Dynamic IT Values and Relationships: A Sociomaterial Perspective

Leon Dohmen

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CGI Nederland B.V.
Leon.dohmen@cgi.com

Abstract. Management scholars are criticized for ignorance and the wrong approach when studying the impact of technology in organizational life. Impact of technology in this paper is interpreted as IT values created or achieved from equivalent and contingent interaction between human (people) and non-human agents (technology, organization). Researchers and theorists propose to include a sociomaterial perspective and to develop general and broader, empirical based patterns across different contexts. Based on a literature review containing publications of theoretical considerations and empirical research this paper introduces a first general and sociomaterial based overview and taxonomy of IT values and their relations. IT values have a techno-economic or socio-techno orientation, are dynamically entangled and competitive, and complementary or overlapping. IT values are related to time, sponsor and, hierarchy. The identified IT values are ordered into a framework which has to be treated as a starting point to discuss further the definition, dynamics and relations of IT values from a sociomaterial perspective.

Keywords: Impact of technology · IT values · Sociomateriality · Relationship · Entanglement · Emergence · Techno-economic · Socio-techno

1 Introduction

Management scholars are criticized in two ways when researching the *impact of technology* in organizational life. Either they ignore it[1] or they prefer a linear approach by separating technology, organization and people [1]. Sociomaterial theory is proposed as alternative. "*Sociomateriality* stands out as a symbol for the interest in the social and the technical, and in particular, the subtleties of their contingent intertwining" [2]. One of the key concepts of sociomateriality is based on Actor Network Theory. Human and non-human agents are inseparable connected maintaining equivalent relationships and "enact continuously relational effects" [2]. But also sociomateriality is subject of criticism. Sociomaterial oriented theorists and researchers argue to unlock

[1] Orlikowski refers to a study of Zammuto et al including a survey of four journals: Academy of Management Journal, Academy of Management Review, Administrative Science Quarterly and, Organization Science. Only 2.8 percent of the research articles in these journals focused on technology and organizations.

broader, general patterns across different contexts [2] and to acquire more empirical evidence.

This paper interprets impact of technology as *IT values* achieved from the equivalent and contingent interaction between technology, organization and people. To meet the objection of linear research, IT values will be analyzed through a sociomaterial lens. First IT values will be identified, collected and ordered based on literature review and discussions with subject matter experts. Secondly this paper introduces the relational dimensions between collected IT values.

2 Dynamic IT Values through a Sociomaterial Lens

Assumed is that IT values are depending from the sociomaterial context and are emergent as attitude, learning processes and skills play a crucial role [3]. Here we accept that values are in a "state of becoming" rather than a status quo [2] assuming a fully relational ontology, where IT values exist in relation to each other.

To acquire insights in the dynamics of IT values when applying IT-facilities this study, identifying and collecting IT values, proposes a new sociomaterial based IT values framework and taxonomy. The question we focus on for this inventory is: *Which IT values can be identified and how are they related?*

2.1 Research method

To search for broader and general sociomaterial patterns zooming out technique is used for a literature review containing theoretical expositions and/or empirical research. A zooming approach provides ideas about how to extend qualitative research methods for investigations of sociomateriality [2]. Exploration and selection of IT values and composition of the framework and taxonomy happened from March 2011 until April 2015. The study started with a consultation of subject matter experts with an academic and/or business background. Following their literature suggestions revealed a heterogeneous representation of the concept of IT value.[2] Due to the zooming out approach publications from outside the IT domain like product design were included. Books and articles showed different approaches and definitions to describe and explain IT value (related) concepts. These concepts showed for example quantitative and qualitative research approaches and/or objective and subjective (perceived) definitions of IT value. Another difference was that some articles focus more on the process of value creation and conditions rather than on IT value. Because the contribution of this paper is to compose a framework and taxonomy for IT values we fo-

