From ensemble view to ensemble artefact – An inquiry on conceptualisations of the IT artefact

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Abstract

This paper investigates the notion of an ensemble artefact. This concept is proposed by Sein et al (2011) in their description of the Action Design Research method. This concept is based on the ensemble view of IT artefacts, which is described by Orlikowski & Iacono (2001) together with four other views. The conceptual journey from ensemble view to ensemble artefact is found problematic and is the impetus for a conceptual inquiry conducted in this paper. The conceptual investigation is supported by the use of a case illustration of an IT artefact in the social welfare sector. The different views from Orlikowski & Iacono are analysed and compared. The suggested conceptualisation of IT artefacts based on the ensemble view, made by Orlikowski & Iacono, is also analysed. Based on these analyses an alternative view is articulated: A communication tool view of IT artefacts. This view is compared with the ensemble view, especially in a design research context. The notion of ensemble artefact is contested, as is the suggested use of it as a main conceptual basis in design research.

1 Introduction

1.1 Background

The paradox of a low focus on the IT artefact[1] by information systems (IS) scholars was addressed by Orlikowski & Iacono (2001). Their article is probably one of the most cited IS papers during the 2000s. In their paper they issued a call for theorizing the IT artefact. Their paper was one key trigger to debates on the core of IS discipline. Another trigger to this debate was a paper on IS identity crisis by Benbasat & Zmud (2003). These papers and several commentary papers have been collected in an an-

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[1] I am using the British spelling "artefact" in my text. In quotes I have adhered to the original spelling; which means that "artifact" can appear in such quotes.

thology by King & Lyytinen (2006). Besides commentary papers discussing the core and boundaries of IS, there have been several responses in terms of attempts to theorize the IT artefact (e.g. Ågerfalk, 2003; Sein & Harindranath, 2004; Alter, 2006; Matook & Brown, 2008; Sjöström, 2010; Strong & Volkoff, 2010).

Orlikowski & Iacono (2001) made an analysis of articles published in the journal *Information Systems Research* over a ten-year period. They identified different conceptualisations of the IT artefact in these articles. The conceptualisations were grouped into five views and labelled in the following way: 1) Tool view, 2) proxy view, 3) ensemble view, 4) computational view, and 5) nominal view. The fifth view is actually not any clear view of the IT artefact; it is only an indication of an existence of an artefact but no specific treatment of it. As the authors write, "the articles in this group invoke technology in name only, but not in fact" (ibid, p 128). This means that the IT artefact is considered absent in these articles. The high degree of absence (approximately 25% of the ISR articles) was one ground for the quest for more focus on the IT artefact. There are several scholars who have contributed with similar studies in later publication materials such as leading journals and conferences (Ayanso et al, 2007; Akhlaghpour et al, 2009; Zhang & Scialdone, 2010; Zhang et al, 2011). Changes are reported in relation to the original distribution in the findings of Orlikowski & Iacono (2001). However, there are no unequivocal patterns among these later studies.

One recent response to the claims of Orlikowski & Iacono (2001) is the development of the Action Design Research (ADR) approach by Sein et al (2011). Their ambition is to broaden the design research (DR) approach (e.g. Hevner et al, 2004) to also cover organisational concerns, and to integrate design research and action research into a methodological whole. One ingredient to broaden DR (into ADR) is the focus on "ensemble artefacts". Sein et al (2011), with a clear reference to Orlikowski & Iacono (2001), state that the goal of ADR is the design of ensemble artefacts through research-based integration of building, intervention, and evaluation. In the introduction, the authors speak of "artefacts as ensembles" (ibid, p 38). However, throughout the whole paper the authors speak of "ensemble artefact" as being some special kind of IT artefact. A bundle of quotes from Sein et al (2011) are furnished below to illustrate this:

- "Designing ensemble artifacts involves dimensions beyond the technological, because they result from the interaction of design efforts and contextual factors throughout the design process" (ibid, p 38)

- "By ignoring the interplay between planned design and the context, they do not capture the emergent nature of the ensemble artifact" (ibid p, p. 39)

- "Since it focuses on ensemble artifacts, ADR deals with certain critical issues" (ibid, p. 40)

- "Our essay is built upon the premise that ensemble artifacts are dynamic and emerge from the contexts of both their initial design and continual redesign via organizational use" (ibid p 52)

- "ADR emphasizes the inseparability of building, intervention, and evaluation, reflecting the nature of ensemble artifacts." (ibid p 53)

In general I find their work to broaden DR and to integrate DR and action research (AR) as important and valuable. I am also sympathetic to a broad view on the IT artefact, including different aspects of its context codified as "ensembles". However, this notion of ensemble needs some critical analysis and unfolding. Orlikowski & Iacono (2001) speak of an "ensemble view of IT artefacts". In the conceptual journey to Sein et al (2011) there has been a transformation to "ensemble artefact". What is the difference between an ensemble view of artefacts and the ensemble artefact as featuring certain properties? I find this conceptual transformation a bit problematic. "Ensemble" is not used as a special view by Sein et al, but instead as a special class of IT artefacts. Sein et al (2011) speak of the special nature of ensemble artefacts, as in the; cf. quotes above. Is it so, that ensemble artefacts should be considered as a special kind of IT artefacts? As a consequence, there must exist other types of IT artefacts, which are not ensemble artefacts. What is not an ensemble artefact, i.e. what is a non-ensemble artefact? How does such an artefact appear?

1.2   Purpose, motivation, and delimitation

The purpose of this paper is to investigate the notion of ensemble artefact. It is a conceptual inquiry and, being an inquiry (Dewey, 1938), it starts from a problematic situation. This situation is the divergent uses of "ensemble" in "ensemble view of IT artefacts" and "ensemble artefact". I want to investigate this conceptual journey from the initial analysis of Orlikowski & Iacono (2001) to the modified uses of "ensemble" in the ADR approach by Sein et al (2011). This means that this paper is also an inquiry into the IT artefact and its theorizing and as such a response to the call of Orlikowski & Iacono (2001). The paper will investigate and problematize the ensemble view and the other IT artefact views presented by Orlikowski & Iacono (2001). It will contribute to theorizing the IT artefact as a consequence of this conceptual inquiry. It addresses related questions like: Should we really speak about ensemble artefacts? Does it represent an appropriate conceptualisation to further the IS discipline? How are different views of IT artefacts related? Are other views needed besides the IT artefact views already presented? I will also address the related questions: Is an ensemble view an appropriate base for IS design research? What would a more appropriate view look like?

