

Association for Information Systems AIS Electronic Library (AISeL)

Research Papers

ECIS 2019 Proceedings

5-15-2019

THE ROLE OF CONTRADICTIONS AND NORMS IN THE DESIGN AND USE OF A TELEMEDICINE SYSTEM: A HEALTHCARE PROFESSIONALS PERSPECTIVE

Pascal Schwalb

London School of Economics and Political Science, pascal.schwalb@gmail.com

Ela Klecun

London School of Economics, e.klecun@lse.ac.uk

Follow this and additional works at: https://aisel.aisnet.org/ecis2019_rp

Recommended Citation

Schwalb, Pascal and Klecun, Ela, (2019). "THE ROLE OF CONTRADICTIONS AND NORMS IN THE DESIGN AND USE OF A TELEMEDICINE SYSTEM: A HEALTHCARE PROFESSIONALS PERSPECTIVE". In Proceedings of the 27th European Conference on Information Systems (ECIS), Stockholm & Uppsala, Sweden, June 8-14, 2019. ISBN 978-1-7336325-0-8 Research Papers.

https://aisel.aisnet.org/ecis2019_rp/176

This material is brought to you by the ECIS 2019 Proceedings at AIS Electronic Library (AISeL). It has been accepted for inclusion in Research Papers by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

THE ROLE OF CONTRADICTIONS AND NORMS IN THE DESIGN AND USE OF A TELEMEDICINE SYSTEM: HEALTHCARE PROFESSIONALS' PERSPECTIVE

Research paper

Pascal Schwalb¹

Pascal.Schwalb@gmail.com

Ela Klecun¹

E.Klecun@lse.ac.uk

¹*London School of Economics and Political Science, UK.*

Abstract

Telemedicine's potential to improve accessibility and quality of healthcare has been advocated for decades. However, its adoption has been fraught with problems. This paper applies a socio-technical approach, and specifically activity theory, to study the adoption and use of telemedicine by healthcare professionals (HCPs) in Sri Lanka. It depicts how contradictions in the initial activity system mediated by improvised telemedicine were addressed by the intended telemedicine application and how this motivated HCPs to adopt it. It also highlights the influence of social norms on the use of telemedicine. Based on the research findings this paper recommends that the designers of telemedicine need to consider: (a) identification of objects' motivations to engage in the activity mediated by telemedicine, (b) norms and rules mediating the activity, (c) contradictions in the existing activity system, and (d) technological characteristics of the application. To stimulate its adoption, the new technology should help to address contradictions in the existing activity system, be congruent with social norms, whilst offering possibility of influencing social norms that are a source of contradictions.

Keywords: Telemedicine, Healthcare professionals, Activity Theory, Contradictions, Social norms

Introduction

The healthcare sector is undergoing transformation triggered by information and communication technologies (ICTs) (Agarwal et al. 2010; Fichman et al. 2011; Gianchandani 2011). Telemedicine - the use of ICTs to deliver healthcare services over geographical distance (Xue et al. 2015) - is set to play an increasingly important role in the way healthcare services are delivered (Helsel et al. 2018).

However, the adoption of telemedicine has been slow and fraught with problems, from its roots in the 1960s projects, which did not become established, through renewed interest in the late 20th century (Klecun-Dabrowska and Cornford 2002; Darkins and Cary 2000; Perednia and Allen 1995), to current initiatives (Dorsey and Topol 2016).

Many reasons are identified as barriers to adoption and use of telemedicine, including technical, societal (described as lack of access or skills to use the technology), legal, reimbursement arrangements and clinical issues (such as the quality of the patient-physician relationship and the quality of care) (Dorsey

and Topol 2016). In low- and middle-income countries, specifically, legal, sustainability, culture, language and contextual factors are singled out as important for the implementation of telemedicine (Saliba et al. 2012). However, the majority of studies tend to adopt an engineering/ computer science perspective, highlighting discrete factors hindering telemedicine's diffusion, and presenting technological solutions. Articles concerned with diffusion and adoption of telemedicine tend to approach it either from a macro-level perspective, identifying structural factors, or reports on an individual-level studies of technology acceptance, predominantly applying quantitative approaches informed by the Technology Acceptance Model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT) or the Coping Model of User Adaptation (CMUA) (Beaudry and Pinsonneault, 2005). Such studies often lack in-depth consideration of social context that shapes the adoption and use of telemedicine services (Greenhalgh et al. 2013), yet understanding of local social context has been shown to be important to the design and use of such services (Miscione 2007; Saliba et al. 2012; Thapa and Sein 2018). Telemedicine's fit with healthcare professionals (HCPs) lives, their notions of good patient care and broader social norms and regulations influence HCPs motivations to use and actual use of telemedicine (Walker and Whetton 2002). A focus on practitioners' initial attitudes to telemedicine needs to be complemented by studies analysing their interactions with patients through telemedicine, taking a holistic process-oriented approach that takes into account the context of those interactions (Sam 2012), as well as the technology characteristics.

Inspired by a socio-technical approach, and informed by the rich tradition of applying activity theory in Human Computer Interaction (HCI) field, we advocate taking the human activity, as mediated by technology and society (e.g. through norms and rules), as the fundamental unit of analysis for a study of telemedicine use (Roth and Lee 2007). Therefore, this paper applies activity theory to the study of a telemedicine service in Sri Lanka to better understand conditions that may lead to a sustained use by HCPs of a commercial telemedicine system, and to contribute to the understanding of how such services might be designed. Specifically, we ask the following questions:

- What are HCPs motivations for adopting telemedicine?
- What characteristics of the telemedicine system facilitate its use?
- How does the telemedicine system address contradictions in the HCPs activity system, and to what extent does it reflect social norms and how does it shape them?

Our study stresses the contextualised and social transformation that is brought about by the implementation of an individually based telemedicine application and illustrates how socio-technical aspects influence user experience of complex and multifaceted information systems (IS) (in this case a telemedicine system). Drawing on those insights the paper makes suggestions pertinent to the design of technology and its implementation and use within a broader socio-technical system.

Our case study examines a commercial telemedicine service that uses smartphone-based software applications and caters for mainly urban, techno-savvy patients seeking convenient access to healthcare. Such a service reflects a new trend in the way telemedicine is practiced (Dorsey and Topol 2016; Helsel et al. 2018), and complements the literature that covers studies of telemedicine systems linking healthcare professionals with each other, involving dedicated technologies in hospitals and satellite clinics, and usually aimed at providing care for populations living in remote areas. Furthermore, most studies focus on the adoption and use by patients, but neglect the intention of HCPs to accept and use telemedicine (Segrelles-Calvo et al. 2015), on which our case study concentrates. From HCI perspective this is an interesting case as it examines HCPs engagement with patients through the use of social networking sites and a more formal but still a smartphone-based application within a highly institutionalised and regulated environment.