[2] Recommended literature, which some of is included in the list of references, led to an extensive list of concepts related to or representing IT value: business/IT alignment, business value, company value, contribution of IT, customer satisfaction, customer value, information system success, IT absorption, IT adoption, IT value perception, net benefits, technology acceptance, user acceptance, use of IT, user value and, value of IT.

cused especially on studies and considerations with primary attention for explaining and defining IT value. After composing the first draft of the framework further consultation of subject matter experts took place which led to new literature suggestions. Additional literature review was done using keywords (see footnote 2) searching on the Internet for relevant articles, papers and books dealing with the subject of IT value. New IT values discovered became part of the collection. To construct and order collected IT values, terms and definitions of the public values discussion [4] are adopted for the IT values framework. Public values are values in governance and public service [4]. The public values discussion involves the relational and entangled dimension between values which corresponds with important principles of sociomateriality. Strong point of this long term and evolving zooming out approach is the broad coverage of the concept of IT value. A weak point is due to the extensive range of related key words (see footnote 2), important relevant literature can be missed. Despite this weakness, because of the need to unlock broader general patterns as contribution to support sociomaterial theory it is chosen for this approach.

The framework presented in this paper consists of eight nodal values, sixteen neighbour values and sixty four co-values (table 1).[3] Neighbour values are the bridge between nodal values, which are referred to as starting point and co-values are determined as promoter or contributor [4]. Co-values can be positive or negative. The interpretation of an IT value and position in the framework is partly derived from the categories of user value from Boztepe [5].[4] Because of the readability of the table references are omitted here. These are explicitly mentioned in the accompanying text.

Nodal IT values	Neighbour IT values	IT co-values
Utility	Convenience	– Accessibility – Appropriateness – (Physical) compatibility – Availability – Time management – (Avoidance of) sensory unpleasantness
	Safety	– Security – Health (e.g. reducing stress) – Comfort – Compliance
	Quality and performance	– Durability – Reliability – Fit for purpose (usefulness) – Agility (flexibility) – Speed – Effectiveness

[3] Selected values follow the definition of the referred to literature in the reference list, in some cases supported by an example or key word between brackets.

[4] Boztepe originally distinguishes four categories which are positioned as nodal value in this paper: utility, social significance, emotional and spiritual. These categories are used as starting point for the framework and further supplemented with other relevant nodal values.

		– Efficiency (ease of use)
	Economy	– Use economy – Purchase economy (price value) – Objective financial indicators (e.g. net margin, profitability, operational expenses, etcetera) – Share value
	Service	– Assurance – Responsiveness – Empathy – Relationship
Social	Social prestige	– Influence – Power – Impression management (face saving acts) – Respect
	Identity	– Role fulfilling – Group belongingness
	Ethics	– Right conduct – Moral principles – Honesty
Emotional	Pleasure	– Fun – Enjoyment – Beauty – (Job)satisfaction – Attachment – Affection (love) – Detachment – Addiction – Nomophobia – Panic – Anger
	Sentimentality	– Memorability – Nostalgia
Cognitive	Stimulation	– Excitement – Curiosity – Self-actualization
	Growth	– Independent thought and action (independence) – Creating new innovative things – Diffusion (of gained knowledge)
Universal	Welfare	– Social innovation – Tolerance
	Protection	– Sustainability – Care for people
Traditional	Loyalty	– Commitment (deep attachment) – Respect
Spiritual	-	– Good luck – Superstition
Singularity	Super-humanity	– Super-intelligence – Immortality – Personalized food

Table 1. General Sociomaterial IT Values Framework

We prosecute our discourse about IT values with a brief description and definition of chosen values when appropriate supported by illustrative examples from practice.

2.2 Utility Value

Utility value is the consequence of using a product and encompasses neighbour values *convenience*, *safety*, *quality (and performance)*, *economy* [5] and, *service* [6]. IT values to a large extend are connected to the material aspects of the product and have a techno-economic orientation.

