Connections, Information and Reality

'*thinking about the internet of things'*

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Abstract

The number of connections between people, organizations and technology is proliferating rapidly, and the amount of information they produce, exchange and share is increasing accordingly. These connections and the information they produce are defining and shaping our daily life and work and our perception of reality. Computers in all forms are becoming smaller and less visible, but they are omnipresent. This development of information technology 'everyware', as Greenfield calls it, is also referred to as ubiquitous computing. With the development of ubiquitous computing, computers not only disappear from our perception, but also from our experience. When these new and almost invisible technological devices are tied together, for instance in the Internet of Things, the information resulting from that connection will be more than the sum of its parts. The Internet is the place where subjects are connected and where they exchange and share information. With the development of the 'Internet of things', the Internet will also connect objects and enable them to exchange and share information. In this Internet of the future, subjects and objects are more and more connected in random coalitions and networks on the basis of information. These new connections and their seamless exchanging and sharing of information will challenge traditional organizational structures. The information produced in networks will be used for changes to our existing reality and will help create a new reality. Will this development of subjects and objects connected in networks raise new questions and challenges for science and for the development of knowledge within a changing reality?

Keywords: *Postphenomenology, ubiquitous computing, networks, interpenetration, enactment*

1. Postphenomenology

The connections that arise within and between combinations of man, organization and technology define, as observed by philosopher Martin Heidegger (1927), the way in which reality as created by the joint efforts of man and technology is approached. This specific combination also determines the eventual possibilities of what products or services can be produced (as in the combination of weaver and loom, and blacksmith and anvil). Heidegger attempts to unearth new and as yet non-existent phenomena in the relationship between man, organization and technology. Heidegger discourages us from considering technology as something mythical or unreal, urging us to look for the essence of applied technology, the relation with that technology, and the underlying objective of technology usage. He found that technology and technological applications are increasingly becoming a framework around the actions of individual people or the collective of people. Following on from Heidegger, philosopher Don Ihde (2003:2009) posited that modern man should start devising an interrelational ontology of entities that applies to new and hybrid combinations of man, organization and technology. Interrelational ontology refers to the inextricable link between human experience and the environment or world in which humans live. In this world, man and organization are subject to continuous changes to their perception and experience of reality. This process is affected by the fast development and uptake of technology and technological applications that play a fundamental role in man's environment. Ihde argues for research into and analysis of the new embodiment of these relations, and to analyze them as relations of man, technology and world (IT, digimedia). Embodiment is Ihde's concept signifying the way in which man approaches his environment or world, connects with it, and the role of artifacts or technology in that. Within that very framework we can, for example, consider the reciprocal relations of man-IT-man and organization-IT-organization in any possible manifestation as a kind of embodiment of relations between hybrid systems as defined by Ihde. The mutual relation that thus arises between subjects and objects, and between the physical and the digital world, requires a new and different approach to these relations. Continuing Ihde's train of thought, Verbeek (2005) goes on to designate that new approach using the term 'post'phenomenology: "*From the postphenomenological perspective, reality cannot be reduced to interpretation, language games or contexts. To do so would amount to affirming the dichotomy between subject and object, with the weight merely being shoved to the side of the subject. Reality arises in relations as do the human beings who encounter it*". (2005:113). During the ninety years that separate the ideas of Heidegger and those of Ihde and Verbeek, technology not only saw sweeping changes, but also became a more integral and indiscernible part of our daily existence. This has not only changed our relationship with this technology and these technological applications and made it more self-evident, it is also increasingly changing what we produce using this technology. Technology and technological applications are increasingly turning into the framework within which we live and work. They encase our everyday reality. In this context, I concur with Berger & Luckmann's definition of reality: *"It will be enough for our purposes, to define 'reality' as a quality appertaining to phenomena that we recognize as having a being independent of our own volition, and define 'knowledge' as the certainty that phenomena are real and that they possess specific characteristics."* (1966:13). Berger & Luckmann argue that everyday reality is experienced as something we take for granted and does not require additional verification in its everyday appearance and perception. Everyday reality is just there, Berger and Luckmann point out, as an undeniable axiom. Man's biological development therefore always feeds off his surroundings, *"in other words, the process of becoming man takes place in an interrelationship to its environment*". (1966:66). The increasing number of interconnections between

man, organization and technology are causing them to be ever more intertwined. They are basically casually drawing on that relation in creating a new everyday reality as an everyday environment made up of reciprocally interacting elements. The Internet is one example of relations and the possibilities these offer for the exchange and sharing of information. The relation between man, organization, technological application and the Internet, and the information exchanged and shared within that realm, drives our perception of everyday reality.