The paper is structured as follows. The underpinning theoretical perspective, activity theory, is described next, specifically as adapted for studies of collective activities, and in particular those mediated by ICTs. This is followed by the methodological section, and then the description and analysis of the study case.

The discussion highlights the main points and themes identified from the case study and relates them to the literature. The paper ends with its main contributions, limitations and further research opportunities.

1 Insights of Activity Theory to the study of ICT-mediated activities

Activity theory has been applied extensively in HCI and work studies (Nardi 1995; Korpela et al. 2000; Clemmensen et al. 2016) and, more recently, has begun to enjoy increasing popularity in IS (Nardi 1995; Korpela et al. 2000; Karanasios and Allen 2018). The theory has its roots in psychology and initially was concerned with the complexities of human – material interaction and the workings of a human mind but since then it has evolved to encompass theoretical concepts for studying collective activities and organisational practices (Clemmensen et al. 2016). The key concept, as formulated by Vygotsky and extended by Leont’ev (1978) is ‘activity’ – “a purposeful, social, mediated, multilevel, and developing interaction between actors (‘subjects’) and the objective world (‘object’)” (Clemmensen et al 2016, p. 609). Subjects (a person or a collective) are seen as being motivated to achieve a specific object-transformation towards an aspired outcome. Objects may be material (such as software), or less tangible (e.g. plans or strategy) or even totally intangible, such as shared ideas “as long as it can be shared for manipulation and transformation by the participants of the activity” (Kuutti 1996, p. 27). They also might be human, for example in Engeströms’ (1999) study the object of hospital work is the patient. This might be considered controversial as patients clearly have agency, but in activity theory the object is in a reciprocal relation with the subject who transforms it and in turn is influenced by it. This relation evolves when the subject’s immediate goals are attained, lessons are learned, or interests and perceptions shift. An object frames an activity, i.e. an activity is directed towards a transformation of one object. The extended agency of humans is reflected within tools (Karanasios 2018), mediating the subject’s activity. While these tools are used for one activity they can also affect other activities or tools, as they are part of social processes (Blunden 2010).

Activity theory, as developed by Leont’ev (1978), differentiates between motives and more concrete goals and introduces a distinction between related levels of analysis: the activity, the individual action and the operation. An activity is motive driven (object oriented) and realised through concrete, short-lived actions (such as updating an electronic record), which are goal oriented (e.g. to have up-to-date patient records). In turn, actions are realised through unconscious operations (such as moving a computer mouse). Operations are conditioned by the relation between the goal, current state of the action and its material context (Roth and Lee 2007), e.g. an operation ‘moving a computer mouse’ is related to the goal of having an up-to-date record, state of the action (finished entering data and ready to save) and the placement of the mouse of the table.

Engeström (1987) extended Vygotsky’s and Leont’ev’s versions of activity theory by introducing the activity system model that elaborated the notion of collective action and introduced as components of the activity system: community, within and for which and activity takes place, rules and norms, and the division of labour. This conceptualisation has opened up the possibility to understand different, even contradicting perspectives represented within one activity system or across the network of various activity systems.

A key notion in activity theory is that each component of an activity cannot be understood in separation but rather through interactions with the other components. Furthermore, activities are seen as historically and culturally constructed. For example, ‘patient’ (an object) is conditioned by capitalist system and historically developed notions of a doctor-patient relationship. Applying those insights to IS suggests we can only understand the use, ‘impacts’ and transformative potential of an information system through a practice perspective that conceptualises IS use within a broader socio-technical system. Norms and rules, seen as regulatory element towards appropriate behaviour (Karanasios, 2018), maintain an important role in any human activity system.

An activity system can be interlinked with many other single activities, which affect each other. The complexity of the activity systems increases over time (Spinuzzi 2008), and this is reflected through “multiple mediations” (Engeström 1999, p. 66) within a single activity and through a network of activities. The concept of mediation is important for IS scholars, as information systems can be conceptualised as ‘tools’ albeit often complex and ambiguous (Karanasios 2018), mediating subjects’ actions and influencing both the subject and object.

An activity system is dynamic in nature (Allen et al. 2011) and changes within one of the components lead to a transformation of the whole system (Ditsa and Davis 2000). Changes are initiated in order to resolve occurring contradictions (Engeström 1999). We believe that analysis of contradictions is key to the understanding information system use (in our case a telemedicine-based service) and to its potential (re)-design, and thus we focus on those in our research. According to activity theory first order contradictions appear *within* the activity. These occur either (a) within each constituent component of the activity, as e.g., in Engeström’s (1999) example a patient may be seen as a person to be cared for or as a source of revenue; a tool may become a source of contradictions, (b) between the components (e.g. between the community and the division of labour) and (c) between an activity and its more advanced form (e.g. before and after the introduction of and information system) (Karanasios 2018). Secondary contradictions refer to the interaction between different activity systems (Engeström 1999). Contradictions within an activity (Engeström 1987) and between activities give rise to change and to transformation of the individual activity system (Engeström 1999).

By providing concepts that place human-technology interaction within a larger context of purposeful human activities the theory facilitates a deeper understanding of technology and its meaning for people, as well as its design and use (Karanasios 2018; Bødker 1989; Kuutti 1996). Within healthcare context activity theory has been applied to study the transformation of hospital work (Engeström 1999), the use of assistive technologies at home (Woll and Bratteteig 2018) and chronic disease management (Cornet et al. 2018). Those studies illustrate how activity theory, on its own or complemented by other theories, can help to provide insights related to the transformation of healthcare and self-care practices. Thus, activity theory offers a useful lens to study telemedicine use in healthcare consultations.

2 Methodology

Based on the research question and the use of activity theory for the conceptual model, a qualitative research design was applied in order to better understand the complexity of the emergence, adoption and use of telemedicine from the health care professionals’ perspective embedded in their work setting and societal influences (Sam 2012). In this section, the specific case study from which the empirical data was collected is described. This is followed by the research design and analysis approach, before a presentation and discussion of the findings.

2.1 Study Case

The empirical data in this study is gathered from a case study of a Sri Lankan telemedicine application. As a Less Economically Developed Country (LEDC), Sri Lanka offers a comparatively high standard of health care for its population (Edirippulige et al. 2007). Although the public sector offers free health care service for everyone, a stronger establishment of the private health care sector has been recorded in Sri Lanka (Fernando 2000). In order to acquire their specialisation HCP are required to work for at least one year abroad, and initially in the public sector once returning. Our study revealed that HCPs intention to work in the public sector is predominantly driven by job security and in the private sector by better pay. With a high density of smartphone ownership, new telemedicine applications are being developed and utilized to provide healthcare. This study focuses on the use of a teleconsultation service between patients and healthcare professionals (HCPs) from various specialities. A digital platform connecting HCPs and patients is provided by a private company without any governmental support and serves a private market currently. Currently patients must have a bank account to register. HCPs are security vetted by the Sri Lankan Ministry of Health before their registration is activated by managers

of the platform. Digital prescriptions are legally accepted if the following are provided: signature and the HCP's medical registration number, and a photograph of a HCP's stamp (government registered seal of each HCP). The platform supports video communication, a messenger function for doctor-patient communication and a digital prescription function. Although not the only telemedicine application on the market in Sri Lanka, it is the only one with a video consultation function and a prescription option. At the time of study the referring application had around 2000 consultations each month and more than 120 registered HCPs of several disciplines, offering us the opportunity to study an established and widely used telemedicine service.