As an inquiry into artefact conceptualisations, I investigate different ways to conceive and characterise IT artefacts. All such concepts need to be labelled, which means that terminological issues are an integrated part of this inquiry. From a semiotic standpoint, it is not possible to make a distinct separation between conceptual and terminological matters.

This is mainly a conceptual investigation, exploring and discussing different ways to conceptualise and speak of IT artefacts in scientific and other endeavours. The fundamental question of how to conceive IT artefacts still has a salient place in the IS research agenda. This discourse has not yet come to an end. The notion of an IT artefact and ways of theorizing this phenomenon are still demanding and live concerns for IS scholars. The analysis of different IT artefact views presented by Orlikowski & Iacono (2001) is well-established knowledge in the IS research community. Scholars know about the ensemble view of IT artefacts. The relation between design research and action research has been a widely debated issue for several years (cf. e.g. Cole et al, 2005; Järvinen, 2007; Iivari & Venable, 2009; Papas et al, 2012). It is expected that the launching of the ADR method in Sein et al (2011) as a merging

of DR and AR, as done in MIS Quarterly, will attract much interest from IS scholars. These facts make a conceptual investigation of the ensemble view and ensemble artefact a desirable research endeavour.

The work by Orlikowski & Iacono (2001) is preceded by earlier contributions by Orlikowski, such as her work on the duality of technology (Orlikowski, 1992). It is also followed by later works on practice theory and sociomateriality (Orlikowski, 2008). I will not review and discuss other works by her and the status of the five views in relation to earlier and later contributions, as this paper is not about persons; it is about concepts and ideas.

1.3   Research approach and structure

This is a conceptual inquiry into the notion of IT artefact, an ensemble view of the IT artefact and other such views, and the notion of ensemble artefact. Even a conceptual study dealing with abstract entities needs some empirical ground in order to avoid getting lost in abstraction. I will use a case on the development of an IT artefact in the social welfare sector for illustration. This is a longitudinal research study that has been conducted through action research and design research. The author has close experience of this IT artefact (a multi-query application) through participation both as action researcher and design researcher. The empirical purpose is not to report about the development and research processes; this has been done elsewhere (Goldkuhl, 2012; Eriksson & Goldkuhl, 2013). The purpose is to briefly describe an IT artefact as a basis for the analysis of the ensemble artefact and other related IT artefact concepts. It will be helpful for my analysis to have a case illustration to ground the abstract discussion about different properties of IT artefacts. The case will be used for illustration of different IT artefact views; see below.

The knowledge for the brief reconstructive description of this multi-query application has been obtained through participating in design meetings, conducting parts of the design myself (process modelling, legal analysis, conceptual modelling, user-interface design), and observation/review of the IT artefact and the documentation concerning the artefact and its social welfare context.

The structure of this paper is as follows: In section 2 I will investigate the ensemble view and the four other views of IT artefacts from Orlikowski & Iacono (2001). I will also investigate their suggested conceptualisation of the IT artefact, which is based on the ensemble view. The conceptual journey from ensemble view (Orlikowski & Iacono, 2001) to ensemble artefact (Sein et al, 2011) will be contested. I will also question the division and separation into different views, especially the ensemble view and the tool view. In section 3 I will present a case illustration - an IT artefact in the social welfare sector - which relates the abstract inquiry to empirical matters. In section 4, I continue the conceptual inquiry. I introduce an alternative view of IT artefacts: A communication tool view. This view is related to some of the views presented by Orlikowski & Iacono (2001). The case example of the IT artefact is used to illustrate the ensemble view and the communication tool view. These two views are discussed and compared in the context of design and design research of IT artefacts. Section 5 contains a summary of the main conclusions from the conceptual inquiry.

2 Ensemble artefact: a conceptual inquiry

2.1 An etymological starter

The conceptual inquiry will start with an etymological investigation: What are the original meanings of the central words? This is not to say that the original meanings are the true ones and those that we must return to. However, we can learn something conceptually by looking at the original meanings of the words. I will look into the words of 'ensemble', 'artefact', 'information' and 'technology'. I have used Online Etymology Dictionary (www.etymonline.com) as the source.

The meaning of ensemble is "together, at the same time", "all the parts of a thing considered together", coming from Middle French (15th century) *ensemblée* with an origin in Latin, *insimul* (from *in-* + *simul*) "at the same time". An ensemble is obviously a collection of things considered as a whole or all the parts of a thing considered together.

The meaning of artefact is "anything made by human art", from Italian *artefatto*, with its origin in Latin, constituted by *arte* "by skill" and *factum* "thing made", from *facere* "to make, do". An artefact is thus a thing, made by a human with skill.

The type of artefact that we are concerned with in this inquiry is an IT (= information technology) artefact. This means that we need to look into the words information and technology. The meaning of information is "act of informing" from the Old French *informacion*, *enformacion*. It is a noun of action stemming from *informare*. This verb, to "instruct, inform, teach", has an original in Latin, *informare* "to shape, form" (figuratively "train, instruct, educate") from *in-* "into" + *formare* "to form, shape".

The meaning of technology is more complex. "Technology" is given the meaning "science of the mechanical and industrial arts". It is a combination of the Greek words *tekhno-* + *-logia*. The Greek word *tekhne* "art, skill, craft, method, system" has a probable origin from the Proto-Indo-European root *tek-* "shape, make".

It is noteworthy that "artefact" and "techno" have similar meanings (coming from different languages) of "things made by [human] skill". In an etymological sense, "technological artefact" should be seen as a tautological concept. In modern language use, it is not tautological since technological has now a limited meaning of engineered products. The concept of artefact has, on the contrary, rather a broader meaning. This makes it meaningful to talk about a technological artefact (as a special kind of artefact). It is also noteworthy to be reminded about the verb/action origin of information. The word information is a noun coming from the verb "inform". The processual character of someone informing another should not be forgotten. Last, if we use the composite term "ensemble artefact" the appropriate meaning from an etymological standpoint would be the whole artefact or all the parts of the artefact considered together.

2.2 Different views of IT artefacts

The seminal paper by Orlikowski & Iacono (2001) - abbreviated to O&I below - presented five different views of IT artefacts: the ensemble view and four other views. Actually, the five views are compounds of more basic views (sub-views). For example, the ensemble view consists of four sub-views: "technology as development project", "technology as production network", "technology as embedded system", and "technology as structure". There has obviously been a construction in two steps; first

the basic views are coded, then they are grouped into the compound views. O&I have made a coding of ISR articles leading to these different views in the two levels. Different features of IT artefacts are combined, building the basic and compound views. The conceptual investigation of IT artefact views (the ensemble view and other views) made here will alternate between the basic and the compound views.