2. Ubiquitous Computing and the 'Internet of Things'

At the end of the twentieth century, Mark Weiser (1991) concludes that a new way of thinking and working is needed in relation to the physical fashion in which computers present themselves in the world. The basic underlying principle for Weiser's new way of thinking is that computers in a new manifestation will eventually fade into the background of the human environment, both physically and in terms of perception, and will at the same time disappear from man's perception altogether. Computers will, in his view, become smaller, increasingly indiscernible and more autonomous over time. Weiser (1991) comes up with the concept of ubiquitous computing to refer to that new reality of computers. The real challenge Weiser (1993) sees in the development and shaping of ubiquitous computing is that it will involve reinventing and reshaping the relationship between man and computers *"one in which the computer would have to take the lead in becoming vastly better at getting out of the way so people could just go about their lives"*. (1993:2). The advent of the Internet adds, in Weiser's theory, a new dimension to the concept of ubiquitous computing. Weiser considers the Internet as a form of distributed computing (1996) connecting millions of people and computers through a network (i.e. the Internet) to exchange and share information. The evolution of the Internet will eventually not only make it a network of distributed computers, but also contain ubiquitous computers. These ubiquitous computers are small, indiscernible and, as the concept suggests, ubiquitous. When discussing the development of ever smaller and ubiquitous computers, Weiser says: "*tie them, to the Internet, and now you have connected together millions of information sources with hundreds of information delivery systems in your house*". (1996:5). The evolutionary development towards a combination of distributed computing and ubiquitous computing will, in Weiser's opinion, peak in the period between 2005 and 2020. According to Greenfield (2006), ubiquitous computing forebodes a development that will see everyday objects enabled to observe their own environment and record information about, for example, their environment, location, status and history. And the possibility of exchanging and sharing that information with other objects and subjects will inevitably lead to a changing relation with these objects. "*We'll find our daily experience of the world altered in innumerable ways, some obvious and some harder to discern*". (2006:23). Looking upon all available technological possibilities as components of a network of mutual connections leads to a whole that is more than the sum of its parts. The (im)possibilities and applications of this new whole are as yet uncharted. Greenfield therefore goes on to state: "*But when things like sensors and databases are networked and interoperable, agnostic and freely available, it is a straightforward matter to combine them to produce effects unforeseen by their creators*". 2006:143. Greenfield foresees the birth of this network of sensors and databases and the ensuing behavior throwing up some new and major challenges for us as individuals and as a society in the coming years. However, Bell and Dourish (2006) point out that Weiser's prophecy has basically already been fulfilled in that the network he foresaw has already taken root in our society: "*in the form of densely available computational and communication resources, is sometimes met with an objection that these technologies remain less than ubiquitous in the sense that Weiser