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Abstract

In this paper we present a preliminary model for the characterization of ICT services in a beyond 2020 perspective based on the particular properties ICT has as design material. The paper aims at unifying traditions from service research and service encounter research with the research traditions from Human Computer Interaction (HCI), interaction design, and user experience research. We suggest that the ICT in ICT-based service encounter no longer should be seen as neutral or transparent tool, as in existing literature, but as an independent element that essentially transform the service encounter. This is important for the design of future automated and intelligent ICT-based services.

1. Introduction

The potential in introducing ICT in service encounters or replace physical service encounters with a ICT service is attractive to many service providers, as well as service users. The transformation of a face-to-face service encounter to an ICT-based service encounter is however far from trivial. Thus it is not untypical that customers complain about a decline of service quality, particularly in the case of service failure. It is obviously difficult to discuss with a computer interface in case the service is rendered different than expected. While much of the research in this field focus on particular cases, or see the problem as a matter of lack good usability, system- or interaction design, the aim of this paper is to present a more general model of the potential problems in ICT-based service encounters.

Our assumption is that the shift from face-to-face based service encounters to ICT-based service encounters not just is a question of good usability or user experience design – a view that see design as a nice cover applied on an existing product (cf. [8]) – but that the ICT radically changes the service encounter. It does thus not make sense to use the face-to-face service encounter as design ideal for the ICT-based service encounter. We do not see the face-to-face encounter as superior to the ICT-based encounter, but instead we aim to characterize the ICT-based service encounter in a way that let its' particular qualities stand out.

To do so, we – like in [16] - base our research on two fields that, despite they address the same problem, seldom are linked together. The one field is service design and service encounter research. The other field is comprised of Information Systems (IS), Human Computer Interaction (HCI), and interaction design (as design discipline). The purpose of this dual approach to the question is not only to examine whether the two fields can inspire each other, but also to draw on both fields to characterize ICT-based service encounters.

What can be termed a service encounter has been subject of much debate [16]. In this paper we apply a broad definition that encompasses all kinds of B2C service encounters, short and ad-hoc as well as long and complicated. We include also both face-to-face service encounters, pure ICT-based service encounters as well as any combination of face-to-face and ICT based service encounters. Less focus has however the role of ICT as pure communication tool, e.g. the use of a phone in the service encounter, since we focus at the intelligent information processing as one of the particular but still under-utilized properties of ICT. We include also citizen's interaction with public authorities both face-to-face, and via ICT such as web-based self-service tax registration as used e.g. in Denmark (www.skat.dk). When we in the following talk about 'customers' we include thus also service encounters with public authorities, as well as non-commercial service encounters.

2. Service encounters in the literature

The research of ICT service encounters has traditionally taken place in separated research areas, with each their focus. The service encounter research tradition (e.g.: [13]; [3]) typically approaches ICT-services as a continuation and extension of face-to-face

services and see ICT as foreign element infused into services. The term 'self-service technologies' as used in [11] as well as the title of another research paper "Technology Infusion in Service Encounters" [1] indicate a historically informed view where ICT is seen as an technological enhancement of, and a tool for, the a service encounter that has the physical meeting as reference. ICT is a foreign element being added to the service encounter. The same view is embedded in the term "E-services" [6]. On the other hand, the research of human computer interaction (HCI), including its newer and more design- and experience oriented branches 'Interaction Design' and 'User Experience Design' (UX) [17], typically just see the service encounter as a particular case of the general field human computer interaction.

The aim of this paper is to examine whether the nature of ICT service can be better understood when these two research traditions are combined. Where the work in this field mainly has been empirical (cf.: [7]), this paper contributes to the conceptual development of the understanding of ICT services and their relation to real-life service encounters.

1.1. Three types of service encounters

As discussed by [19], not all services are suitable for the transformation to become ICT-based. The authors thus discern between "Irriducible-", "Hybrid-" and "Automated services" [19:107]. Zysman et al.'s definition of 'irreducible services' has many similarities with one of the traditional definitions of services, namely that they created simultaneous with their consumption, and thus unlike physical goods and products, cannot be stored and sold on an anonymous market, cf. [16]. Another, in this case more productive characteristics is that irreducible services "[r]ely on humans to deliver the services" [19:107], typically since the human judgment being applied in the delivery of the service is central. Zysman et al. mention as examples the services offered by hairdressers, judges, psychologists, and priests. Exactly this element of human judgment is seen as the limit of the transformation of services to ICT-based services [19: 109].