In the O&I paper, the results of their coding processes are presented. In a close reading of O&I there seems to be space for some complementary coding. I have gone through the O&I texts describing the sub-views and the compound views and generated short descriptions of the characteristics of each view. The complementary coding can be seen as emphasising what already is in the text of O&I, or what can be derived from it but is not made explicit by O&I in a structured way. This coding also makes possible a structured comparison between the views. The complementary coding (characteristics of each view) is presented in tables 1-4. This procedure is a way to further analyse the different IT artefact views of O&I.

A general comment on labelling is useful here. I have used the same labels for compound views as O&I. I have, however, changed the labels of the sub-views. O&I have used a standard clause for the sub-views: "technology as <characterisation>"; one example is "technology as labor substitution tool". In this case it works well. However, in other cases, this standard clause does not work well. For example, "technology as perception" is misleading since it denotes what people think of technology, not a characteristic of technology. "Technology as development project" is also misleading because this label denotes activities of development leading to an IT artefact. Instead of this type of labelling of sub-views, I have explicitly mentioned that these are views, which means that the word "view" is always used. I have also replaced "technology" with "IT artefact". To just use "technology" implies a reduction to the technical qualities of IT artefacts, which does not seem necessary. On the contrary, this is actually surprising, since O&I seem to have a research agenda to broaden IT artefact conceptions beyond the mere technical.

In table 1 the tool view and its four sub-views are presented. The tool view is described as "the common, received wisdom about what technology is and means" (Orlikowski & Iacono, 2001, p. 123). O&I seem to have a rather restricted view of the tool character of IT artefacts: "what the technology is and how it works are seen to be largely technical matters" (ibid p, p. 123). The four sub-views of the tool view are coded in table 1. I exemplify the coding procedure with the labour substitution view. This view emphasises that some labour is moved from humans to machines, which implies that the IT artefact has the capability to perform work. The IT artefact has some labour function. The replacement of human work leads to effects for humans, i.e., some contextual effects. The tool view and its four sub-views seem to emphasise the functions and uses of the IT artefacts, which leads to effects in the artefact context.

The proxy view (table 2) means the use of "surrogates" to represent some characteristics of IT artefacts. This means knowledge about IT through other means, an indirect way of characterising. The O&I sub-view "technology as perception" (relabelled to "view of IT artefacts through perceptions") is one example of this proxy cluster. "In this conceptualization, information technology is represented in terms of measures of user's perceptions of technology" (ibid p 124). O&I refer here to the well-known constructs "perceived usefulness" and "perceived ease-of-use" from the Technology Acceptance Model (Davis, 1989). This is based on scholars' interest in studying use-

perceptions of users, which implies a view on IT artefact as "something to use", as in; cf. table 2.

Table 1: Analysis of tool view of IT artefacts

IT artefact view	Characteristics
Tool view (general)	*Functions*, *capabilities*
Labour substitution view	Performing labour *functions*; *effects* in *context*
Productivity tool view	*Use* of IT generates productivity *effects*
Information processing view	Information processing *capabilities* influence information flow in *contexts* (*effects*)
Social relations tool view	Communication *functions* of IT may change communication behaviour (*effects*)

Table 2: Analysis of proxy view of IT artefacts

IT artefact view	Characteristics
Proxy view (general)	Knowledge about IT through other means
View of IT artefacts through perceptions	Something to *use*
View of IT artefact through diffusion understanding	Something *used* by different numbers of people (*effects*)
View of IT artefact as capital	Costs of IT artefacts (*effects*); IT as having economic value

The ensemble view (table 3) is a broader view of IT artefacts emphasising "the dynamic interactions between people and technology" (Orlikowski & Iacono, 2001, p 126). This includes not only use, but also construction, implementation and deployment. The two most important sub-views seem to be the embedded system view and the social structure view. In the embedded view, the IT artefact is emphasised as a contextual phenomenon, that it is "an evolving system embedded in a complex and dynamic social context" (ibid p 126). The social structure view builds on the application of structuration theory (Giddens, 1984) within IS. IT is seen to embody social structures, i.e. rules and resources including norms and signification schemes. These have been built into the artifact during its design and they will also be appropriated by the users during interaction with the artefact. Influential here is Orlikowski's own work on a structural model of technology (Orlikowski, 1992) and also adaptive structuration theory by DeSanctis & Poole (1994). The ensemble view emphasises the IT artefact as a dynamic element which is an integral part of a larger social context and that it embodies elements of this broader social context.

Table 3: Analysis of ensemble view of IT artefacts

IT artefact view	Characteristics
Ensemble view (general)	*Contextual prerequisites* for IT artefact *use*; *interaction* between people and artefact
View of IT artefact through its development	Something designed through participation of different stakeholders; what is put into the system (*content*) has social origin (*context*)
View of IT artefact in production networks	Broader socio-economic *context* of IT development with cooperation processes and market forces
View of IT artefact as embedded system	IT is embedded in a complex and dynamic *context*; the influence of the social *context* on the emergence of the IT artefact and its *use*
View of IT artefact as social structure	Embodiment of rules and resources (from *context*) into IT (*content*) through design; appropriation by users through interaction/use

The computational view (table 4) of IT artefacts has a focus on computational capabilities, leaving out its interactive use in a social context. Both sub-views emphasise the content of the IT artefact either as algorithm or model. The model view is not totally self-contained. The constructed model is considered to represent some phenomena from its surrounding context. These views represent narrow views of IT artefacts as computational machines.