suggested*". (2006:140). Bell and Dourish base their finding on the unstoppable development of mobile applications and the possibilities these offer to exchange and share information anytime and anywhere. Although mobile telephony is a form of ubiquitous computing that is still visible and tangible for subjects, that visibility and tangibility is a whole lot less in the case of a technological application such as the RFID chip. Wu et al. (2006) describe a radio frequency identification (RFID) chip as a: "*small tag containing an integrated circuit and an antenna, which has the ability to respond to radio waves transmitted from the RFID reader*" (2006:1317). One of the manifestations of the concept of ubiquitous computing is the development and shaping of the 'Internet of Things'. In a report published by the cluster of European research projects on the development and shaping of this 'Internet of Things' (CERP-IoT - 2010) the effect of this concept is considered an addition to existing interactions between man and their applications. Within the context of the 'Internet of Things', a 'thing' is defined as a real/physical or digital/virtual entity that exists and moves in time and space and that can be identified. The 'Internet of Things' is an integral part of the development towards and the future usage and application of the Internet. The 'Internet of Things' will slowly but surely create a dynamic network of numerous and wirelessly connected 'things' that are capable of intercommunication. The 'Internet of Things' arises and is developed based on, among other things, ideas stemming from the concept of ubiquitous computing. The 'Internet of Things' enables interconnections between people and things anytime and anywhere. Mark Weiser's vision is set to become reality in the coming years as the 'Internet of Things' evolves. The evolution of the 'Internet of Things' will, according to Clarke (2003) inevitably lead to changes in our private and work lives both on an individual and a collective level. On an individual level, new technological applications will further blur already diffuse boundaries between man and technology. On a collective level, this new form of distributed and activity-sensitive software will enable us to accrue new knowledge based on the electronic traces left behind through the use and application of that knowledge. Clarke formulates the latter as follows: "*These shiny new tools will not simply redistribute old knowledge; they will transform the ways we think, work and act, generating new knowledge and new opportunities in ways we can only dimly imagine. Our smart worlds will automatically become smarter and more closely tailored to our individual needs in direct response to our own activities. The challenge, as we are about to see, is to make sure that these smarter worlds are our friends, and that our tracks, tools and trails enrich rather than betray us*". (2003:165). In order to be able to develop and shape this new and smart world, we need better understanding of ourselves as humans, Clarke states. The first step en route to this greater understanding of the concept of the human being is the recognition that man is de facto already a hybrid being. Man as a hybrid being is a combined product of our biological origin and the cultural, linguistic and technological networks man is part of. Only based on that recognition of man as a hybrid being will we be able to make an active contribution to the development and shaping of a new and smart world, as well as the corresponding technology and culture, while also developing into the human beings we want to be in such a world.