A utility is acquired to fulfil (convenience) needs – including *accessibility*, *appropriateness* and (physical) *compatibility* – of the user and *avoid unpleasantness* [5]. Technological *availability* [7] should also be considered as an important co-value for convenience. The human role is shaping as well as being shaped by *time* [8]. Orlikowski and Yates [8] define time as "people produce and reproduce what can be seen to be temporal structures to guide, orient and coordinate their ongoing activities."

Security, *health* and *comfort* are co-values of safe usage [7]. Paro, the robot seal used in healthcare for people suffering from dementia, is an interesting reference in practice for these co-values [9]. Paro reduces stress and leads to a positive mood. Serving road safety, *compliance* is meeting governmental laws and regulations [10].

Durability and *reliability* of materials used are important co-values of quality and performance [5]. *Efficiency* is also performance related [5]. Investments in basic infrastructures have a different purpose compared to investments in innovative applications [11]. So the utility should fit the *purpose* of use. Business operation changes permanently due to increased competition, new rules in law, etcetera. To adapt smoothly to these changes *agility* [12] or *flexibility* is another important aspect of quality and performance [13]. Increasing *speed* to access knowledge and service delivery is experienced as an important gain when applying social tools [14]. Al-Maskari and Sanderson [15] refer to a general term like *effectiveness* to express utility value. From an expectancy perspective Venkatesh, Thong and Xu [16] refer to ease of use (*effort*) and *usefulness* (performance). Usefulness is interpreted as similar meaning as fit for purpose.

Economy is a next neighbour value of utility value used in as well as the business context [9], [17, 18] as consumer context [5], [16]. Where Boztepe [5] refers to *purchase economy* Venkatesh, Thong and Xu [16] introduce the term *price value* as an indicator of technology use in a consumer context. Sneller [9], [18] and Kersten [17] emphasize the importance of *use* economy when discussing utility value. Kersten [17] urges to replace legacy systems ('old' IT) by modern technologies ('new' IT). Economy value includes the life cycle of a technology and is measured with *objective financial indicators* like *net margin* and *profitability*. Implementing an ERP-system increases *share value* [18].

Besides applying a utility or product, service is determined as an important neighbour value of utility value. DeLone and McLean [6] adapted their previous IS Success Model. Service quality contains similar co-values as identified for product quality and performance. Additional important co-values are *responsiveness*, *assurance* and *empathy*. *Relationship* between actors when providing services to a product also impacts user value perceptions [19].

2.3 Social Value

Social value involves socially oriented benefits. From a sociomaterial perspective here the material is used to derive or gain social advantage. This includes *social prestige* and construction and maintenance of one's *identity* [5]. *Ethics*, another identified neighbour value, is of increasing importance [20].

"Social significance (prestige) value refers to the socially oriented benefits attained through ownership and experience" [5]. Product benefit examples lead to social associations (*impression management*, *face saving acts*) between family and other social groups with increase in *respect*, *influence* and *power* as consequence [21]. "Possession of a trendy object is often seen as sufficient to communicate a certain image of self (identity)" [5]. Social significance or influence becomes meaning in relations with others which concerns *group belongingness* and *role fulfilling* [5], [21]. Companies can build up a company image (identity) by chasing IT fashions [22].

Ethics refers to a set of (local) principles of *right conduct* or a theory or system of *moral* values. IT solutions have a big impact on the work of others. Engineers of IT solutions should embed an ethical (value) dimension (*honesty*) in the requirements of the to build solution [20].

2.4 Emotional Value

Emotional value is about aroused feelings of affective states like *pleasure* and is triggered by co-values like *fun* and sensory *enjoyment* [16], [21]. Also hedonistic values like *beauty* initiate pleasurable experiences and belong to this neighbour value pleasure. *Memorability* can arouse a *sentimental* feeling which is also associated with emotional value [5].