2.2 Research design and data collection

The complex nature of the healthcare sector, and our desire to understand the underlying motives and goals of HCPs engaged in the telemedicine service, their interactions with patients structured by telemedicine and connections between the activity systems in question, motivated us to follow a common practice in IS healthcare research and use a single case study to extract empirical data (Boudreau and Robey 2005). Such a choice allows for depicting "diverse and possibly contradictory perspectives" (Caronna 2012, p. 71) and placing the individual actions within broader activities and cultural-historical context.

Empirical data was collected through twenty semi-structured face-to-face interviews in Sri Lanka between July and August 2018 and a review of all registered doctors' data about their application use (amount of total consultations, unique patients, average rating, price per consultation, membership length) in order to support data triangulation (Denzin 1978). This study focuses on the qualitative part, whereas the quantitative data was only used for validation reasons.

Initial contact was made through the support of an employee within the telemedicine application under study, interview partners were contacted by mail regarding their consent and availability, and were informed about the content of the research. Interviewed HCPs were randomly selected from the providers HCPs sample and their representativeness was assessed on the basis of their total work experience, the work they had conducted on the platform and their background. It was felt that 20 interviews allowed us to reach a point of saturation. Following Pope and Mays' (2006) description of "naturalism" (p.4), interviews were held at their place of work or home. Interviews ranged from 30 minutes up to 2 hours; they were recorded and verbatim transcribed.

Questions asked in the interviews were derived from the conceptual framework of activity theory as described by Engeström (1987), and were related to the following categories: Subject, Object, Tool, Division of labour, Community and rules. Further questions were developed during the process of interviewing and data collection.

Interviewees	Age range	Years of overall work experience	Monthly consultations held by HCPs	Smartphone savviness	Workplace
20	33 - 64	1 - 36	3 - 15	Unexperienced familiar savvy	Government clinic private clinic self employed
Professions	General Practitioner (9), Nutritionist (2), Psychiatrist (2), Family Physician (2), Surgeon Physiotherapist, Diabetes Care, Sexual Health, Gynaecologist				

Table 1 Interviewee demographics

2.3 Data Analysis

The first author conducted thematic analysis of the data, an approach which is common in qualitative studies (Nowell et al. 2017), in particular in healthcare and psychology (Pope and Mays 2006), using the six-stage method introduced by Braun and Clarke (2006): 1) Becoming familiar with the data, 2) Generating initial codes, 3) Searching for themes, 4) Reviewing themes, 5) Defining and naming themes and 6) Producing a report. Thematic analysis was used to abstract themes and see their patterns. A mixed

deductive and inductive coding approach was applied, as initial codes were based on the concepts from activity theory and adjusted throughout the iterative process of coding and clustering into thematic units (Miles and Huberman 1994). This process was supported by Nvivo software.

3 Description & Analysis of the case study

The following section represents object-actor dynamics of patients-HCPs remote engagement by means of digital technology, embedded in its cultural-historical context and influenced by rules and social norms. HCPs handling mobile phone-based interactions with patients presents a typical human-computer interaction. We analyse the transformation of the patient-HCP's interaction through the lens of contradictions and tensions on an individual and collective level of HCPs. We reveal the transformation from an improvised to an intended telemedicine system adopted by HCPs in Sri Lanka. Using thereby the notion of the human activity system by Engeström (1987) to unfold the complexity of mediated relationships HCPs (the subject in our study) face to deliver better healthcare service to private patients (who are the object of the activity system). The holistic perspective that activity theory provides helps to understand contextual influences and their mediating role.

3.1 Rise of an improvised telemedicine system

Our analysis of the motivations and attitudes of HCP's handling telemedicine in Sri Lanka reveal that HCPs used to communicate with their patients before the intended telemedicine system through social messaging applications. Ilyenkov (1982) stated that every transformation towards a new mode, caused by contradictions first introduces itself through an individual action deviating from the norm. In our case study, interviewees revealed a transformation of the HCPs-patient engagement towards a technology supported communication. This began about a decade ago when an unknown doctor or doctors started handing out their private phone numbers to patients to provide them with a better service.

Nowadays it is common practice for HCPs in Sri Lanka to hand out their private phone number to patients. Senior and long working HCPs referred to different times, where patients didn't demand their personal phone number, or felt obligated in order to retain patients in a competitive private market, but noted that now:

“Routinely we do give the private number for emergencies!” (HCP 02).

The interviewees gave the following reasons for providing their phone number: to improve patients' healthcare, to adhere to social norms and to respond to patients' demands and market pressure (applied through patients as consumers). They wanted to spare their patients travel and waiting time for follow up appointments and to strengthen the patient-HCP relationship, believing that offering patients the possibility to contact them instantly at any time would lead to increased patients' trust in them.

The initial action of an individual HCP affected the activity of other HCPs as a collective. The actions of other HCPs who also started handing out their private phone number, and simultaneously the actions of patients who began to demand it, changed the collective activity of HCPs-patients engagement (see Figure 1). HCPs stated that patients' expectations about their perceived work changed over the years towards a service provider with required availability at any time. The activity system changes as social norms change (as giving a phone number becomes normalised, i.e. becomes a typical thing to do), affecting the collective activity system.

Contextualising the interaction, it is important to distinguish the governmental from the private healthcare system; where the patient-HCP relationship differs. HCPs reported that patients in the private sector come to see a specific HCP. Whereas patients in the government sector are assigned to a specific unit and receive treatment by the next available HCP, potentially someone different every visit:

“Because in the private sector, they come specifically to see me. In the Government sector, they come to the unit not to see a particular doctor. [...] In the government sector, we don't have name tags. They don't know that I am so and so.” (HCP 18)

Patients in the private sector seek a more personal interaction with their specialist, which frequently means seeking contact with their HCP outside a consultation. The relationship between patient-HCP's rests upon trust, understood by patients as constant accessibility. “In the private sector, it goes beyond the consultation.” (HCP 18).