In the other end of the continuum, Zysman et al. define 'automated services' as services – relying on ICT - that have been codified and digitized. In [19] no further characteristics are provided, but a number of examples ranging from bank ATMs, internet travel agencies or "electronic systems for collecting road and bridge tolls" [19:107]. The problem with these examples is that the amount and complexity of user interaction is very different in the three examples. Some use cases, such as detecting the presence of a vehicle at a toll road, requires far less user interaction and decisions than planning a trip by air with the help of an Internet travel agency. In this respect, the term 'automated' deserves further elaboration before too optimistic conclusions are drawn on the potential of automated systems. The vantage point of [19] is arguably service provider oriented, since the particularities in the user interaction is not captured in their term 'automated services'.

Finally, Zysman et al.'s category in between 'irreducible services' and 'automated services', is 'hybrid services'. These "combine human and machine-based capabilities, either harnessing technology to improve and leverage the abilities of people or depending on human talents to argument, deliver, customize, personalize or otherwise add value to automated processes" [19:108]. One could add the need of human help in case of service failure – or usability problems – of automated systems. The hybrid systems are here presented as tools for professional service providers in their rendering of a service to a customer. In [19] the personal judgment exercised by the service professionals in particular – irregular – situations is stressed as an important element.

The hybrid systems, which also are the focal point of this paper, are seen by [19] as very interesting field since a "*growing fraction of the most valuable and popular services (...) now [are] hybrids*" [19:108]. Again, the very broad category would benefit from a deeper analysis of the interplay between the human service render, the customer and the ICT. This interplay becomes increasingly important to understand as many customer journeys consist of both human and ICT-based touch points / service encounters, cf. [2].

3. A new model for the ICT-based service encounter

As discussed above, existing concepts of ICT in the service encounter and of the ICT-based service encounters, take their part of departure in human (face-to-face) service encounter. This is reflected in terms like "technology infusion", "e-services" and "e-commerce". We argue that this historically based view overlooks the new situation for service encounters that ICT - through its embedded properties as design material - imposes on the design of the service encounter. This has implications both for the utilization of the innovative potential in ICT as well for users' perception of quality in the service encounter.

The view on ICT as inserted into the service encounter could easily lead to a lack of attention to the transforming potential that ICT has for services, cf.: [19]. If ICT is seen as an independent element in the service encounter, and in the design of the service, it is possible to analyze the mutual interactions not only between customer and service provider, but also between the ICT 'design material' and the customer, respectively the service provider. Visually, the three mutual relationships, which we will discuss in the following, can be depicted as a triangle with three bi-directional arrows:

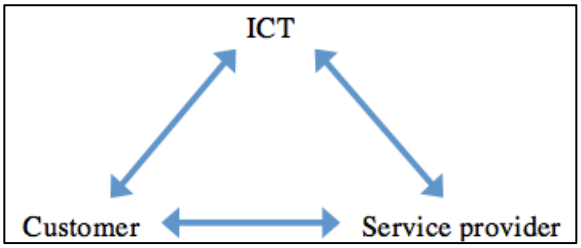

Figure 1: Relations in the ICT-based service encounter © The authors, 2015

When we use the term 'ICT design material' here is it to emphasize the possibility – which we will discuss later in this paper – that the structural properties of ICT to a certain extent determine the possibilities for the design of ICT-based services and service encounters. Among these structural properties of ICT are the scalability at a near-to-zero cost, the ability analyze vast amounts of information, its dependency on interfaces and rectified (predictable) user-interaction, the inability to understand users and context in an intelligent way (defined by the limits of Artificial Intelligence), the predominance for 'regularities' and the foreignness of 'particularities', cf. [5]. In this paper we discuss the analytical potentials in seeing ICT as an independent element in the service encounter, hereunder whether the analysis yields a different result when ICT is seen as possessing certain properties, as above introduced, compare to view on ICT as a neutral tool applied on a context or problem.

In the following we discuss each of the three mutual relations between customers, service providers and ICT.