3. Organizations and Networks

Biologist Ludwig von Bertalanffy (1966) claimed that the combination of technology and society (nuclear bombs, the space program) had become too complex for traditional scientific approaches and interpretative systems to grasp. He identified a need for more holistic or 'system-oriented' and more generic and interdisciplinary approaches, and therefore formulated a general systems theory; a doctrine or a collection of accepted and well-founded general principles and methods, which can be applied to all kinds of systems that are the object of scientific research in different fields. He defines a system as a complex of mutually interacting elements, with interaction meaning that these elements are in a mutual relationship and that they all have an effect on each other. The approach that ensues from general systems theory is, in the eyes of Von Bertalanffy, not limited to material entities, but rather intended for entities that are partly immaterial and largely heterogeneous in their make-up. This latter point is, in my view, fully applicable to the development of ubiquitous computing and the ensuing 'Internet of Things'. The development towards networked subjects and objects gives rise to new questions about the way in which organizations can handle that, and the consequences it will have for the process of organizing. After all, in that new reality, organizations and their environments will be hybrid systems (combinations of man, organization and technology) that will increasingly depend on information from networked systems and entities. However, modern organizations are generally still structured and shaped based on vertical principles, with information organized from the top down. This vertical principle is increasingly eroded by the process of hybridization, the use and application of ever more connections and the exchange and sharing of information across these connections. These developments are creating organizations that are increasingly connected horizontally on the level of their activities. There are, in the opinion of Baecker (2001), hardly any phenomena, events or activities in today's world that are not in some way interconnected or that do not co-produce as part of networks. In many situations it will be unclear or imperceptible whether communication and interaction actually takes place between two or more persons, two or more machines, or a random combination of both. This complex of networked, interacting and intercommunicating systems is perpetuated based on information from random combinations of hybrid systems. In this context, organizations are increasingly showing a metaphorical resemblance to the human brain, as suggested by Morgan (1986). He based this metaphor on the idea that every aspect of an organization's functioning depends on some kind of information processing. That makes an organization a more or less closed system of information processing, where information is interlinked and converted into new links back to the organization's environment, based on the exchange and sharing of information and corresponding actions. However, organizations' thinking and operations within information-based networks requires new insight. Barabasi (2003) claimed that real networks are made up of *communities*, which, in turn, are made up of nodes with tight mutual links, stronger than their links with nodes outside the network. "*Thus a web of acquaintances – a graph – emerges, a bunch of nodes connected by links. Computers linked by phone lines, molecules in our body linked by chemical reactions, companies and consumers linked by trade, nerve cells connected by axons, islands connected by bridges are all examples of graphs. Whatever the identity and the nature of the nodes and links, for a mathematician they form the same animal: a graph or a network.*" (2003:16). The network is then the result of the sum of all interaction and communication between the different hubs or nodes in the network. A relatively limited number of nodes, which Barabasi calls hubs, dominate most of these networks. These hubs are special and dominate the structure of the network they are part of, and make it come across as an independent small universe. Their central position amid a large number of nodes means that many connections between those nodes run through them, and they therefore enable quick links between any two nodes in the network or system. Barabasi claims that hubs make networks *scale-free* in the sense that some hubs seem to be able to maintain an infinite number of links with nodes, regardless of whether the nodes in question are similar or not. He goes on to distinguish between *scale-free* networks and what are known as *random* networks, with the large majority of nodes in the latter having a similar number of connections with other nodes. Barabasi's assumptions lead to the conclusion that the development of organizations as hybrid systems will, in the future, strongly depend on connections and communication. On the other hand, there is a dependency on the process of organizing this complex of connections and communication. That makes the extent to which organizations are capable of functioning as a hub in their section of the network, organizing their (information) links with other nodes and exchanging and sharing information within this process of organizing a decisive factor in the development and success of organizations in their environment. Baecker (2001) claims that our thinking on organizing and structuring organizations is changing, leading to drastic changes in both existing organizations and their management. The shift in our thinking is one from a hierarchical and functional approach to a more horizontal and connection-driven approach. This new and more horizontal approach mainly involves developing and maintaining relations between the hybrid system's interior and its exterior world. As a hybrid system, an organization will increasingly be incorporated into the networks in its environment on a social, technological and economic level. The ability and willingness to operate in these networks will pose a growing challenge for the existing organizational structures as they are today. But the organization as a social system, which is based on traditional principles such as hierarchy, will not quickly or easily accept a different form or allow itself to transform, or be transformed, as a matter of fact. New theoretical insights are needed to channel such developments and support organizations in developing a new basis for themselves. New insights are also needed to be able to further develop new connections between organizations as systems and hubs in the network for the exchange and sharing of information with their environment. In the eyes of Baecker, this will not add up to hierarchical or organizational layers being wiped out altogether by these developments and the exchange and sharing of information, but rather to new functions being added to them to absorb the insecurities that are part and parcel of operating in networks. In this changing environment, information is a crucial raw material for organizations. However, with an increasingly horizontal instead of vertical flow of information, organizations will have to start developing and implementing new and more ecological forms of management and control. These new forms of control and management must veer away from exclusively focusing on direct management of the execution or controlling of available information, and move towards self-organization and self-management of and by small hybrid systems. Organizing thus becomes focused on creating smaller sub-systems that, within the greater whole, independently organize their connections, and exchange and share information with their environment within the boundaries of predefined frameworks. That will not only contribute to the development