Attachment is a positive (pleasurable) emotional state in the relation between user and product [23]. Opposite to it *detachment* is a negative emotion which indicates the lack of linkage between an individual and a product [23]. Socio-technical studies see *job satisfaction* and productivity as important outcomes manipulated by social and technical factors [7]. Automation leads to controlling and deskilling while empowering and upskilling are a result of informate. Both – automate and informate – are different purposes when applying IT leading to different values [7]. Robot seal Paro is an interesting example how people suffering from dementia can get *attached* to it and develop *affection* for Paro [9]. On the other hand attachment can evolve into habit for example in mobile phone usage [16] and *addiction*. Venkatesh, Thong and Xu [16] introduce habit for technology use in a consumer context to extend UTAUT.[5] Habit here is defined as prior behaviour or automatic behaviour. *Nomophobia* [24] is detected as a new 'illness'. When people have lost or forgotten their mobile phone emotional feelings like *panic* become part of them.

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[5] UTAUT is Unified Theory of Acceptance and Use of Technology.

Using a screensaver or background picture on a device with a family photo or *memorable* event – *nostalgia* – is an experience of emotional feelings. Sentimentality is here appointed as a separate neighbour value [5].

Emotional value benefits arise from affective experiences related to aesthetic, giving meaning and provoke feelings as *love* (affection) and *anger*. Emotional co-values are person related, subjective and intrinsic [5]. These contributors are mainly assigned to the socio side of sociomateriality.

2.5 Cognitive Value

"IT has given a boost to knowledge related activities which are a continuation of the written word and printed book. This has been sometimes referred to as the information revolution" [25]. Heng [25] provides a classification scheme for IT-applications and addresses the *cognitive* value of IT. This nodal value is lacking in the overview of Boztepe [5]. The value of IT recognized as a source to contribute to knowledge creation and distribution is linked to the network era [26], social technologies and the networked organization [27]. *Stimulation* and *growth* are neighbour values of cognitive value. Cognitive value is also designated as epistemic value [21].

"IT's contribution (stimulation) to the knowledge enterprise enable employees to create, store and disseminate knowledge on a scale hitherto unknown" [25]. *Curiosity, excitement* and *self-actualization* are important elements to acquire (new) knowledge and support the *creation* and *growth* of *new (innovative) things* [21]. Value sensitive design here is linked *to independent thought and action* decoupled from group values [21]. The more rapidly (individual) innovative IT capabilities can be deployed, the more rapidly (business) value will grow [28]. While legacy research highlights random adoption in a social network Baldwin and Curley [28] claim that *diffusion* of innovations can be actively directed and accelerated, especially for IT systems.

Cognitive value – diffusion and access to information and knowledge – is a value which evolved from efficiency and information value [26]. Cognitive value is primarily intrinsic and subjective but can be made explicit and objective. Applying IT in education becomes more and more popular and impacts the learning process [29]. Savas [23] appoints *independence* as a positive emotion possibly leading to attachment to a product. This link to emotional value shows that values are not perceived isolated but are dynamic and (closely) interwoven [5].

2.6 Universal Value

To *care for people* in emerging countries platforms on the Internet like Get It Done [30] provide opportunities to fund projects or create your own projects. These crowd funding initiatives supported by IT are occurrences associated with *universal* values like *welfare* and *protection*. Welfare and protection can also be associated with public values [4]. However, the discussion about public values goes far beyond IT values only. The application of IT by national and local administrations leads besides IT value also to transformations in relationships between governmental institutions recip-

rocally and to transformations in relationships between governmental institutions and their citizens [31]. The latter is another example of dynamic emergence [2] of IT values.

Social innovation [32] and *tolerance* reflect welfare. People are able to connect with social tools [27] to whoever they like to. The application of IT is also seen as a social innovation issue in Belgium to support the increasing aging of the baby boom generation [33].