Technological development of mobile devices -specifically smartphones- enabled new opportunities of communication such as social messaging applications and the possibility to send and forward pictures just as visual images. This also led to changes in the patient-HCPs' interaction. Young HCP's purposefully advised their patients to make use of a social networking application to contact them, in order to reduce their paper work and receive instant messages and easily access photographs. By communicating and providing advice to patients via social networking applications such as WhatsApp or Viber, HCPs make use of an unstructured and improvised form of telemedicine – *an improvised system*.

“So even my patients before [intended telemedicine application], for example, if I want to see some reports you know for the patient's convenience I have them send them to me through WhatsApp or Viber rather than having them come over once again or pages to show the reports.” (HCP 05)

When asked for their motivation to engage in the informal telemedicine system HCPs cited improving patients care and being pressured to do so through patients and market expectations.

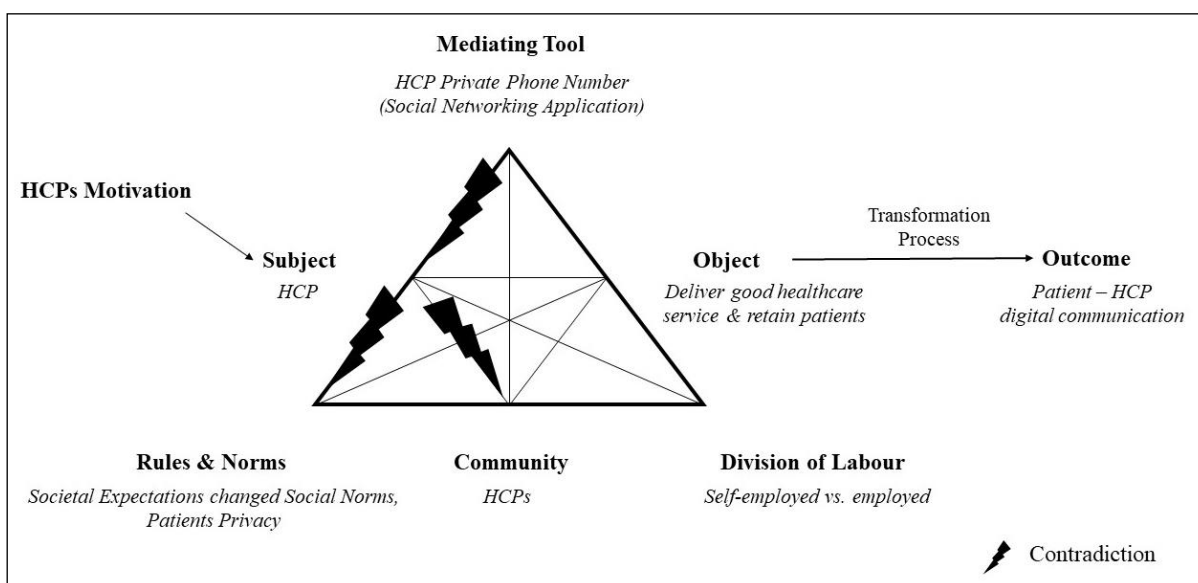


Figure 1 Improvised Telemedicine System - Collective Activity System

3.2 Occurring Contradictions from an improvised telemedicine system

The establishment of the improvised telemedicine system as a human activity, starting with HCPs aiming to retain patients and improve their healthcare services raised major intertwined contradictions through social norms, market competition and an open technology.

A contradiction developed over time as HCPs were expected to provide their private phone number to patients, despite their unease about losing their privacy (see figure 1). Social expectations manifested themselves in new norms (as described in 4.1). Patients expressed their distrust, if HCPs did not comply with their expectations. The attempts of HCPs to overcome these social pressures by acquiring a second

telephone number which they did not use or answer, caused patients to lose trust in their HCP and switch to another HCP.

“And if the doctor doesn't answer and [...] the patient feels deprived and [...] loses the confidence with the doctor saying he's not credible because he doesn't want to talk.” (HCP 14)

On the other hand, HCPs mentioned concerns about liability issues that could arise while using online messengers to converse with their patients, as there were no clear legal regulations, and they feared the risk of being required to substantiate their consultation advice afterwards, as no notes were taken, or records made during such informal appointments. In addition, security issues and questions of patients' privacy through the use of online messengers must be taken into account, as social networking applications are criticised for their lack of encryption (Watson et al. 2016). Nonetheless HCPs were generally more concerned about their own liability, so they consciously avoided recommending medication.

The conflict between the subject, the HCP, and the community of fellow HCPs – a first order contradiction between the components of the activity system is intertwined with the social context. Long-term competition between HCPs in the private sector, especially general practitioners, supports the pressure for HCPs to retain their patients' loyalty and meet their expectations. Some HCPs blamed the increase in competition on the national healthcare system, which did not require patients to see a general practitioner before being referred to a specialist. Instead, patients could freely choose their HCP at their own discretion. Individual HCP's decision to provide their private phone number was driven by the dynamics of the community's actions.

“But again, there is a trend now a lot of consultant they know that if we don't give them our private mobile number, we might lose some patients! We might win them [if we provide our phone number]!” (HCP 1)

Another contradiction for HCPs lies within the nature of the technology of social messaging applications. Within the improvised telemedicine application patients exploited the open design of social messaging applications for their benefit, supported by social norms – of HCP's accessibility that have emerged over time.

Open accessibility between users of social messaging application is granted on the basis of a telephone number. Despite the advantageous reasons for HCPs handing out their private telephone number to patients, they are beginning to see the disadvantage of having no control over how patients choose to use their private number. According to the HCPs interviewed, this interrupts their private lives, as patients are abusing this privilege by calling in the middle of the night, or making multiple attempts to contact their HCP within a short time. Furthermore, patients may also attempt to avoid paying the consultation fees that would apply, if they instead attended a consultation in a private hospital or clinic, using the informal improvised consultations via a social networking application instead. This means a loss of income for HCPs, as providing a consultation service via a social networking application constitutes unpaid work. The contradiction lies within HCPs right for privacy and pay opposed to the interface design of the social network application with the lack of control and remuneration possibility.

“In the past where we just provided free WhatsApp consultation. I lost a lot of revenue through WhatsApp!” (HCP 02)

The next section will discuss how contradictions in the activity system mediated by improvised telemedicine system helped the introduction and acceptance of an intended telemedicine system.

3.3 Intended Telemedicine application responding to current contradictions

Human activity systems are coherent in their nature. Changing one element within the activity (e.g. in our case changing mediating tool) leads to changes in the other elements. The responses of HCPs showed

that the intended telemedicine application responded to contradictions (depicted in Figure 1) that HCPs experienced over time whilst using the improvised telemedicine (social messaging) application.

Technical design of the mediating tool - The intended telemedicine application includes video communication, messenger for HCP-patient communication, electronic prescription of medications, as well as feedback function. Contact time and duration between HCPs and patients, as well as transferred documents, photographs or other data are recorded within the application on securely stored servers that comply with American data security standards. Although patients initially reported problems with getting their prescriptions recognised by local pharmacies, these issues settled in time and with further acceptance of the application thanks to publicity.