3.1. The customer – service provider relationship

The relation between the customer and the service provider is possibly the most well-researched of all three relations, since this relation has been the focal point for traditional service design - and service encounter research, as discussed above. Despite our focus on the ICT element in the service encounter, we maintain the importance of examining the customer – service provider relationship. This relationship unfolds on different levels, both on a very practical level, such as the exchange of information related to the rendering of the service, as well as the rendering of the service itself. It unfolds however also on more general levels such as the customers' over-all contact with the service provider through a series of touch-points – the customer journey, or – expanding the scope further – to the pre-decision phase of comparing different service providers, as well as the general brand perception of the candidate service providers. The importance of including these aspects in the analysis is, that the introduction of ICT in the service encounter might affect negatively or positively not only the exchange of communication, but also the customer journey and finally the potential customer's prejudgments of the service offered.

3.2. The customer – ICT relationship

The relation between the customer and the ICT service finds its expression in the interface design. The design of the graphical user interface (as well as other user interfaces) represents the system designers' expectations of possible user needs, as well, in the case of e.g. e-commerce, 'nudging' of users to attract their attention to content or interactive options otherwise overseen and encourage certain interaction. As Donald Norman [12] in an early contribution on usability of ICT observe: The designers communicate their intentions to users only through the interface. Thus the potential breakdown of communication always exists, particularly when a user need has not been foreseen or accommodated by the system- and interaction designers.

Customization and personalization could be described as two different attempts to overcome the impossibility for designers to predict every possible user needs, cf.: [14], [15]. The user is offered the possibility to shape the service: a) when interfaces and functionalities can be customized to look and or react differently than planned by the designers, b) when the system over time adopts to user behavior or preferences through algorithmically based personalization. The two approaches are however still limited by anticipations of the designers of possible user behavior.

3.3. The service provider – ICT relationship

The relation between the ICT material and the service provider is often depicted as a tool-user relationship, where ICT is applied to increase the efficiency of the service provision, or to create a new disruptive service purely ICT-based. Assuming that ICT is a material with specific properties, an overseen question is how the ICT material, through its properties, inspires and shapes the creation of services. The relation is thus also here mutual, although further research must illuminate the strengths in the relationship: Is ICT - through its properties and due to its efficient scalability - setting the agenda for creation of services, or is ICT - with its properties - itself a product of the needs of services?

In the following we will discuss the implications of the above-suggested model. We will do so by looking at two concepts derived from the face-to-face service design research, namely 'service blueprints' and 'service evidence' [13]. We will also return to the above-introduced discussion of the possible properties of ICT. Finally we bring these two together in an analysis of four possible relations between ICT and the service encounter.

4. Service blueprints and ICT services

A central term in the service design literature is "the service blueprint", a term that to our knowledge first was introduced 1982 by [13]. Shostack suggests a systematic description of the elements in a service – both the tangible products objects involved, as well as the processes in the service rendering - to make it possible to design services to be more efficient and calculate the costs and profits related to the production of the service.

According to e.g. [19] a clear, well-modeled service blueprint could easily lend itself to the transformation into an ICT-based service, increasing the profitability of the service through the dramatic economy of scale potentials in ICT. In the book chapter "Services with Everything – the ICT-enabled digital transformation of services" Zysman et al. [19:99] state that "[w]hen activities [services] are formalized and codified, they become computable. Processes with clearly defined rules for their execution can be unbundled, recombined and automated". [18] thus foresee an "algorithmic revolution". In this paper we discuss why this revolution might be less straightforward in praxis.

Beyond introducing the formal description of services, Shostack also points at the difference between the service blueprint and the actual rendered service. Here he illustrates it with an example from a hairdresser: *"In its potential state, a service can only be described in hypothetical terms, or as what will be called a "blueprint " (...) the actual rendering (...) of the service will almost always deviate in some way (...) no two haircuts are exactly alike. They may differ in duration, in quality, or in customer satisfaction, even when a specific blueprint has been followed."* [13:55-56]

The question is: How does Shostack's distinction between the potential service as described in the service blueprint and actual rendered service translate or apply in the ICT-based encounter? Which, and how many are the parameters can could produce the difference? To answer this question we must turn the attention to the discussion of ICT as material; does ICT have particular properties, and if so, which?