Sustainability shows care for planet and nature. A great example of protection is the 'volmeld'-system of the city Groningen in the Netherlands [9]. Underground waste containers are equipped with a system which transfers twice a day a message of the degree of filling to the central computers. If the percentage reaches seventy percent the container is automatically included in the route of the garbage trucks. Besides time savings (efficiency) which is usually a business objective the environmental pollution is decreased due to the reduction of co2 emission by seventeen percent [9]. U-city concerns the environmentally friendly and sustainable smart (or knowledge) city which makes the ubiquitous computing available amongst the urban elements such as people, building, infrastructure and open space [34]. This is an ongoing example of the evolving entanglement of technology, things and people like described and explained in sociomateriality theory and the dynamic values it creates [2].

Universal value is associated with care for people and planet [21]. From a sociomateriality perspective this nodal value is very much linked to the socio part of materiality. However, these values can easily be mixed with organizational value objectives like improving efficiency.

2.7 Traditional Value

Respect and *commitment* are related to acceptance of customs and ideas that *traditional* culture and religion impose on themselves [21]. Commitment (deep attachment) is related to co-value attachment which is associated with nodal value emotional.

Besides involving content also the support in users' tasks in maintaining ideas and customs is an example of traditional value. Commitment can evolve to *loyalty* to a product and recommendation. Commitment can also lead to repeat purchase of a product [35] or increased (intention of) use [16]. "Positive experience with use will lead to greater user satisfaction in a causal sense. Similarly, increased user satisfaction will lead to increased intention of use and thus use" [6].

Within traditional value the socio and material are very close related. Irritation and frustration – as experiences of negative value perceptions – can be linked directly to the (material) product when it does not work properly or as expected.

2.8 Spiritual Value

"*Spiritual* value refers to *good luck* and *sacredness* (*superstition*) enabled by a product" [5]. According to Boztepe [5] examples show that communication technologies are increasingly becoming enablers of spiritual experiences too. For instance, several websites have been set up that serve Muslims who live away from their home countries, allowing them to pay online and make sacrifices on their behalf.

2.9 Super-humanity Value

Technological *singularity* [36] which can be achieved via biomedical science and nanotechnology will create *super-intelligence* and *super-humanity* [37]. Although mainly envisioned and to date hardly proven, the concept seems to be able to abolish biological limitations and create immortality [38]. Vinge [37] described several appearances of singularity and super-human being based on artificial intelligence, intelligence amplification and, biomedical, Internet and, digital Gaia[6] scenarios. For this paper, singularity is appointed as a provisional end point in the evolution of IT (see figure1).

A further application of IT that should not be ignored is 3D food printing [39]. Data-driven recipes (Jeffrey Lipton, Cornell Creative Machines Lab) provide possibilities for older people with chewing and swallowing problems to create a meal with a modified food structure[7] and nutritional hardness (Pieter Debrauwer, TNO). 3D (food) printing adds a new dimension to the application of IT. While old applications and IT systems transfer data into reports and documents – focusing mainly on data, transaction and transfer – 3D printing transforms data into physical products. Hereby 3D food printing creates also new sensory experiences. The printed food can be tasted and smelled. Other values mentioned during the 3D Food Printing Conferences [39] were contribution to flexibility, sustainability and comfort. Instead of feeding elderly people with pureed food which sometimes leads to social isolation while people feel ashamed, feeding people with *personalized food* that looks regular but which structure is adapted increases group belongingness (nodal value social). To date it can be determined that IT values are able to trigger all five human sensory experiences: feel; see; hear; smell, and; taste.

With this involvement of biological (food) aspects it could be considered to include the biological aspect in sociomaterial theory. Also the nodal value universal and neighbour value protection is linked to biological value when involving a co-value like sustainability.

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[6] The Digital Gaia Scenario: The network of embedded microprocessors becomes sufficiently effective to be considered a superhuman being.

[7] In the food industry this is also referred to as food texture.