When using the intended telemedicine application, HCPs mentioned similarities with the technical features of the improvised telemedicine in terms of ease of use. They saw ease of use for both patients and themselves as rudimentary but essential aspect motivating their engagement. Since the interviewees joined the platform at different stages, some have been active for a long time and recalled the different stages of development from a computer-based system to the smartphone application and its development to the current stage.

In contrast to the improvised telemedicine system, HCPs stressed the benefits of being able to charge for consultations and prescribe drugs remotely, directly through the application. They also referred to the advantage of being able to see the patient through video streaming instead a voice call. Some HCPs revealed that they purposely refused patients' attempts to contact them via other types of video call, referring them instead to the formal telemedicine application. The on-off status button allowed HCPs to indicate when they were not available and thus to retain some degree of control over their time.

Through such design the intended telemedicine application helped to alleviate contradictions inherent in the technical design of the improvised system.

Rules and Norms - Although HCPs could use the system at their own convenience and maintain some control of their privacy, as they did not need to submit their personal telephone number, the social norm (and market pressure) of pleasing patients requests remained very strong, as most of the interviewed HCPs still handed out their personal telephone number to their patients upon request. Just a small number of interviewees responded that they purposely channelled their patients through the formal telemedicine application to ensure their privacy, while at the same time hoping to retain their patient base. They motivated patients to contact them through the formal (intended) telemedicine application by presenting arguments for patients' convenience in being able to stay at home and avoid travel or waiting times at clinics. However, some HCPs felt they should remain available online all the time:

“Yeah I like it when it's under my control I like it, but sometimes I feel it may not good for the client because from client side they call from the video consultation they expect the doctor to respond immediately.” (HCP 13)

The intended telemedicine system provides facility to charge patients for online consultations. However, HCPs could decide whether to do so, and often did not charge for consultations that did not lead to a resolution, e.g. when a physical examination was needed, seeing such behaviour as congruent with social norms. Nevertheless, they still considered using the intended telemedicine system as favourable to providing free consultations via social messaging applications. The intended system became a source of additional income for HCPs, with telemedicine consultations conducted outside their regular work (e.g. in public hospitals), and sometimes even within working hours (e.g. during shifts in public hospitals).

However, referring patients from a public sector contact to the private telemedicine platform was seen as ethically problematic, and one HCP reported to feel bad for charging such a patient. Professional norms thereby still seem to be negotiable, and left to an individual HCP's judgement.

Responding to shifting of control of communication and remuneration back to HCPs, patients changed their behaviour. HCPs reported that patients started to approach them with more serious and urgent concerns, as compared to a free contact through social messaging applications.

Liability issues that concern HCPs in remote consultations were better addressed within the formal telemedicine application, as HCPs were required to take notes of patients' history and current state of health as justification for prescribing drugs.

"For the benefit of the patient and safety of mine. Because documentation is vital, I have to have clear documentation." (HCP 10)

Generally, the healthcare system in Sri Lanka requires patients to store and take care of health records themselves. In face-to-face consultations patients forgotten documents cause delays and difficulties in their treatment plan as history examination plays an essential role. However, the intended telemedicine application enabled patients' history tracking through centrally stored data. HCPs liked the ability to review a returning patient's data before a consultation and felt that this was beneficial for them and their patients:

"Every comment and every like, presenting complaints, it's all in the platform, and it's good for the patient also, so both parties have some validation points" (HCP 14)

Intrapersonal factors of motivation - HCPs often expressed technology savviness and their interest in using technology at their work place as an underlying motivation for them engaging in both improvised and intended telemedicine applications. Although this personal interest was found to be predominantly with younger practitioners, it cannot be generalized as also older HCPs engaged with passion the new technology. Connected to HCPs interest of technology was the motivation in using digital approaches to interact with patients as an additional channel to accommodate patient's expectation of availability and additional service opportunities. One HCP mentioned the possibility that the availability on a telemedicine platform might become a competitive advantage and patients might depend on telemedicine in the future.

"One is the hassle is less and also if you are motivated and if you love medicine and love technology then this is one of the best things to have." (HCP 10)

Next to financial benefits as a second income source, HCPs were incentivised through the aspect of flexible work hours and workplace independence, which enable them to take calls at home and while travelling. Two of the interviewees were mothers staying at home, and they stressed how the telemedicine system enabled them to continue to practice their profession, while staying at home with their children. Whereas another HCP reported that the formal telemedicine application helped him to organize his work as it offered the possibility to consult patients in the evening conveniently from home.

"Then just after working I can go home and be with my family." (HCP 14)

However, the adoption of intended telemedicine system was still at an early age, and our study indicates rising tensions that might morph over time into contradictions. Currently HCPs tend to be logged in all the time, so that online consultation requests present an interruption of their face-to-face consultations. Additionally, HCPs sacrifice their private time at home, through their constant accessibility. Some HCPs were considering opening up their own private practices once they acquired a certain patient base through the intended telemedicine application. In the longer term the activity systems of private hospitals might be affected, if patients contact HCPs directly through the application and skip the hospitals' registration fee. These are just indications of tensions that might cause new contradictions of the second order – between the central activity and other activity systems.

4 Discussion

4.1 Overview

While most telemedicine applications studied are purposely intended by an institution, in our case of Sri Lanka's HCPs adoption and use of telemedicine, we identified an emergence of an improvised telemedicine system, which was characterised by an open access, simple usability and unstructured nature, not

being governed or owned by one organization. This self-emerging system facilitated HCPs-patients technology mediated engagement through opening up a new and already familiar communication channel for the interaction between HCPs and patients. Through HCPs accounts we traced their motivations to switch to the intended (developed and managed by an organization) telemedicine system. Addressing the research questions, our findings are examined through the lens of activity theory (Engeström 1987), focusing on HCPs motivations, social norms, contradictions within the activity system and how technology design addressed these contradictions.

4.2 Object's motivation to engage in the activity

In our case study, we identified that contradictions in the existing activity system led to new motivational drivers resulting in an adjustment of the subjects' (HCPs) motivation. HCPs were motivated by interconnected, intrapersonal and contextual (external) factors to use telemedicine. Their intrapersonal motivations were: to improve patients' care (e.g. by saving patients travel time, faster report consultations and better accessibility), maintain doctor-patient relationship and patients' custom. In addition HCPs expressed the desire for flexibility in working practices (e.g. being able to work from home), maintaining (some level of) control over privacy and work-home balance. Those motivations were differently facilitated by the two types of telemedicine used (improvised and intended). Contradictions arising from using the improvised telemedicine application led to additional motivating factors to use the intended telemedicine system. Thus, financial incentives within the intended telemedicine system played an important role, underpinned by the improvised telemedicine contradictions of revenue losses.

