed within the home – the entanglements of spaces, objects, and subjects' (Nansen et al, 2011, p 694). Their research considers the ways in which people, domestic architectures and material artefacts – including ICTs – 'are materially and temporally woven together to constitute the particular kind of place called home' (Nansen et al, 2011, p 694). Consequently, they treat the social and the material, the human and the nonhuman, and the social and the technological as mutually shaped emergent 'sociotechnical phenomena' (Arnold, 2004, p 185) rather than separate entities. A major focus of their work is the agency of technologies, which they argue 'are not simply neutral tools, but active participants in constructing the familial, the organisational, and the social' (Nansen et al, 2010, pp 139-140). For example, they explore how technology-mediated practices shape domestic rhythms and the temporal organization and experience of contemporary life. They argue that family routines and schedules are inflected by new technologies through their involvement in everyday practices (Nansen et al, 2009). Importantly, they locate

agency not simply with ICTs and their affordances but rather with their interactions with domestic and family life (Nansen et al, 2010, p 147). In this sense technology is neither an agent of change in family practices and relations, nor is it a passive tool that is simply domesticated by human actors (Arnold, 2004, p 185). Rather, technology has effects through its participation in networks of domestic practices, architecture and material artefacts (Nansen et al, 2011).

Posthumanism

On the posthumanist approach that we outlined above, the study of the relationship between ICTs and the family entails a way of doing research that takes neither 'ICTs' nor 'the family' as already constituted entities, but rather sees these domains, and the separation between them, as dynamically constituted through historically, culturally and materially contingent and specific material-semiotic practices (Mauthner and Kazimierczak, 2014). These include, among others, technology design, development and marketing; family practices, relations and ideologies; government policies and legislation around technology (surveillance, privacy, trust, safety and security), family and work-life balance; organizational policies and practices around technology, family and work-life interactions; educational policies and institutions; notions of childhood including their intersection with conceptions of nature and its role in child development; and various public discourses on these matters, including the media, popular culture and academia. A posthumanist study could focus on one or several of these aspects. The important point is that it would specifically investigate and account for how practices across these various domains are implicated in the constitution of the boundary between ICTs (the technological) and family (the social). Our earlier discussion of the different theoretical conceptualizations of the relationship between technological and social change (technological determinism, social constructivism and actor network theory), as well as our outline of the empirical studies above, are examples of how academic practices have been involved in (re)producing the ICT/technology and family/society binary. Our argument is that a posthumanist study of ICTs and family life is one that accounts for the *constitution* of these entities (and their separation), rather than assuming that these entities are pre-existing starting points for the investigation. On this posthumanist approach, agency lies with multiple historically, culturally and materially contingent and specific practices that materialize 'ICTs', 'family' and the separation between them.

Conclusion

In this chapter we have highlighted the links between specific studies of ICTs and family life and broader conceptualizations of technological and social change present in social theory. In doing so, we want to emphasize that what is at stake in these empirical projects is not only the issue of how families are shaped by, engage, form networks, or come into being with ICTs. Rather, embedded in these investigations, and the theoretical perspectives that underpin them, are more fundamental assumptions about the nature of the world, and how it is made and sustained. For technological determinism, it is the laws governing technological developments and human behaviours that act as causal mechanisms driving the world forward. Social constructivism, on the other hand, positions human intentional actions as the main locus of change. ANT conceptualizes the world as produced and reproduced through operations of heterogeneous sociotechnical networks. On a posthumanist account, the world makes and remakes itself through dynamic materializations of difference – such as the distinction between technology and society – where these differences and boundaries are open to ongoing reconfiguration.

These distinctive approaches have implications for how we conceptualize the nature of time and its relation to technological, social and family change. On our reading, the first three perspectives all treat time as an ontological given, but differ in their understanding of how time relates to technological and social change and progress. Technological determinism takes time as a fixed external parameter and backdrop against and within which transformations unfold. The future both temporally and causally follows from the past according to a teleological trajectory that promises ever-increasing progress, knowledge and understanding. Social constructivism conceptualizes change as an effect of human meaning-making processes. Here, the past can only be understood through a present that renders it meaningful, and progress is attributed retrospectively. Actor network theory rejects the notion of progress understood as inevitable movement from a less developed and informed past to a more advanced and enlightened future. Instead, it suggests that the direction of change proceeds from complexity to ever-increasing complexity in the form of entangled networks (Latour, 1998, 2004). A posthumanist perspective, as outlined in this chapter, does not treat time as a pre-existing container or marker of 'what already is' (Barad, 2007, p 430). Rather, it conceptualizes time as constituted *with* social, technological and family change. While this approach rejects a teleological notion of progress, it nevertheless retains

a version – albeit reconfigured – of causality. In this understanding of causality, distinctions between cause and effect, past and future, are not taken as given but rather as relational outcomes of dynamic processes of materialization through which other binaries such as society/technology are constituted. This means that, for instance, technological developments, social change and family practices across the life course are not seen as separate and pre-existing phenomena, each unfolding over time independently of, but in interaction with, one another. Instead, the posthumanist proposal is that technology, society and the family intra-actively (re)constitute themselves dynamically not through time but together with time.

The theoretical formulations presented in this chapter and their conceptualizations of technology, society, family and time are important because they provide resources through which people, families, organizations, governments, educational systems, the media, and much more, make sense of the role of technology in contemporary life, and devise interventions accordingly. For example, while technological determinism is one of the most critiqued ways of understanding the technology/society relationship, this perspective nevertheless underpins many popular and policy accounts of how technology has changed society, as well as everyday experiences of technology (Marx and Smith, 1994; Wyatt, 2008). It is in this sense that, as Suchman (2007, p 1) suggests, the ways in which the 'human-machine' relation is configured matter and have material-semiotic effects because they provide possibilities for seeing, imagining, intervening and indeed making the world.

In brief

1. Underlying studies of ICTs and family life are particular conceptualizations of the relationship between technological and social change, which frame how ICTs are understood to relate to family dynamics: 'technological determinism', 'social constructivism', 'actor network theory' and 'posthumanism'.
2. Technological determinism views the laws governing technological developments and human behaviours as causal mechanisms driving the world forward. This perspective informs studies in which ICTs are understood as autonomous material devices carrying inherent properties which influence family life.
3. Social constructivism rejects the assumption that technology drives social change and gives priority to human actors and their intentional meaning-

making processes. This entails conceptualizing ICTs as effects of human actions and interpretations, rather than as determinants of family life.

4. Actor network theory conceptualizes heterogeneous sociotechnical networks (rather than either technology or humans) as prime agents of change. ICTs are seen as having effects through their participation in networks comprising family members, technological artefacts, domestic practices and the material home.
5. Posthumanism regards the world as constituting itself through dynamic materializations of difference, including the technology/society distinction. This approach investigates and accounts for how practices across various domains are implicated in the constitution of the boundary between ICTs and family.

Notes

[1] The authors and approaches included within each of the four perspectives are not unified in their understanding of the relationship between technology and social change. However, their conceptualizations share some key common principles and characteristics which warrant grouping them together.

[2] There are different interpretations as to whether Marx's work constitutes a technological determinist account of history (Bimber, 1990; Heilbroner, 1967, 1994; MacKenzie, 1984).

[3] See Marx and Smith (1994) for a discussion of 'hard' and 'soft' versions of technological determinism.

[4] There are other practices and projects that are also implicated in the making of these boundaries, for example, developmental psychology, evolutionary biology, etc (Castañeda and Suchman, 2014; Suchman, 2007).

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