2.10 The sum of IT Values: Net Benefits

With respect to the ongoing theoretical and philosophical discussion of foundations for sociomateriality [40] our study to explore, define and categorize IT values contains a broad orientation and generalization leading to an overview and ordering of IT values from a sociomaterial perspective. Herewith we respond to the call and need for sociomaterial generalization across different contexts [2].

Same as for public values [4] IT values seem to be in competition and are not strictly separated but overlapping each other. From utility value – being the material representative – a number of socio related IT values are triggered, sometimes as an undesired and negative side-effect like addiction or when improving efficiency consequence can be a decrease in working pleasure – informate versus automate [7]. This means that IT values do not exist in isolation, are dynamically entangled, maintain *relationships* and are the sum up of positive and negative values in a certain context. To express the sum of positive and negative IT values we propose to connect the term *net benefits* [6], [41] to sociomaterial theory when discussing and researching IT values. Net benefits have to be defined depending on the context, are probably the most accurate descriptor of value and, should address the level of analysis [6].

The term cyborg[8] [2] is suggested as a useful metaphor that supports exploration and explanation of sociomaterial reality in future organizational life. But we also observe a further entanglement or even fusion of the synthetic[9] and real world [1]. IT values are in an ongoing state of becoming subjected to dynamics of emergence [2].

3 IT Values and Relationships

As explained before values do not appear in isolation but are closely interwoven [5] and subject to dynamics of emergence [2, 3]. In our interpretation of the relational ontology *relations* between values can be competitive, complementary or overlapping [4]. The terms nodal, neighbour and co-values [4] suggest that IT values are related and entangled in a value network. At least three types of relationship can be distinguished in our relational ontology: time, stakeholder and hierarchy. We zoom in further to these relation types to discover, describe and explain the relational tension between IT values.[10]

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[8] A hybrid of machine and organism. See also: http://www.zdnet.be/nieuws/161067/belgische-cyborg-opent-deuren-met-ingeplante-chips/.

[9] Orlikowski [1] here refers to the world known as MKP20 within Sun Microsystems. Sun Microsystems is acquired by Oracle in 2010. See also: http://virtualworldsforum.com/

[10] This paper contains a first orientation, interpretation and description of the sociomaterial relation between IT values. Further theoretical and empirical research is needed to determine this sociomaterial relational concept in more detail.

3.1 IT Values and Time Relation

The value of IT shifts over time from focus on efficiency to focus on effectiveness and flexibility and customer satisfaction [26], [42]. Explaining the difficulties and complexity of IT an article in the Dutch professional magazine CFO refers to 'old' and 'new' IT [17]. Examples mentioned for old IT are enterprise resource planning and mainframes. Social media is referred to as a new IT trend. Pictured by figure 1, let us put the emergence of IT and IT values in a *time* perspective. We include the theoretical origin and expected continuation of sociomateriality.

The start of this timeframe is around 1970 denoted as the fifth technological revolution [43] and a (provisional) destination is called singularity whose estimated range is around 2040 [37, 38]. In the beginning of the technological revolution IT was applied mainly inside organizations only for business purposes. IT from that era like enterprise resource planning applications, mainframe systems and terminals is typed as old IT. Around 1990 the structuration theory – theory of structure and agents – supports social research focusing on the impact of IT on business processes and work executed by people within organizations [7]. Much has changed in the decades after 1980.

Sociomateriality saw light as successor of structuration theory because technology, organization, and people became more entangled and inseparable [44]. IT became widespread into as well as organizational as private lives. Besides physical presence IT offers the possibility for virtual presence which introduced the phenomena of synthetic world [1]. In synthetic worlds, deployed within organizations, people can collaborate and communicate real time [1]. IT created in this era is referred to as new IT in this paper. Appearances of new IT are social media and mobile devices like smart phone and tablet computer. This is also the era the paper positions phenomena like digital business, services and society: IT for business and private purpose.