Motivations for the adoption of a new technology mediating an activity are affected by cultural-historical context, while ecological boundaries determine it (Bertelsen and Bødker, 2003). Contextual elements, referred to in activity theory as norms and rules, affected HCPs (the subject) motivation throughout the process of using the two telemedicine systems. For example, evolving norms (patients "right" to be able to contact HCPs permanently) demanded a certain behaviour from HCPs and, intertwined with other intrapersonal factors, motivated HCPs to use telemedicine. The following section discusses how rules and social norms shaped and in turn were shaped by the use of telemedicine, and how they affected HCPs motivations to use it.

4.3 Norms and rules mediating the activity

There is no one established definition of norms, however scholars have argued that when considering influence of social norms on behaviour we should distinguish between descriptive norms (what *is*, i.e. what others typically do, and hence what appears to be sensible to imitate) and injunctive norm (what *ought to be done*, i.e. what constitutes morally approved or disapproved behaviour) (Cialdini et al. 1990).

Our research shows that HCPs were influenced by both descriptive social norms (e.g. that others shared their personal telephone number) and injunctive norms (e.g. of what a good care means). HCPs in the private sector in Sri Lanka mentioned social norms influencing their own willingness to hand out their personal phone number to patients, provide free consultations and privately engage with patients. This development towards such collective expectations of patients started through an individual HCP's action to hand out his/her private telephone number to patients (in the private sector), and this in time has led to emerging new social norms. HCPs described that their role had become 'a personal service provider'. The relationship between HCPs and patients was based on trust. HCPs realized patients' trust was strongly influenced by the possibility to access their HCPs in emergencies and on-demand. The literature has shown that social values influence the decision making process of patients in their selection of their HCPs of trust (Kin & Han, 2009). HCPs using the improvised telemedicine system on a smartphone lost their private time and work-life balance (Duxbury and Smart, 2011), due to constant accessibility. Communication via social apps caused liability concerns (due to lack of record keeping, non-legal prescriptions given out, and lack of security). Attempts of HCPs to withdraw from the expectations of patients led to patients switching HCPs.

The telemedicine system has been designed to allow flexibility to reflect social norms (rather than organizational rules – see Engeström (1987) - due to the nature of the healthcare sector in this case) and at the same time has subtly influenced those norms. Thus, the intended system allowed HCPs not to charge for a consultation, when they felt it was not congruent with social norms (e.g. when physical examination was needed). At the same time, social norms were not set in stone and with each new technology mediating the activity (a phone, a smart phone with apps, the intended telemedicine system) new social norms have evolved (e.g. it was becoming acceptable to charge for tele-consultations).

4.4 Contradictions in the existing activity system

Engeström (2001) states that contradictions play an essential role in provoking development though change in human activity systems. Our case study exemplifies the importance of contradictions and “innovative attempts to solve them” (Hasu and Engeström 2000, p. 65), through showing the emergence of an improvised telemedicine system and the shift towards an intended telemedicine application. Our case shows that norms and rules can manifest - as Karanasios (2018) suggests - contradictions temporarily, till the activity system advances.

While HCPs were subject to a social norm to disclose to patients their private phone numbers and provide free consultations, patients (as consumers and income providers for HCPs) could easily take advantage of their superior position. Furthermore, this confirms the evolving nature of contradictions over time within their historical reference (Hasu and Engeström 2000). Our study suggests that subjects, once personally affected by the contradictions, use the easiest solution to resolve disturbing contradictions within their activity. Karanasios and Allen (2014) reveal that subjects use advanced mediating tools to overcome contradictions. We discovered the same phenomena, as the design and technical features of the mediating tool met HCPs’ need to overcome social norms and pressure by the community to resolve contradictions in their work practices. The dynamic nature of objects, adapting to different activities and subjects leads to a (temporary) solution till new contradictions find manifestation and affect the activity system (Engeström 1990). In our case study, the HCPs adopted the intended telemedicine system, as it solved contradictions within the previous system. However, solving a contradiction may lead to emergence of multiple new contradictions, different in their nature (Engeström, 1999). Our study indicates that, in time as the use of telemedicine consultations increases, the pressure on the HCPs’ time will intensify, and conflicts between their different roles (e.g. as a doctor in a hospital and as a tele-consultant) may arise.

Thus, the essential questions related to the adoption of a new technology, competing with an existing one are: Which mediating technology better facilitates solving the existing contradictions? Who will be the major benefactor of the new arrangements and what new contradictions may arise from the use of the new technology?

4.5 Technological characteristics

The design of the intended telemedicine application addressed HCPs activity systems’ contradictions by providing on/off status indication, ability to respond to patients via an integrated messaging and video call system, an integrated payment, prescription and feedback system. An activity log and a cloud-based patient’s history storage addressed HCP’s concerns about liability. The intended system allowed HCPs to behave in a way that reflected the accepted norms for a private face-to-face consultation, to charge for their consultation when diagnosis or help could be given.

While the use of telemedicine for consultations was not new, the intended application, in contrast to the emergent improvised telemedicine system, addressed various historically evolved and experienced problems HCPs faced, providing conditions for its sustained use. Addressing contextualised and historically evolved contradictions should be an essential point of consideration for the design within the development of any HCI technology. Our study shows that characteristics within the intended telemedicine application addressed specific pain points that HCPs experienced as contradictions within their work

activities whilst using social messaging application, but we also indicate that the new (intended) system may result in new contradictions. Because objectives and motivations are dynamic, the HCI design of the telemedicine application requires constant adjustments to accommodate evolving activity systems, a point also made by Saigi-Rubió *et al.* (2016).

We support the position of “activity-centric perspective of how users use artifacts” (Tchounikine, 2017, p. 162) for the appropriate technological design of telemedicine systems, and we place emphasis on contextual elements, specifically norms and rules within a given society, community, or organisation. Hence, the relevant question to ask when designing technologies is: Who are the (potential) users of the technology being developed and how does the technical design support their goal achievement by solving contradictions in the existing activity system?

5 Conclusion

Drivers of and barriers to telemedicine adoption have been extensively discussed in the literature (Darkins and Cary 2000; Dorsey & Topol 2016; Miscione 2007; Perednia and Allen 1995; Saigi-Rubió *et al.* 2016; Saliba *et al.* 2012; Segrelles-Calvo 2015; Thapa and Sein 2018; Xue 2015). However, most case studies are concerned with purposely designed telemedicine systems, often intended to provide care to remote populations.

Major contributions of this study stem from its historical perspective based on HCPs accounts of their use of the emergent, improvised telemedicine application and their transition to the intended, specialised telemedicine. We illustrate applicability of a socio-technical perspective to a study of telemedicine use by depicting complexities of a human-technological interaction, with a focus on HCPs work.