As already mentioned, a central property of ICT is that it is rule-bound. This is expressed in the programming code via commands, long series of if-else statements and conditions. Unambiguous rules must be established by the system designers, interaction designers and programmers, and these rules are executed whenever the ICT-based service is requested. Local parameters, such as the user's operating system, browser, internet connection speed or screen size can be incorporated in the rendering of the service, or even personal parameters such user preferences can be reflected in the interface, information and functionalities through customization and personalization. But even this 'deviation' from the blueprint must be foreseen in the blueprint - in the computer code. Isolated seen, the ICT-based service is thus characterized by a very high similarity between the blueprint and the rendered service. This implies a low degree of flexibility in the ICT service rendering. If ICT is used by a human service-provider some of this inflexibility can potentially be countered. This points however to a less discussed question: In which ways do the ICT material possibly shape service provider's design of the service? We shall return to this question in the last part of the paper.

5. The service evidence

Important for the discussion of the ICT-based service encounter is not only the systematic description of the service but also the acknowledgement of the interplay between physical objects and processes. This interplay obviously looks different in the ICT-based service encounter. Particularly relevant for this paper is the role of the 'service evidence'.

In his analysis of the elements in a service Shostack [13] introduce "service evidence", defined as "*physical objects, which cannot be categorized as true product elements. These objects, or pieces of "evidence", play the critical role of verifying either the existence or the completion of a service*" [13:51]. Also the people rendering the service, as well as the physical surrounds can be counted as service evidence: "*People, for example, are often essential evidence of a service. The way a service renderer is clothed or speaks can have material impact on the consumer's perception of a service. Intuitively, many service firms recognise this phenomenon; thus the prevalence of uniforms of various kinds in service-dominant industries such as airlines, fast food chains and hotels*" [13:53].

Shostack's article is published 1982, at a time before customers started to use ICT-based services. The information embedded in the service evidence is here linked to a physical carrier, e.g. a paper ticket as evidence of the service "transportation". The question is how does the concept "service evidence" look like in the ICT based service encounter?

The graphical user interface could in the case of ICT-based service encounters be described as service evidence. In some cases it can be signified as peripheral evidence, e.g. when the interface displays information that is not regarded important by the user, e.g. very predictable or ephemeral information. In other cases - where the interface displays information that is regarded important by the user, the interface is the essential service evidence. An example could by an on-line purchase where credit card information are typed in and submitted, but the system replies with a ambiguous "transaction failed" message.

The question is, compared to the examples of physical service evidence in [13], whether the immateriality of the service evidence in the ICT-based service encounter, impacts negatively the service experience. In the above-mentioned example, a screen-dump or photo of the screen could effectively be the customers only evidence of service failure. The weakness of the service evidence in the ICT-based service encounter – in terms of the intangible nature of the evidence – contributes to the hypothesis that the ICT-based encounter is less rich, and less flexible, compared to the face-to-face service encounter.

6. ICT as design material

As indicated above, the introduction of ICT in the service encounter highlights the ambiguous nature of ICT: From one perspective ICT appears to be a neutral tool used for human action that just makes services more efficient and economical, cf.: [10:171], as well as [19]. Zysman et al. overlook or ignore that the computer systems – the automated systems – themselves are results of human judgment expressed through the designers understanding of the use context and their modeling of the system and interfaces.

From another perspective, the particular properties of ICT change the way services are delivered and perceived. The embedded properties of ICT influence the design of ICT-services. Harris & Henderson [5], e.g., claim that the information and communication technology, due to the historical context in which it was created, lends itself very easily to what they call a "standard mythology" for systems design. Here system requirements always are clear, where the system architecture always can meet all the requirements, and there always are clear choices for the user. Behind this, there are some fundamental assumptions such as "*[t]he parts of the system must interact according to a pre-established harmony defined during its design*" and that *"[t]he job of a designer is to discover, clarify, and when necessary invent the rules that define that harmony, and then embed them into the computer system"* [5: 89]. In their paper, Harris & Henderson however challenge these assumptions by examining the historical background for the emergence of 1) bureaucratic organizations, 2) information and communication technologies.

6.1. Particularities and regularities

According to [5] a main tension in any bureaucratic organization is the tension between 'regularities' and 'particularities': "*Humans in groups depend on shared regularities – expectations, norms, conventions, assumptions – to coordinate their activities*" [5:89] and typically these regularities are made explicit as rules. However, constantly a number of particularities emerge which cannot be addressed or resolved within the rules. Instead they "*generate unpredictable and unbounded diversity*" [5:89]. In the bureaucratic organization, the regularities officially structure the work, but in real bureaucratic organizations are "*[p]articularities (...) observed and accommodated*", rules evolve to interpret and fit particularities and these are accumulated. To Henderson and Harris' observation one could add a number of less beautiful sides of human bureaucratic organization such as the internal power play between departments and among employees, as well as less rational or explicit reasons applied in the decision-making, but this will takes us too far away from the topic of the paper, and will not contribute essentially to the argument we are

presenting. More relevant is the observation that the distinction between regularities and particularities resonates well with Shostack's observation of the gap between the service blueprint and the actual rendering of the service. It is this gap that we examine in relation to ICT services.