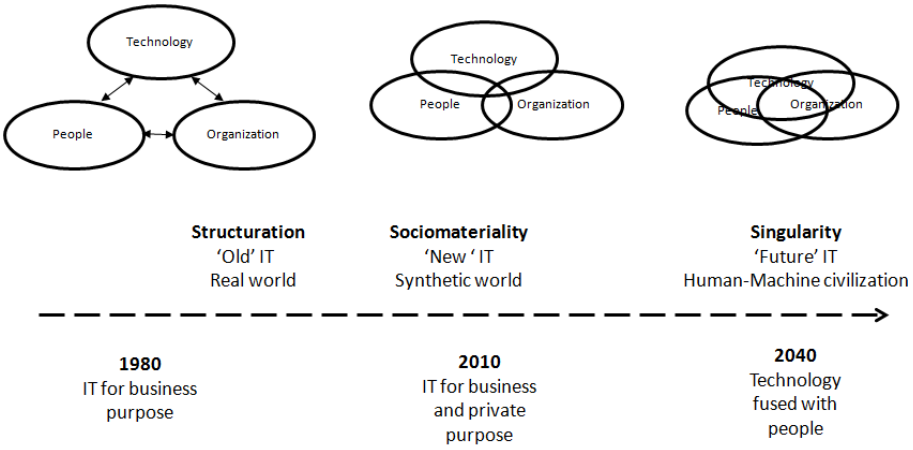

Fig. 1. Emergent IT Values and Time Relation

But the end is not reached yet. Researchers and scientists predict that people and technology will fuse which will create new and unprecedented opportunities which are referred to as 'future' IT. IT converged with other technologies will overcome biological and cognitive limitations and interaction between humans and non-humans will change dramatically [36, 37, 38].

IT was once a mean to improve operational efficiency, to date IT has changed in a multipurpose and multiform vehicle covering a broad spectrum of socio and material related values. The entanglement and dynamic emergence of IT and IT values clarify the objection to linear and quantitative research [1]. Referring to the general IT values framework in table 1 we can conclude that the framework contains a mix of old (e.g. efficiency), new (e.g. social innovation) and future (e.g. super-humanity) IT values.

3.2 IT Values and Stakeholder Relation

Besides time related IT values are also assigned to different *stakeholders* [45]. Reviewing and re-specifying the DeLone and McLean model of IS success the term net benefits [41] distinguishes different types of stakeholders: societal, organization (management and groups) and individual. IT values listed in table 1 depend from the stakeholder point of view and can vary by situation. Stakeholder relation is an important source for competition between values. When striving for organizational value as efficiency this can lead to deskilling [7]. Involving IT outsourcing causes multiple customer and supplier stakeholder relations.

Chau et al [45] compared IT value studies conducted in Asia and Europe. They note that in IT value research most studies involve the organizational level. Fewer studies focus on the individual level. Chau et al [45] distinguish objective measures – e.g. accounting and financial indicators, costs, return on investment and, firm value – besides perceptual measures – e.g. increased decision quality, better alignment with business strategy, etcetera. They observe a general shift from using objective measures to perceptual measures to study IT value.

A special entry to societal value is the debate about public values [4]. This includes at one hand the broader discussion about the common good referring to contributors to value like public interest and social cohesion. On the other hand national and local governments apply technology serving public values. Technology shapes the intra-organizational aspects of public administration institutions and the relationship between public administration institutions and citizens leading to IT induced public sector transformation [31]. Due to increase of digital fraud and other crime (cyber-crime) security seems to become a value of increasing societal importance.