Generalising from our case study we suggest that: a) objects’ motivations depend on intrapersonal and contextual elements, b) contradictions in the activity system are an important driver for change and can stem from social norms, as well as adoption of a new mediating technology, c) social norms are essential contextual elements with different manifestations (Engeström, 1987; Karanasios, 2018), stimulating or hindering change.

We show how contradictions in the activity system mediated by improvised telemedicine were resolved by the intended telemedicine application and how this motivated HCPs to adopt it. We discuss that HCPs felt not only that the intended telemedicine system was easy to use, but more significantly perhaps, that it fitted with their working life, responded to explicit intrapersonal needs (for flexibility, maintaining control and privacy, building up health practice, financial rewards, etc.), was congruent with social norms in Sri Lanka (e.g. maintaining patients relationship of trust through accessibility) and its regulatory requirements (e.g. validity of electronic prescriptions and patients records).

Based on our research findings we propose that the designers of telemedicine systems need to consider: (a) identification of objects’ motivations to engage in the activity mediated by telemedicine, (b) norms and rules mediating the activity, (c) contradictions in the existing activity system, and (d) technological characteristics of the application. To stimulate its adoption, the new technology should help to address contradictions in the existing activity system, be congruent with social norms, whilst offering possibility of influencing social norms that are a source of contradictions. It is essential to consider historical development of the system’s context to design its interface, respecting the danger of over-emphasising specific conflicts (Karanasios and Allen 2014).

This study concentrated on activity systems involving HCPs. Further studies could research potentially interrelated contradictions and congruencies, arising from different activity systems involving telemedicine application providers, patients, healthcare service providers, clinical institutions and governmental regulators.

References

- Agarwal, R.; Gao, G.; DesRoches, C. and Jha, A. K. (2010): The Digital Transformation of Healthcare. Current Status and the Road Ahead. *Information Systems Research* 21 (4), pp. 796–809.
- Allen, D.; Karanasios, S. and Slavova, M. (2011): Working with activity theory. Context, technology, and information behavior. *Journal of the American Society for Information Science & Technology* 62 (4), pp. 776–788.
- Beaudry, A. and Pinsonneault, A. (2005): Understanding user responses to information technology. A coping model of user adaptation. *MIS Quarterly* 29 (3), pp. 493–524.
- Bertelsen, O.W. and Bødker, S. (2003): Activity Theory, Chapter 11, in Carroll, J.M. (Ed.), *HCI models, theories, and frameworks: Toward a multidisciplinary science*, Morgan Kaufmann, pp. 291–324.
- Bærentsen, K. and Trettvik, J. (2002): An activity theory approach to affordance. In O Bertelsen, S Bødker & K Kuuti (eds), Nordichi 2002. Proceedings of the Second Nordic Conference on Human-Computer Interaction. pp. 51-60.
- Blunden, A. (2010): *An Interdisciplinary Theory of Activity*, Brill, Leiden.
- Bødker, S. (1989): A Human Activity Approach to User Interfaces. In *Human-Computer Interaction* 4 (3), pp. 171–195.
- Boudreau, M.C. and Robey, D. (2005): Enacting Integrated Information Technology. A Human Agency Perspective. *Organization Science* 16 (1), pp. 3–18.
- Braun, V. and Clarke, V. (2006): Using thematic analysis in psychology. *Qualitative Research in Psychology* 3 (2), 77- 101.
- Caronna, C. A. (2012): Why Use Qualitative Methods to Study Health Care Organizations? Insights from Multi-Level Case Studies. In Ivy Lynn Bourgeault, Robert Dingwall, Raymond G. de Vries (Eds.): *The SAGE handbook of qualitative methods in health research*. With assistance of Ivy Lynn Bourgeault, Robert Dingwall, Raymond G. de Vries. Los Angeles: SAGE Publications Inc, pp. 71–87.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, pp. 1015–1026.
- Clemmensen, T.; Kaptelinin, V. and Nardi, B. (2016): Making HCI theory work. An analysis of the use of activity theory in HCI research. *Behaviour & Information Technology* 35 (8), pp. 608–627.
- Cornet, V.; Voidsa, S. and Holden, R. J. (2018): Activity Theory Analysis of Heart Failure Self-Care. *Mind, Culture, and Activity* 25 (1), pp. 22–39.
- Davis, F.D. (1989): Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 3 (3), pp. 19–40.
- Darkins, A. W. and Cary, M. A. (2000): *Telemedicine and telehealth. Principles, policies, performance and pitfalls*. London: Free Association Books.
- Denzin, N. K. (1978): *Sociological methods. A sourcebook*. 2d ed. New York: McGraw-Hill.
- Ditsa, G. E. and Davis, J. (2000): *Activity Theory as a Theoretical Foundation for Information Systems Research*. Idea Group Publishing: *Challenges of Information Technology Management in the 21st Century*.
- Dorsey, E. R. and Topol, E. J. (2016): State of Telehealth. *The New England Journal of Medicine* 375 (2), pp. 154–161.
- Duxbury, L. and Smart, R. (2011): The ‘myth of separate worlds’: an exploration of how mobile technology has redefined work-life balance. In *Creating Balance* (Kaiser, S.; Ringleter, M.J.; Eikhof, D.R. and Cunha, M.P. Eds) Springer-Verlag, Berlin.
- Edirippulige, S.; Fujisawa, Y.; Marasinghe, R. B.; Jiffry, M.T.M.; Smith, A. C. and Wootton, R. (2007): Medical Students’ Knowledge in E-Health in Developing Countries. A Survey in Sri Lanka. New York: IEEE. In *e-Health Networking, Application and Services, 2007 9th International Conference on*, pp. 95–99.
- Engeström, Y. (1987): *Learning by Expanding. An Activity-Theoretical Approach to Developmental Research*. Finland: Helsinki: Orienta-Konsultit.