Harris and Henderson also points out that ICT historically has been invented in "communities intensely dedicated to bureaucratic norms" e.g. "telephone systems engineering, ballistics calculation and metamathematics". Harris and Henderson depict computer systems as "perfect bureaucratic tools" since "[c]omputers can only work in terms of the regularities they have been built to handle" [5: 89]. One could here object that if the rules have been phased sufficiently generic and broad, the consequences of these restrictions are few (e.g. when I press a letter on the keyboard, this letter will be displayed on the screen provided that I use the right language setting, thus this type of rule or instruction does not restrict me in any way of expressing myself until I need to type a special character). On the other hand, with the argument presented by Lawrence Lessig [9] on digital rights management systems, these DRM systems are effectively executing contracts, laws and regulation though the computer code. In both cases there is a 1:1 similarity between the rule (as expressed or executed by a human) and the rule executed by the computer system. So to this end, we agree with [5].

7. Four cases of ICT – service encounter relationships

The two different views on the properties of the ICT material have obviously implications for how the encounter between ICT and the service rendering is seen. Assuming that ICT is neutral or transparent to the situation it is 'applied' on, the result could be the optimistic prediction of the benefits of the ICT-enhancement of the service encounter, as in [19]. Assuming that the ICT has specific properties, the expectations must be modified with limitations of ICT, or alternatively an exploration of the specific potential in ICT. To these two views, we can add another dimension, namely the above-introduced gap between the service blueprint and the actual rendered service, as formulated by Shostack [13].

Combined, the two dimensions of the ICT-based service encounter can be presented in a matrix. Here we see four cases – or four visions – of the ICT-based service encounter. It should be stressed that we here present theoretic positions and that real ICT services might include elements from more than one of these cases. It should also be stressed that as an analytical tool, it to a certain degree points back to the viewer's perception, since it supports different descriptions of the ICT-based service encounter. It is thus not intended as a blueprint or reference tool.

In the table we use the term "Ad hoc / Deviating / Service Encounters" to encompass both service encounters that have no well-established script or blueprint, as well as those that deviate from an existing blueprint. The intension is thus to encompass all kinds of service encounters, also smaller and irregular ones, e.g. those between a single, independent service render and a one-time customer.

	Ad hoc / deviating service encounters	**Blueprint service encounters**
ICT as a material without properties	**Case 1:** The ICT service captures the particularities of the service encounter without changing it, possibly improving it	**Case 2:** The existing service encounter is transferred seamlessly to an ICT-based encounter
ICT as a material with properties	**Case 3:** ICT service fails to capture the particularities of the service encounter and changes it negatively with possible loss of service quality	**Case 4:** ICT boosts and rectifies the service encounter by adding economy of scale

Table 1: Two dimensions in the ICT-based service encounter

7.1. Case one: Absorbing the ICT in the service encounter

Case one describes a deviating or ad-hoc service encounter where the ICT material is neutral since it captures the particularities of the service encounter without changing it. This could be the case if ICT is only applied to elements in the service encounter that are not central to the service, e.g. payment. In case of ICT failure, it is easy for the service render and the customer to blame the technology, and use cash instead. The use of ICT in this case is characterized by 1) that it is designed by service renders on a personal

basis, 2) that it is used in a flexible way – rather as information storage and transportation than as information processing / structuring. There are however obvious limitations to the kinds of processes in the service encounter that can be transferred to ICT, since there is a need for flexibility in the service encounter.

7.2. Case Two: Isolated islands of ICT

In the second case, a consistent and stable blueprint defines the service encounter, but the ICT does not result in any increased efficiency or improvement of the service. Since the service blueprint is consistent it is easy to identify human service elements that can be automated and replaced with ICT but these elements are isolated from each other since the ICT fails to bridge between the different service elements. This could be in cases where the core service proposition in reality is what Zysman et el. calls an "irreducible service" [19: 107]. The introduction of ICT in this type of service encounter is not enough to boost the efficiency of the service rendering. But since only isolated elements of the service are ICT-based, any tension between the rectifying properties of ICT (that support regularities) and the heterogeneous and irregular particularities of real world service encounters are resolved by the human service renders' (and customers') appropriation of the ICT service, cf.: [4].