3.3 IT Values and Hierarchy Relation

The third relational dimension is *hierarchy*. Hierarchy is related to the relative primacy or importance of a value [4]. Relative primacy depends on the context. From a public value point of view liberty may be more important than efficiency. Within an organization, especially when acting in private competition, efficiency may be of

more importance instead of employee's job satisfaction. Hierarchy of values and their relations are considered to be inseparable. Hierarchy between values is designated as prime values and instrumental values. Prime values are seen as temporary[11] conditions whereas instrumental values are consequences [4]. The hierarchical relation between IT values listed in table 1 in this paper can be different per situation.[12]

Referring once again to Paro – the robot seal used in healthcare to accompany patients suffering from dementia – how should value be expressed? Paro is reducing stress and has a positive impact on the mood of patients. Should we primarily look at the aspects of value or should we first look at the cost of development and maintenance of Paro [9]? In the Paro example the techno-economic view [43] and socio-techno perspective [44] become unified.

4 Summary and Looking Forward

Primary contribution of this paper is to unlock general and broader patterns regarding the impact of technology which is interpreted as IT value. Herewith this paper encompasses a response to the call and need to fundament sociomaterial theory [2] because the concept of sociomateriality is extremely theoretical and philosophical [40]. A second purpose for contribution is to close a bit of the gap in management research ignoring the impact of technology in organizational life [1]. The study is limited to IT value as a result of the interaction between technology, organization and people. The process of value creation and conditions is excluded.

The answer to the research question "*Which IT values can be identified and how are they related?"* delivers a taxonomy and framework of IT values containing eight nodal, sixteen neighbour and sixty four co-values. The sociomaterial relationship between IT values is dimensioned to time, stakeholder and hierarchy. Grounding theories of sociomateriality like Actor Network Theory are part of ongoing discussions [2]. Due to dynamics of emergence and the continuous state of becoming the concept of IT values is a spectacular and interesting sociomaterial subject for social research. IT values, their entanglement and relations are far more than a linear relationship between two or a (limited) number of variables and their causality and therefore a difficult to capture phenomenon.

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[11] We add here the word temporary before condition because this reflects the sociomaterial principle that IT values are in an ongoing state of becoming subjected to dynamics of emergence.

[12] This relational view and entanglement of IT values – based on sociomaterial principles – is important and meaningful to understand the concept of IT values in this paper. However, more investigation is needed to deepen out this relationship and to create a stronger theoretical fundament.

IT values are the result of interaction between technology, organization and people [1]. The result of this extensive study is a generalized IT value framework based on sociomaterial theory and guiding principles. This overview should be seen as a starting point for further discussing IT values and their relationships. The principles below are accompanying the general sociomaterial IT value framework (see table 1):

1. The study to explore, collect, define and categorize IT values to a general framework is the answer to the call to search for generalizations and broader patterns to support sociomaterial theory.
2. The constructed framework should be seen rather as a starting point for further discussion and research than as an end point.
3. IT values have a socio-techno or techno-economic orientation.
4. IT values are measured subjectively (perceived) or objectively.
5. IT values are classified as nodal, neighbour and co-values.
6. Due to dynamics of emergence IT values should be understood as a state of becoming (temporary condition) ontology instead of a solid state.
7. IT values exist not isolated but are entangled and maintain dynamic emergent, competitive, complementary and overlapping relationships.
8. IT values are time, stakeholder and hierarchy related.
9. IT values can be either positive or negative.
10. Net benefits are the sum of positive and negative IT values.
11. It should be considered to include biological aspects into sociomaterial theory.

In a next paper the theoretical foundations of sociomaterial IT values and their relations are applied in a digital business situation. Subjects like new IT, mobile IT, user behaviour, use patterns, security and IT values in a digital culture will be deepened. This next paper will contribute to sociomaterial theory by associating empirical evidence to this paper dealing with IT values and their dynamics and relationships.[13]

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[13] Personal reflections, findings and insights collected during the study to IT values and their relations are captured and expressed in a number of (smaller) articles and blogs on media like Slideshare, ManagementSite and Blogit: http://www.slideshare.net/ldohmen; https://www.managementsite.nl/auteurs/leon-dohmen; http://www.blogit.nl/author/leon-dohmen

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