Table 4: Analysis of computational view of IT artefacts

IT artefact view	Characteristics
Computational view (general)	*Capabilities* to store, manipulate, retrieve, and transmit information
View of IT artefacts as algorithm	The computation of the IT artefact (*content*)
View of IT artefact as model	Computational *capability*, especially a representational model (*content*) of some phenomena in the *context*

The nominal view is the view of absent technology, so here there is nothing to characterise. During the coding process several codes emerge as distinct labels describing topical aspects. These emergent codes are:

- Content = what the IT artefact is constituted by

- Capabilities = what the IT artefact can do

- Function = what the IT artefact can do in relation to the environment

- Use = what the IT artefact is utilised for by users/environment

- Context = the environments of the IT artefact

- Effect = consequence in the context of the IT artefact

- Interaction = how the IT artefact interacts with actors in contexts

A brief explanation of how these concepts are related to each other is useful here. Artefact capability is part of artefact content. It is an active part since it denotes what the artefact can do. Capability is stated without explicit reference to actors and their uses, such as the capability to transmit messages. A function is an artefact capability, but it is stated with clear reference to the user environment. A typical function is the exposure of requested information to a user group. When talking about artefact use (by users), this implies the utilisation of artefact functions. Artefact use consists of both user actions and the executions of artefact functions. Typically a human-computer interaction situation consists of exposure of artefact potential functionality (on the user-interface), a user manipulative action followed by execution of artefact functions (both internal and/or on the user-interface); cf. Ågerfalk (2003), Sjöström & Ågerfalk (2004), and Goldkuhl (2008; 2009). Context is the environment of the arte-fact including users and sociomaterial settings. Effects are designated as consequenc-es (intended as well as unintended) that arise in the artefact context. Interaction de-notes the interplay between human actors and the artefact (during both design and use) and consequential changes of this interplay.

When comparing the different views, using the tables shown above, a clearer pat-tern emerges (table 5). The tool view emphasises the artefact's functions and its uses. The ensemble view emphasises the content in relation to its context and the interac-tive character of artefact and actors/context. The computational view is focused on capabilities and content. The proxy view, being a compound of rather diversified sub-views, seems to focus on use and effects. These different views also imply differences in views of actors (table 5). The tool view emphasises the human actor as the (tool) user. The proxy view is more diversified. The orientation is on actors as being influ-enced by IT (*up-takers*) and that (potential) users hold beliefs about artefacts (*per-ceivers*). The ensemble view transcends a restricted recipient view to a more active view. The human actors are seen as those influencing artefacts. The shaping of arte-facts is done, not only through intentional design, but also through appropriation use. Human actors are, in the ensemble view, seen as interacting with artefacts through different active efforts. In the computational view, the emphasis is not on the use of IT, but rather on humans as technical constructors of the artefacts.

Table 5: Comparison of different views of IT artefacts

IT artefact view	Main focus	Actor view
Tool view	Function, use, context, effects	User (influenced by IT)
Proxy view	Use, effects	Perceiver, up-taker (influenced by IT)
Ensemble view	Context, content, interaction	Influencer, interactor
Computational view	Capability, content	Constructor of IT

Following the etymological inventory above (section 2.1) the term ensemble appears a bit problematic. As I understand the O&I use of this concept, it denotes a bundle of different parts and aspects of the IT artefact, especially bringing "material" and "cultural" properties together. Ensemble should thus be seen as an *inclusive* concept in their use. However, there is a logical difference between taking *many* things together (an inclusive concept) and taking *all* things together (a holistic concept). Seeing "ensemble" as holistic, following the etymological comment from section 2.1 above, meaning "taking all things together" - would not be consistent with proposing the ensemble view as one view contrasted to other views. As I understand O&I, they want to distinguish different views which emphasise different characteristics of IT artefacts. My interpretation is that O&I propose the ensemble view as an inclusive concept, however not as a holistic a concept.

2.3 Ensemble characteristics of IT artefacts

One key message of O&I is that we, as IS scholars, should put more emphasis on theorizing the IT artefact. The conclusions from their investigation are that IT artefacts, in the majority of the selected journal articles, "are either absent, black-boxed, abstracted from social life or reduced to surrogate measures" (Orlikowski & Iacono, 2001, p 130). They demand that we "engage more seriously and more explicitly with the material and cultural presence of the IT artifacts that constitute the 'IT' in our research" (ibid). They are not only critiquing current research, but they also start bringing more conceptualisation to the IT artefact. Based on their analysis of different IT views, O&I present five important characteristics of IT artefacts:

1. IT artefacts are not natural, neutral, universal, or given. This means that these artefacts are *socially created*; they "are shaped by the interests, values, and assumptions of a wide variety of communities of developers, investors, users, etc." (Orlikowski & Iacono, 2001, p 131).

2. IT artefacts are *embedded* in some time, place, discourse, and community, making it inappropriate for researchers to ignore their *social contexts*.

3. IT artefacts are made up of "often fragile and fragmentary components" (ibid). This means that artefacts are not always working in integrating, seamless, and flawless ways. We cannot expect full congruence within artefacts as they *consist of different parts*.

4. IT artefacts are not fixed or independent: they *emerge* from ongoing *social practices*.

5. IT artefacts are not static and unchanging: they are *dynamic* and change over time.

It is important to note the origin of these stated characteristics in relation to the five formulated conceptualisations of IT artefacts by O&I. Markus (2007) has noted: "What Orlikowski and Iacono (2001) neglected to point out is that those five premises are accepted cornerstones of the ensemble view". A further comment by Markus (2007) is that "those premises might not, however, be appropriate for other views, such as the tool view".

I offer here some comments on these five characteristics. In three of the five characterisations, O&I start by stating what IT artefacts are not, as a kind of negative characterisation. I also wonder how specific these characteristics are for IT artefacts. Could they not also apply to several other technical artefacts? Is it not important to state salient and distinguishing features of IT artefacts in relation to other technical artefacts? Where is the 'I' (i.e. the information) in their conceptualisation of the IT artefact? It seems to be a focus on the contextual and the mere technical aspects in their ensemble conceptualisation. We should not forget that IT artefacts are means for informing. They are not only technological artefacts. They are information artefacts!

2.4   From ensemble view to ensemble artefact?

The ensemble view is constituted by the different sub-views. The social structure sub-view emphasises that the IT artefact consists of elements (like norms and signification schemes) originating from its social context. These elements are inscribed mainly through the design process but also appropriated through the implementation and use processes. This means that the IT artefact can be conceived as a contextual carrier – an IT artefact that carries elements of its social context. The embedded sub-view emphasises that the IT artefact is embedded in social contexts.

The ensemble view seems to be constituted by these two important contextual aspects of IT artefacts: They are integral parts of social contexts (*embeddedness*) and they also hold inscriptions of parts of these social contexts (*contextual carriers*). Sein et al (2011), when declaring their adherence to the ensemble view, explicitly refer to the technology as structure view: "structures of the organizational domain are inscribed into the artifact during its development and use" (ibid p 38). In addition to these two contextual aspects within the ensemble view, we should add the aspect of a *continual evolution* of IT artefacts. O&I state in both premises 4 and 5 (Orlikowski and Iacono p 131 and section 2.3 above) that they are dynamic and continually changing artefacts. Sein et al (2011) also emphasise this dynamic nature: "ensemble artifacts are dynamic and emerge from the contexts of both their initial design and continual redesign via organizational use" (ibid p 52).