7.3. Case three: ICT endangers the core service proposition

In the third case we assume that ICT has properties that influence the service encounter, in this case negatively. The particularities of the service encounter cannot be captured by ICT, but in contrast to case one, the here service encounter is changed to accommodate the properties of ICT-material. The result is a decline of the service quality, while no efficiency is gained. In worst cases, the core of the service proposition is endangered. This could be the case when ICT is forced into the rendering of a deviating or ad-hoc irreducible service, or in a case where the rectifying elements in ICT dominate negatively the service rendering of a hybrid service. Finally, it could be the case if the service blueprint has not been modeled correctly or sufficiently for an automated service. In these cases, the inner structure or properties of the ICT, e.g. expressed in standard functionalities of a ICT product, is used by the service designers to normalize or rectify an ad-hoc or deviating service encounter without acknowledging the heterogeneity of this service encounter. The ICT 'solution' attempts to impose a simplification of the service rendering, but the result is a loss of service quality or simply service failure.

7.4. Case four: ICT boosts or innovates the service encounter

In case four, the properties of ICT actively helps boosting the existing service encounter by proposing a much more efficient way to render the service. The already blueprinted service encounter benefits from the economy of scale embedded in the ICT and from the rectifying properties that exclude or suppress particularities.

8. Discussion and conclusion

Above we have discussed the relationship between services and ICT based on the existing literature, particularly – on the one side – the service design and service encounter literature, and – on the other side – the HCI literature. We have found that the two research traditions have two different perspectives on the application of ICT in the service encounter. Embedded in the literature, are also some assumptions. In much service encounter literature, the implied assumption is that the service production is best organized when described in a service blueprint. In much, but not all HCI literature, the belief is that ICT is a malleable material that does not itself shape the context it is applied on. We have challenged these assumptions by discussing the propositions that the ICT material has certain properties, and that these properties influence the design of the service and the service encounter.

The proposition that the ICT material influences the design of the service was further examined in a matrix table, with one axis representing two states of services (deviating / ad-hoc versus blueprint service design), the other axis representing two different assumptions about the influence of the ICT material. Through this matrix we saw that it is possible to describe the ICT in the service encounter both as having influential properties as well as not. The descriptions point at different user appropriations of ICT. For the deviating or ad-hoc service encounter the result was in both cases inefficiency since the ICT elements either were isolated to specific service elements or endangered the whole service proposition. For the blueprint service design, we saw either a neutral or a very positive effect.

By presenting such a model, the question emerges: How to categorize existing examples of ICT in services

into these four idealized categories? Do the description of the services determine the categorization or is it possible to establish a consistent framework for the categorization of the role of ICT in different service encounters? A requirement for establishing the framework would be several detailed studies of different cases of interaction and customer-journeys. These studies should also include the user's interaction with user interfaces, not only a description on a general service blueprint level.

A possible research agenda points thus in the direction of micro-studies of selected cases of users' real-life interaction with ICT-based services to inform a more thorough typology than the one presented by [19]. Such a typology should not – as implicitly in Zysman – take its point of departure in a formal top-down description of services, which we argued in this paper makes the researchers blind for the particular properties ICT has seen from the user's point of view, but the typology should take its starting point in a characterization of the particular properties of ICT. Another question is whether the categorization is stable, whether it should include a dynamic element. If ICT is being used to rectify deviating services into blueprint services, the analytical model must include a dynamic element. Our assumption, which however must be examined, is that is indeed possible to find cases where ICT has been applied as part of rectifying a deviating service design. The implications of this both for the customer perception of service quality, as well as for the designers of the service must also be examined further.

In this paper we argued that assuming that ICT as design material has the particular properties provides a more productive platform for examining the ICT-based service encounter than assuming ICT being a neutral tool for service production. The question is now: Do good usability and user experience neutralize the potential negative effects of the properties of the ICT design material, or does it constitute a radical different basis for the creation of services, as basis that makes the classic comparison with the face-to-face service encounter obsolete? This question becomes pressing in the design of future automated or intelligent ICT services, since these might redefine how user autonomy is understood and perceived.

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