and growth of each sub-system, but also to the development of the system as a whole. Organizations organize themselves as networks, and can therefore be included in networks around them without any problem, which is increasingly creating a likeness between organizations and living organisms sharing a living body with other organisms.

4. Information and Reality

Information generated by connections between man, organization and technology is increasingly making a mark on our reality. Bateson (1972) already observed that a complex network of interconnected entities is shaping our world. This connection is, in his view, formed by the exchange of messages, or in other words "*the relationship is immanent in these messages"* (1972:275). Bateson considers the connection the intrinsic result of the exchange and sharing of messages and "*a difference which makes a difference is an idea or unit of information*" (1972:318). In his view, information is a new and externally-created difference or change that installs new differences or changes in a new recipient environment. The message should, in Bateson's theory, end up in a structure that is capable of processing these new differences or changes. But, Bateson warns, structure alone is not enough. The recipient structure must be willing to accept and process the incoming difference or change, or in Bateson's own words: "*This readiness is uncommitted potentiality for change, and we note here that this uncommitted potentiality is not only always finite in quantity but must be appropriately located in a structural matrix, which also must be quantitatively finite at any given time*" (1972:401). In order to be able to understand and interpret the behavior and experience of people, Bateson claims we will, in principle, always need to depart from the complex of connections that systems are part of. Bateson considers these connections a simple unit of thought. Systems with higher levels of development and complexity should, in his view, be looked upon as systems of units of thought. The possibility and ability to exchange and share information between random systems and entities can also be referred to as information interoperability. Van Lier & Hardjono define information interoperability as: "*the realization of mutual connections between two or more systems or entities to enable systems and entities to exchange and share information in order to further act, function or produce on the principles of that information"* (2011:69). The information exchanged and shared between random people, organizations and technological applications in the form of communicative units can be either accepted or rejected by the recipient system. Luhmann's (1995) concept of interpenetration from his social systems theory starts with the possibility of receiving or rejecting an incoming communicative unit. When systems possess a reciprocal willingness and ability to accept the communicative unit, and grant communicative acts from other systems access to their system, a form of interpenetration comes about. "*Interpenetrating systems converge in individual elements – that is they use the same ones – but they give each of them a different selectivity and connectivity, different past and futures*". (1995:215). Luhmann (1995) uses the concept of 'interpenetration' to pinpoint the special way in which systems contribute to the shaping of other systems within the environment of the system. Interpenetration is more than just a general relation between system and environment, but rather an inter-system relation between two systems that make up an environment for each other, and through which a system makes its own complexity available to build other systems. Interpenetration therefore only really occurs when these processes are evenly matched. That is the case when both systems enable each other to introduce their own existing complexity to the other side. The concept of interpenetration presupposes therefore, according to Luhmann, the ability to connect different forms of autopoiesis, such as life, consciousness and communication. The concept of interpenetration is equally Luhmann's answer to the question of how double contingency between different systems is enabled, and a new system based on communication comes into being with sufficient frequency and density. Making connections between two or more systems leads to the evolutionary creation of a new and higher form of system formation, which only manifests itself as it occurs, i.e. in the process of entering into and maintaining a communicative commitment. In Luhmann's view, system evolution is only facilitated by the concept of interpenetration, i.e. in the form of reciprocity. In the systems theoretical approach, reciprocity turns evolution into a self-perpetuating circular process: "*Therefore evolution is possible only by interpenetration, that is only by reciprocity. From the systems theoretical viewpoint, evolution is a circular process that constitutes itself in reality*" (1995:216). Every system that participates in the concept of interpenetration must be willing and able to allow a difference created by another system access to itself without that leading to the erasing of its own difference between system and environment. The concept of interpenetration does not connect execution, but shapes connections every system uses to stabilize its own internal complexity. The difference adopted by the system is shaped by the communicative unit consisting of a combination of information, utterance and understanding. Systems, such as organizations, want to quickly obtain new and relevant information from their environment, and be able to adequately apply this information within their own complexity. New information must therefore be acceptable for the system, and enable the system to assign meaning to the information. Luhmann (1996) borrows the neologism 'sensemaking' coined by US scientists to refer to this process of assigning meaning. By assigning meaning to information, i.e. sensemaking, a system is enabled to perpetuate existing executions, and to pass the ambivalence between knowing and not knowing on to a subsequent situation. A system benefits internally from new information based on what a system can or wants to do with this new information.

Changes based on new information stemming from connections between the organization as a system and its environment create what Weick (1979) calls a meaningful environment. After all, incoming information requires the organization to act in the form of assigning meaning (enactment) to that new information. Intruding information is subsequently the raw material for a process of sensemaking in organizations. The concept of enacted environment, where changes from the environment interpenetrate into the organization as a system, is, in Weick's view, not the same as the concept of a perceived environment. If a perceived environment were to be the core, this phenomenon would have been called 'enthinkment' and not 'enactment' (the act of assigning meaning). Weick considers reality a product resulting from an active process of social construction, and sees the concept of 'enactment' as the starting point of that process. Weick joins Berger and Luckmann (1966) in stating that observing our environment from different viewpoints does not lead to everyone observing a common world in the same way. Similarities in our perception of this common world are based on, among other things, the fact that we use language as a common system. Berger and Luckmann point out that man uses language to construe his social reality. The concept of an ecological environment and the ensuing process of construction of social reality is based on the fact that knowledge is developed