As described in section 1.1 above the ensemble view has made a conceptual (and terminological) journey into the ensemble artefact in Sein et al (2011). Do there exist any IT artefacts that do not have "ensemble qualities"? Are there any used IT artefacts that are not contextually embedded? What is a non-embedded IT artefact? Are there any IT artefacts that are not contextual carriers? What would an IT artefact contain if it did not contain anything from its social context? It is hard to imagine what a non-ensemble artefact would be. If we cannot find anything that distinguishes a class of objects from its opposite class, then this class seems meaningless. I will continue this discussion on the ensemble artefact notion (in section 4.1 and 4.4) after introducing a case example of an IT artefact (section 3).

2.5   Beyond the ensemble view?

The O&I paper has several purposes. One purpose, but not the only one, is to disclose and package different views of IT artefacts and thus demonstrate the absence of IT in much IS research. Another important purpose seems to be to further the ensemble view of IT artefacts. One salient basis for the formulation of the ensemble view is the work of Orlikowski (1992), but there are also other influences, such as DeSanctis & Poole (1994), and Kling & Scacchi (1982). Although O&I state that there must be

room for many conceptions of the IT artefact dependent on research purpose (cf. also Orlikowski & Iacono, 2006), the arguments clearly favour the ensemble view.

In order to develop IT artefact conceptualisations, it might be an unnecessary restriction to adhere to the different views presented in O&I. These views are inductively generated from the reading of journal papers and then grouped together. The ensemble view, the tool view and the computational view were important conceptualisations at one time for clarifying different prevalent views. It has been valuable for the discourse on the IS core and other related issues. I am, however, very doubtful that these views should be construed as packages that direct and limit further theorizing on IT artefacts. To simply take these views for granted, as is done by, e.g., Ayonso et al (2007), would not seem to further our understanding. We must remember that these views are based on a time and journal dependent sample of IS articles, and this sample may not cover all relevant views of IT artefacts. Conceptualisations that have occurred after O&I are not covered and they might not fit into the different views and sub-views of O&I.

Markus (2007) has developed a technology shaping view based on the work of O&I. This is a kind of tool view emphasising features of artefacts that shape their uses. This technology shaping view is partially based on the ensemble view. It can be considered to be a tool view integrated with elements of the ensemble view. Below, I will trace a path that is parallel to this kind of view integration, (section 4.2) This is done from a critical concern of mine: What do we lose when we distinguish the tool view and the ensemble view from each other as distinct and separate views? The ensemble view seems to have had a clarifying function when first formulated, but it might turn into a blinder if other aspects and properties of IT artefacts are disregarded on unclear grounds.

3   An empirical illustration: A social welfare IT artefact

This case study is from a project on IT development in the social welfare sector aiming for improvements in handling requests for social welfare allowances. The responsibility for social welfare allowances resides with the welfare boards of municipalities. It is necessary for municipal welfare officers to check clients' (applicants') total financial situation, including other allowances and benefits. Social welfare officers (i.e., case handlers) need to contact different national agencies and inquire if other allowances are being given to the client. Such contacts have been very cumbersome and time-consuming for the social welfare officers.

The main reason for starting the development project was a new regulation that gives the municipalities better ways of obtaining information about clients. The transfer of client information within the public sector is severely restricted due to data protection regulations. A new statute made it easier for municipalities to electronically obtain information about clients' financial situation (benefits and allowances). Information can now, on demand, be transferred electronically and immediately from national agencies to the social welfare offices at the municipalities.

Several municipalities participated in the project in order to develop joint IT solutions. Besides the municipalities, two national agencies participated in the IT development: the Social Insurance Agency (SIA) and the Board for Study Support (BSS). A multi-query application for the participating municipalities was developed and launched. Queries concerning clients can be made by social welfare officers through

the multi-query application and answers concerning benefits are obtained immediately and exposed to the officers (figure 1). This communication was earlier mainly conducted through telephone calls. Some municipalities have used a slow batch query application.

Social welfare officers use some social welfare legacy system for case handling. Different welfare-related enterprise systems were used by different municipalities. Several of these systems were rather old and the vendors hesitated to develop the systems further with new functionality for data transfer with the national agencies. The social welfare boards of the municipalities that participated in this joint IT development could not wait for the slow vendor development processes. They wanted to exploit the new legal possibilities as soon as possible. The municipalities decided to participate in a joint development of the multi-query application. This software application could be used separately without any integration with the legacy systems.
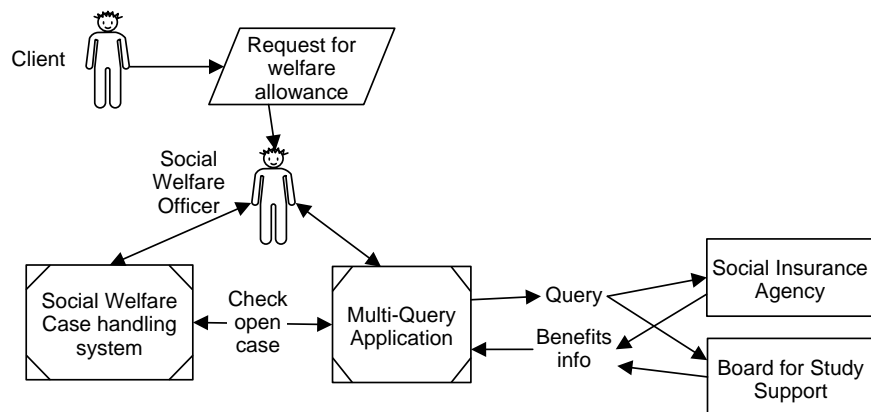

Figure 1: The multi-query application and the social welfare context

The multi-query application is a fairly small IT artefact. It consists of an input form on which case handlers register client identification (household members). Since these systems handle protected personal information, there are several statutes that regulate the way this is done. A case handler can only state a query if there is an open social welfare case (i.e. if an application for social allowance has been submitted). The legal rules for this information transfer are exposed to the social welfare officer when running the system. It is even possible, in the system, to open a screen window and read the exact legal texts. This follows a design principle of "legal transparency" within the system.

The multi-query application sends queries in XML formats to the two national agencies. Answers containing information about benefits and allowances are received from the national agencies in a system-to-system communication. The received XML-files are decoded by the multi-query application and information about the clients is exposed to the social welfare officer in a structured way in screen documents. The XML transfer follows directly what is expressed as permitted to transfer in the new statute. The XML schemas correspond directly to the "information specification" that appears in the statute. There is no storage of information in this multi-query application (partly due to data protection regulations).

The Data Inspection Board is a public agency working with surveillance concerning compliance with data protection regulations. This agency made an investigation of the multi-query application after it had been launched. It is stated in the regulations that there must be an open welfare case and that there should be "technical obstacles" to state queries concerning other persons. In the original IT solution, the social welfare officers needed to enter the ID of the social welfare case when registering clients in the multi-query application. The Data Inspection Board did, however, not consider this sufficiently secure and demanded better technical obstacles. A new solution was designed. The multi-query application was furnished with new functionality. After this change, it could check that there was an open welfare case through reading the database of the social welfare case system. Only after this check was it possible to send a query to the national agencies.

4 From ensemble view to communication tool view

4.1 The ensemble view in light of the empirical example

Does the small IT artefact described above (section 3) have any ensemble properties? The multi-query application is an integrated part of the social welfare officers' workpractice. The case handling needs to include control of the financial situation of the client. The case handler uses the artefact to quickly receive a verified overview of the client's financial situation. The multi-query application is *embedded in the social context* of assessing applications for social welfare allowances.

Can the multi-query application be considered a contextual carrier? Case handling in the social welfare sector is highly regulated. Different legal statutes regulate investigations and decisions on social welfare allowances. The new statute was the trigger to develop the multi-query application. It is not only external (as a trigger) to the IT artefact. Parts of the statute have been *inscribed* into the system. The XML files follow exactly the specified information items of the statute. Regulations for stating queries (e.g., the need for an open case) are also transformed into rules and behaviour of the artefact. The multi-query application *carries information* about the clients. The clients are the most important objects of this workpractice. Without any clients with social and financial problems there would not be any workpractice of this kind at all. It is obvious that the system carries both *norms* and *signification schemes* as elements of itself.

The IT artefact has not been static. There was a stepwise implementation. The system has been furnished with new functionality (more security obstacles for sending queries). New functionalities are expected for the system in the future. More national agencies will be connected. This means additions in the XML transfer and user-interface. The multi-query application is *continually evolving*, which is in accordance with the ensemble view.

4.2 A communication tool view

One of the main ideas behind O&I seems to be to avoid a restricted technical view of IT artefact. They articulate several arguments in favour of an ensemble view. One way to see this is to say that they object to a view of IT artefacts as technical systems with social consequences. This was also a starting point for Goldkuhl & Lyytinen

(1982) when articulating the language action view of information systems[2]. They argue for a reversal of the prevalent view of IS as "technical systems with social implications" to "social systems only technically implemented" (ibid p 14). They mean that information systems, at the same time, are both social and technical. IS is defined as "formal linguistic systems for communication between people which support their actions" (ibid). In this view the linguistic character and the communicative intents built into information systems are emphasised. Different users interact, communicatively, through the use of IS. In this view the system contains a formalised professional language (ibid). Today we could call this a structured workpractice language. This means that parts of the context (different linguistic elements) are implemented in the system. The system carries parts (representations) of the workpractice context.

When taking a communication perspective it becomes obvious that the system must hold parts of the context. The symbolising character of signs means that we say something about something (Bühler, 1932). It is a special case when we use language in a statement to say something about the statement itself (the case of self-reference). Usually, we use language to state something about something other than the communication taking place. The language action view (cf. also, e.g., Winograd & Flores, 1986) emphasises the action character of linguistic statements. When communicating, directly or through communication media (like IT artefacts), people are not only conveying information as in the symbolising function of language. They are also doing something in relation other actors. Communicating has expressive, regulative and other functions as well (Bühler, 1932; Wittgenstein, 1958; Searle, 1969; Habermas, 1984). The implications of this are that an IT artefact, explicitly or implicitly, *carries interactor relationships* as a consequence of transmitting and transforming messages between different users.

A linguistic/semiotic conceptualisation of IT artefacts has other important implications. It is not only the case of users communicating to users through system. Different features of an IT artefact can be seen as communication from designer to user (Andersen, 2001; De Souza, 2005).

An IT artefact conceptualisation based on these language action views (of Goldkuhl & Lyytinen, 1982; Winograd & Flores, 1986) has been articulated in the IS actability theory (cf. e.g. Ågerfalk, 2003; Goldkuhl 2008; 2009; Sjöström & Goldkuhl, 2004; Sjöström, 2010). In addition to language action principles, this theory has been built on how the artefact appears to the user, i.e., through the user-interface. It has a concrete orientation to different features of user-interfaces in relation users' understanding and action. In such a concrete orientation it has not only been used for an abstract conceptualisation of IT artefacts, but also as a design theory informing the design of IT artefacts, cf. Ågerfalk (2003) and Sjöström (2010).

One important concept in the IS actability theory is *pragmatic duality* (Sjöström & Goldkuhl, 2004; Goldkuhl, 2009). This concept pinpoints that in a user-artefact interaction situation, the user interacts, when conducting some action, with both the info-technical artefact and with other human actors. This interaction, with other humans, occurs through reading messages originating from other humans or entering messages into the system that have other humans as a possible destination. The notion

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[2] I use the term 'information system' here with the same meaning as the more modern term 'IT artefact'. The authors (Goldkuhl & Lyytinen, 1982) have obviously the same denotation when using 'information system'.

of pragmatic duality emphasises the entangled social and technical character of IT artefact usage.

The concrete action orientation of the actability view implies theorising of IT artefact features. A primary construct for explaining IT artefact features is the affordance concept (Gibson, 1979). Affordance is a concept from ecological perception theory. It denotes what action possibilities an environment affords to a being (human or animal). A being perceives thus its environment mainly in terms of what action possibilities it affords. Affordances are features of the environment, but they are also relational properties. They are properties in relation to an observer/actor[3]. Gibson explains that affordances (e.g. a floor that is walk-on-able) are dependent on physical properties (e.g. the floor being horizontal, flat, extended and rigid). In IS actability theory, different kinds of affordances of IT artefacts have been theorized (Goldkuhl, 2008): For example, communicative affordances (possibilities for communication), information affordances (conveying information as basis for actions within or outside the IT artefact), navigation affordances (how to navigate and search in the IT artefact).

Affordance is a notion that has been recognised and used within human-computer interaction (Norman, 1988), but also in IS theorizing. Markus (2007) has used affordance as a concept when clarifying tool properties of IT artefacts. Compare also Markus & Silver (2008), where functional affordance is defined as "the possibilities for goal-oriented action afforded to specified user groups by technical objects" (ibid p 622).