through connections between subjects and between subjects and objects. The subject observes the object, and subsequently processes that observation cognitively, labels it in different ways and links it to various other isolated or external events. Weick states that there is too little focus on the possibility that the development of knowledge can also move into another, seemingly opposite, direction, namely the potential effect of the subject on the object. This effect turns knowledge development into an activity where the subject, partly through his own interaction, establishes the object both within his environment and within existing relations in that environment. In Weick's view, that vindicates the principle of a mutual relation between subject and object. That reciprocal influencing is what Weick sees as the model for the relation between enactment and ecological change, which he mainly sees in organizations that greatly depend on technology and technological applications in their operations. Such organizations have to shape enactment around and while taking account of the (im)possibilities of the technology. The high level of entanglement with technology and technological applications causes the process of enactment at organizations to change. But arguing that enactment reduces when the intensity of technology usage increases goes too far, in Weick's view. According to Weick, that argument loses sight of the fact that it is not the technology in itself that is leading to these changes. It is the information this technology generates and the information that is edited and processed using and through the intervention of technological applications that breed change. Technology generates ever greater volumes of raw data, which is a development that is also making ever greater demands on organizations to assimilate this raw data into their own context, in such a way that this data can be turned into usable and manageable information. Weick compares the term enactment, when used in the context of organizing, to the relation that evolution theory established between the term variation (the existence of differences within a kind) and natural selection. He prefers the concept of enactment over variation as enactment has a more active connotation. That reflects the active role participants at organizations play in the creation of their environment and the readiness to impose the environment they created upon themselves. The act of assigning meaning is closely linked to the principle of ecological change. Weick, like Luhmann, follows Bateson's (1972) epistemology, which states as follows: "*Ecology, in the widest sense, turns out to be the study of the interaction and survival of ideas and programs (i.e., differences, complexes of differences etc.) in circuits*" (1972:491). Especially where new differences arise within existing knowledge and experience in the organization, such as through the arrival of new information from the environment, this requires action from one or several actors to isolate and further scrutinize this new difference in order to eventually assign meaning to it. This kind of bracketing of new differences is merely one manifestation of enactment. Another manifestation of enactment can, for example, come about when an actor does something that leads to a new ecological change, i.e. a change that subsequently leads to a limitation in the environment, which, in turn, reproduces a next ecological change, making this an endless sequence. The process of assigning meaning is the only process through which the organism or the organization approaches its external environment. The perspective of being able to assign meaning gives people in organizations greater self-confidence. They become willing to reflect on their own day-to-day actions to a greater degree, as well as on the influence they exert on their environment and the influence their environment has on them. The organization needs to be more committed to and aware of its environment and the influence it has on the reality the organization constructs. If man and organization are more aware of the fact that they construct their own environment and hence their own reality, they can influence that process more. When organizations approach environments from the perspective of active meaning assignation, the focus shifts from the question of what's true and what's not, to the question whether the presented or conceived version of reality is more reasonable or less reasonable. That would prevent endless discussions and questions aimed at showing whether things are perceived and judged correctly and whether they are true or not. From the perspective of assigning meaning, such discussions can, in Weick's view, be replaced by questions along the lines of: what have we done? what meaning can we, and do we want to, assign to certain actions and information? and which actions did we refrain from? This way, people are, on an individual level, challenged to analyze whether the meaning they assigned to changes in their environment has led to the right form of common meaning or sensemaking for that change.

5. Conclusions

The new, reciprocal relations that arise between subjects and objects, and between the physical and digital world, demand new and different approaches to the connections between the different phenomena. Postphenomenology offers an ontological basis for further research into and the development of these new connections between man, organization and technology. Postphenomenology also offers a basis for further research into a changing reality, as developed and shaped based on these new relations between man, organization and technology. New, emerging forms of technology, such as ubiquitous computing, are breeding technological applications that are becoming ever smaller and less discernible, are all around us and drive our human behavior, but are also leading to new connections between objects amongst themselves and between objects and subjects. These connections facilitate an ever greater stream of information exchange and sharing. This information influences the development and shaping of our perception of reality. Everyday reality is hence the product of the connections between man, organization and technology. The increasing volume of exchanged and shared information will slowly but surely erode the vertically-oriented structure and shape of organizations. A more horizontally-oriented approach, based on random combinations of people, organizations and technological applications with a capability to exchange and share information between them, therefore becomes a necessity. This approach to organizations has yet to be developed. A more ecological management and control set-up must lie at the root of that approach, as well as the creation of smaller sub-systems that independently organize connections and exchange and share information with their environment within predefined frameworks. Such a horizontal and ecological approach would have organizations organize themselves as networks. Organizations can then be incorporated into networks around them without any problem, conjuring up a likeness to a living organism co-habiting with other organisms in a living body. Systems theory offers an epistemological framework for further research into and development and shaping of hybrid networks made up of man, organization and technology. Reality comes into being and gains shape as people, organizations and technology exchange and share information. Information that is received leads to active sensemaking by the recipient system. Assigned meaning, in turn, triggers ecological changes to reality as perceived and experienced by humans and organizations. If people had greater awareness of the fact that they create their own environment, which is made up of new combinations of man, organization and technology, they would be able to exert

greater influence on the creation of this new and self-constructed reality. Social constructivism can be a methodological framework for further research into the development of a new reality springing from connections between man, organization and technology.

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