The language action and actability view takes the communication of IT artefacts seriously. It is a social and contextual view, and hence it has similarities with the ensemble view. However, it fits well with a tool view since it emphasises the IT artefact as a communication tool. There are similarities with the social relations tool subview, since communication is emphasised in this view. Information processing is seen as instrumental in relation to communication purposes. The different functions of information processing, such as transmitting, storing and retrieving, are thus sub-parts of this communication tool view. The computational view can in turn be seen as part of the information processing sub-view. These relations are depicted in figure 2.

How does the communication tool view relate to the ensemble view? The ensemble view has been presented as a social view with a broad scope. Is the ensemble view a broader view that includes the view of the IT artefact as a communication tool? We need to look closer at the three main aspects of the ensemble view (section 2.4 above): the IT artefact 1) as contextually embedded, 2) as a contextual carrier and 3) as continually evolving. The IT artefact contains messages (texts) that are exchanged between senders and receivers. A communication situation must always include speakers and listeners, writers and readers. A text is always embedded in authorship and potential readership. Embeddedness is thus a necessary characteristic of a communication tool. So is also the feature of the artefact being a contextual carrier. Communication is about something in the context. The text contains representations of topics in the communication context. The artefact contains rules that regulate the

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[3] The affordances are in the external objects – but they are relational properties, i.e. they exist only in relation to an observer/actor. "These positive and negative affordances are properties of things taken with reference to an observer but not properties of the experiences of the observer" (Gibson, 1979, p 137).

communication; what is possible to say through the communication artefact. One of the most important parts of the IT artefact as a communication tool is that it contains information. The contained information will change over time due to the on-going communication; new messages will be added by users and the system will create and change messages due to processing rules. An IT artefact usually has a limited communication width, which implies that it might not be possible to fulfil certain communication needs in use. Users might try to find ways, through appropriation, to express their communication needs. A continually evolving IT artefact is axiomatic in a communication tool view. The conclusion is that the three ensemble characteristics should also be seen as characteristics within a communication tool view. In the ensemble view there seems to be a dismissal of tool properties; cf., e.g., the criticism in Markus (2007) and the articulation of functional affordances as important elements of IT artefacts (Markus & Silver, 2008). My claim here is that this dismissal of tool properties from the ensemble view makes it narrower in scope than the communication tool view. The illustration of the relationship between the communication tool view and the ensemble view can be found in figure 3.
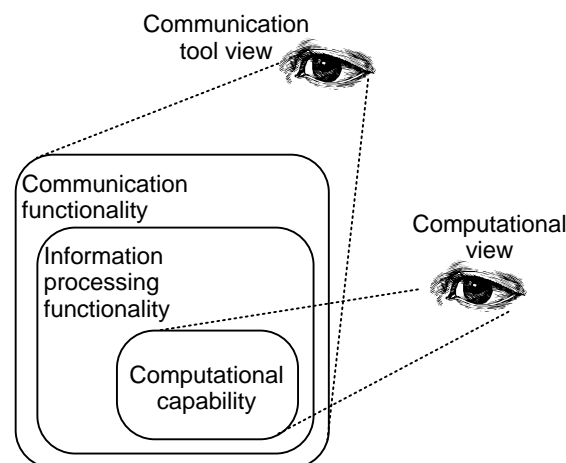

Figure 2: The communication tool view and its relations to information processing and computational views

A communication tool view on IT artefacts is here claimed to be an appropriate view that encompasses social, technical and pragmatic aspects of such artefacts. A more complete articulation of this view can be found in several of the references mentioned above, e.g., Goldkuhl & Lyytinen (1982), Ågerfalk (2003), Goldkuhl (2009) and Sjöström (2010), which also include reviews of communication literature from reference disciplines. My claim here is not that this view is the "best one" in all possible aspects or that this view is appropriate for all types of IT artefacts. Which view to adopt depends of course on purposes at hand.
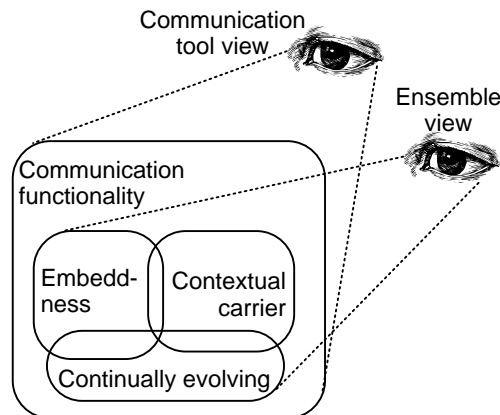
Figure 3: The communication tool view and the ensemble view

4.3   The communication tool view in light of the empirical example

The multi-query application should be seen as a communication tool between munici-palities (social welfare officers) and national agencies (case handlers and decision boards). It is a system where social welfare officers can express their queries concern-ing the financial situation of clients and direct these queries to national agencies. This IT artefact can receive answers from national agencies and expose this complex in-formation in a structured way to the social welfare officers. The main communicative acts of the multi-query application are 1) the query (an expression of knowledge needs based on role assignments of social welfare officers to monitor applications for social welfare allowances) and 2) the answer (a response where the national agencies inform and verify the existence of certain allowances and benefits concerning the client). It is thus a communication system containing a formal dialogue that consists of an initiative and a response (Linell, 1998). The multi-query application contains also conditions for sending queries; there must be an authorized case handler and there must be an open social welfare case.

We can look at the IT artefact as a communication tool from the perspective of Habermas' communicative action theory. Habermas (1979, 1984) states that commu-nication should apply to general validity claims: the communication should be sin-cere, true, normatively right and comprehensive. These validity claims can be applied to the communication that takes place through the multi-query application: The query should be an expression of a genuine knowledge need by the social welfare officer (following the sincerity claim). The transferred financial information from the nation-al agencies should correctly describe the actions of the clients and decisions made by the agencies (following the truth claim). The arranged communication should be compliant with legal statutes (making it normatively right). The financial information about the client should be presented in an intelligible way to the social welfare officer (following the claim for comprehensibility). These different validity claims served as theory-informing the actual design of the multi-query application in the referred pro-ject. In the design situation, we explicitly investigated what would constitute a) a valid query and b) a valid answer.

4.4 Ensembles, communication tools and design

The ensemble artefact notion appears in a design research context in Sein et al (2011). They claim that the object of design, following ADR, is an ensemble artefact. I have contested the very notion of ensemble artefact. The ensemble characteristics are not discernible for a specific class of IT artefacts. These are properties that we expect to find when studying IT artefacts in general. I do not presume that the purpose of O&I was to demarcate a certain class of IT artefacts that should be seen and labelled as ensemble artefacts.

A more meaningful way to marry design and the ensemble view would be to talk about *the design of ensemble characteristics of IT artefacts*. This means that ADR should be seen as an approach with a specific orientation of designing the ensemble features of IT artefacts, i.e., how they are embedded in social contexts, how they are contextual carriers and how they can evolve due to emergent user needs. Such an interpretation is possible, but the question then arises: Is a focused ensemble view the most appropriate conceptual basis for designing IT artefacts? I do think that the foundational work by O&I and the application of this conceptual basis within a design context in Sein et al (2011) are important contributions. However, one important question remains: Are there any properties outside the ensemble conceptualisation that are important when designing IT artefacts?

The tool view has an emphasis on functional properties and a useful utilisation of the IT artefact. Utility is axiomatic in a design research approach. Hevner et al (2004) state that the two fundamental questions for design science research are "What utility does the new artifact provide?" and "What demonstrates that utility?" (ibid p 91). A tool view seems to be evident to apply in design and design research of IT artefacts. A purposeful design of an IT artefact strives for utility.

A focus on ensemble characteristics and a concomitant dismissal of tool properties would not be appropriate in a design research approach. Does the ensemble articulation of Sein et al (2011) imply that elements of other views (e.g., tool properties) should be disregarded? This might actually be one possible interpretation, given their strong emphasis on "the ensemble artefact". There is no elaboration of tool properties made by Sein et al in their method description. It should, however, be noted that they acknowledge utility for end-users as a contribution of the artefact.

When reading the ADR article (Sein et al, 2011) a discrepancy is identified between their abstract method description and the case illustration. The authors use a case of competence management from Volvo IT as an illustration of ADR (Lindgren et al, 2004). This is a reconstructive case, which means that ADR was not applied in this DR and AR case. The design research method was not developed at that time. The case is used to illustrate the principles of ADR. When reading this case an implicit tool and functionality perspective comes through. The authors also discuss different information and communication design solutions. I find it actually harder to discern the ensemble properties of the developed artefact when studying the case. A recommendation from an outsider (this author) is that it is really important that potential ADR users do not only read the abstract method description of ADR but also the case illustration, in which tool functionality and utility of IT artefacts are recognised in a stronger way.

How come there is a discrepancy between the abstract method description (with an ensemble orientation) and the case illustration (with a tool orientation)? I could suggest as a possible explanation that this discrepancy follows the distinction between

espoused theory and theory-in-use (from Argyris & Schön, 1996). People often follow certain tacitly and taken for granted tactics (theory-in-use), which might deviate from what they claim that they do (espoused theory). Communication and tool properties of IT artefacts are simply taken for granted. Markus (2007) states that the "tool view has always been so deeply engrained in the IS worldview". However, there is a danger in relegating it to the tacit sphere. To omit it from method descriptions of design research methods would at worst deceive scholars into ignoring tool properties of IT artefacts. When we start asking (e.g., in design) what a particular artefact is to be used for, we are applying a tool view. I would not advise any IS design researcher to avoid asking such a question. A tool view seems to be indispensable in IS design research.

I propose an alternative approach to that taken by Sein et al, that design research for IT artefacts should foreground these artefacts' function as communication tools. A good example of this is Sjöström (2010). An explicitly stated communication tool orientation (founded in IS actability) has guided his design research of IT artefacts (ibid). It is also interesting to note that Sjöström (2010) acknowledges a close affinity between the actability view and the ensemble view: "This [ensemble] view clearly resonates with the actability view of the IT artefact" (ibid p 181); cf. also ibid p 225. From an emphasised communication perspective, it also follows that the design (research) process should also be considered a kind of communication process (Weigand, 2010).

5 Conclusions

Orlikowski & Iacono (2001) have contributed with an important investigation of different views of IT artefacts. Their claim for more emphasis on theorising the IT artefact has been welcomed by many IS scholars. Their articulation of the ensemble view, based on earlier work by Orlikowski (1992) as well as other scholars, is rightfully appreciated by many. When looking back on their 2001 paper and pointing to the future, there are, however, issues that need further consideration. Through a conceptual inquiry, empirically based on a case study, this paper has contributed by discerning some important issues for future theorising of the IT artefact.

Sein et al (2011) have made an important contribution to broadening design research to cover aspects beyond the narrow design of an artefact. Their method ADR is an interesting and valuable attempt to integrate design research and action research. It is expected that a debate will follow concerning their way of integrating DR and AR. Pivotal in their method is the notion of ensemble artefact (cf. the quotes in section 1.1, above). This notion is derived from O&I and their ensemble view. This paper has examined this conceptual journey from ensemble view of IT artefacts to ensemble artefact. The ADR originators have made a commendable claim to take a broad contextualised view of the artefact to be designed. However, the concept of the ensemble artefact seems to be deeply problematic. The conceptual inquiry conducted here has contested the notion of ensemble artefact as such, and also the use of it as a main conceptual basis in IS design research.

The main conclusions from this conceptual inquiry are summarised below:

- Ensemble view is a problematic label since in addition to 1) the O&I defined view of emphasising some specific properties of the IT artefact (its social context character), it might also 2) denote all aspects of IT artefacts taken together (a holistic view).

- The ensemble view leaves out important tool aspects of IT artefacts, especially its communicative functionality.

- A separation of different views of IT artefacts may limit further theorising of the IT artefact by missing important potentials of integration and synergy.

- Further theorising should follow lines of integration of ensemble and tool views.

- It is inadequate to talk about ensemble artefacts as a special type of IT artefact. Most IT artefacts are contextually embedded, contextual carriers and continually evolving.

- An ensemble approach in design research is too restricted. A communication tool functionality emphasising utility is indispensable in IS design research.

This paper contains many possible threads for future research. Some of them should be mentioned: The articulation of IT artefact views and conceptualisations can use the analysis from this paper as a foundation. The recommendation here is not to simply take the O&I views for granted. Nor should we assume that the ensemble view as described by O&I should be seen as *the* superior view. Further comparison of IT artefact views is definitely needed. Such investigations should also include theorising properties of such views. Concerning design research, we need to investigate how the IT artefact is conceptualised as a basis for design, prescription and theorising. A pending question is: How are different IT artefact views related to artefact utility?

Acknowledgements

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