- Engeström, Y. (1990): Learning, working and imagining. Twelve studies in activity theory. Helsinki: Orienta-Konsultit Oy.
- Engeström, Y. (1999): Expansive Visibilization of Work. An Activity-Theoretical Perspective. In *Computer Supported Cooperative Work (CSCW)* 8 (1), pp. 63–93.
- Engeström, Y. (2001): Expansive Learning at Work. Toward an activity theoretical reconceptualization. *Journal of Education and Work* 14 (1), pp. 133–156.
- Fernando, D. (2000): Health care systems in transition III. Sri Lanka, Part I. An overview of Sri Lanka's health care system. *Journal of Public Health Medicine* 22 (1), pp. 14–20.
- Fichman, R. G.; Kohli, R. and Krishnan, R. (2011): The Role of Information Systems in Healthcare. Current Research and Future Trends. *Information Systems Research* 22 (3), pp. 419–428.
- Gianchandani, E. P. (2011): Toward smarter health and well-being. An implicit role for networking and information technology. *Journal of Information Technology* 26 (2), p. 120.
- Greenhalgh, T.; Wherton, J.; Sugarhood, P.; Hinder, S.; Procter, R. and Stones, R. (2013): What matters to older people with assisted living needs? A phenomenological analysis of the use and non-use of telehealth and telecare. *Social Science & Medicine* 93 ©, pp. 86–94.
- Hasu, M. and Engeström, Y. (2000): Measurement in action. An activity-theoretical perspective on producer–user interaction. *International Journal of Human - Computer Studies* 53 (1), pp. 61–89.
- Helsel, B.; Williams, J.; Lawson, K.; Liang, J. and Markowitz, J. (2018): Telemedicine and Mobile Health Technology Are Effective in the Management of Digestive Diseases. A Systematic Review. In *Dig Dis Sci* 63 (6), pp. 1392–1408.
- Ilyenkov, È. V. (1982): The dialectics of the abstract and the concrete in Marx's capital. Moscow: Progress Publishers.
- Kaptelinin, V. and Nardi, B. (2018): Activity Theory as a Framework for Human-Technology Interaction Research. In *Mind, Culture, and Activity* 25 (1), pp. 3–5.
- Karanasios, S. (2018): Toward a unified view of technology and activity. In *Information Technology & People* 31 (1), pp. 134–155.
- Karanasios, S. and Allen, D. (2014): Mobile technology in mobile work. Contradictions and congruencies in activity systems. *European Journal of Information Systems* 23 (5), pp. 529–542.
- Karanasios, S. and Allen, D. (2018): Activity theory in Information Systems Research. *Information Systems Journal* 28 (3), pp. 439–441.
- Kim, B. and Han, I. (2009): What drives the adoption of mobile data services an approach from a value perspective. *Journal of Information Technology* 24 (1), pp. 35–45.
- Klecun-Dabrowska, E. and Cornford, T. (2002): The organising vision of telehealth. Proceedings of the Tenth European Conference on Information Systems, 6-8 June.
- Korpela, M.; Soriyan, H. A. and Olufokunbi, K. C. (2000): Activity analysis as a method for information systems development. General Introduction and Experiments from Nigeria and Finland. *Scandinavian Journal of Information* 1 (12), pp. 191–210.
- Kuutti, K. (1996): Activity Theory as a Potential Framework for Human-Computer Interaction Research. In Bonnie A. Nardi (Ed.): Context and Consciousness. Activity Theory and Human-Computer Interaction: Massachusetts Institute of Technology, pp. 17–44.
- Leont'ev, A. N. (1978): Activity, Consciousness, and Personality. NJ: Englewood Cliffs: Prentice-Hall.
- Middleton, C.; Scheepers, R. and Tuunainen, V.K. (2014): When mobile is the norm. Researching mobile information systems and mobility as post-adoption phenomena. *European Journal of Information Systems* 23 (5), pp. 503–512.
- Miles, M. and Huberman, M. (1994): Qualitative Data Analysis: An Expanded Sourcebook. London: Sage Publications.
- Miscione, G. (2007): Telemedicine in the Upper Amazon. Interplay with Local Health Care Practices. *MIS Quarterly* 31 (2), pp. 403–425.
- Nardi, B. A. (1995): Context and Consciousness. Activity Theory and Human-computer Interaction. Cambridge, MA, USA: Massachusetts Institute of Technology.
- Nowell, L. S.; Norris, J. M.; White, D. E. and Moules, N. J. (2017): Thematic Analysis. Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods* 16 (1), 1-13.

- Owen, C. A. (2001): The role of organisational context in mediating workplace learning and performance. *Computers in Human Behavior*, 17 (5–6), pp. 597–614.
- Perednia, D. and Allen, A. (1995): Telemedicine Technology and Clinical Applications. *JAMA: the Journal of the American Medical Association* 273 (6), pp. 483–488.
- Pope, C. and Mays, N. (2006): Qualitative methods in health research. In Catherine Pope, Nicholas Mays (Eds.): *Qualitative research in health care*. 3rd ed. Oxford: Blackwell Publishing Ltd, pp. 1–11.
- Robey, D. (1981): Computer information systems and organization structure. *Communications of the ACM* 24 (10), pp. 679–687.
- Roth, W.-M. and Lee, Y.-J. (2007): “Vygotsky’s Neglected Legacy”. Cultural-Historical Activity Theory. *Review of Educational Research* 77 (2), pp. 186–232.
- Saliba, V.; Legido-Quigley, H.; Hallik, R.; Aaviksoo, A.; Car, J. and McKee, M. (2012): Telemedicine across borders. A systematic review of factors that hinder or support implementation. *International Journal of Medical Informatics* 81 (12), pp. 793–809.
- Saigi-Rubió, F.; Jiménez-Zarco, A. and Torrent-Sellens, J. (2016): “Determinants of the intention to use telemedicine. Evidence from primary care physicians. *International Journal of Technology Assessment in Health Care* 32 (1-2), pp. 29–36.
- Sam, C. (2012): Activity Theory and Qualitative Research in Digital Domains. *Theory Into Practice* 51 (2), pp. 83–90.
- Segrelles-Calvo, G.; Chiner, E. and Fernández-Fabrellas, E. (2015): Acceptance of Telemedicine Among Healthcare Professionals. *Archivos de Bronconeumología (English Edition)* 51 (12), pp. 611–612.
- Spinuzzi, C. (2008): *Network. Theorizing knowledge work in telecommunications*. Cambridge, New York: Cambridge; New York : Cambridge University Press.
- Tchounikine, P. (2017): Designing for Appropriation. A Theoretical Account. *Human–Computer Interaction* 32 (4), pp. 155–195.
- Thapa, D. and Sein, M. K. (2018): Trajectory of Affordances. Insights from a case of telemedicine in Nepal. *Information Systems Journal* 28 (5), pp. 796–817.
- Walker, J.; Whetton, S. (2002): The diffusion of innovation. Factors influencing the uptake of telehealth. *Journal of Telemedicine and Telecare* 8 (Suppl 3), 73-75.
- Watson, L.; Pathiraja, F.; Depala, A.; O’Brien, B. and Beyzade, S. (2016): Ensuring safe communication in health care. A response to Johnston et al. on their paper “Smartphones let surgeons know WhatsApp: an analysis of communication in emergency surgical teams”. *The American Journal of Surgery* 211 (1), pp. 302–303.
- Woll, A. and Bratteteig, T. (2018): Activity Theory as a Framework to Analyze Technology-Mediated Elderly Care. In *Mind, Culture, and Activity* 25 (1), pp. 6–21.
- Xue, Y.; Liang, H.; Mbarika, V.; Hauser, R.; Schwager, P. and Kassa G. M. (2015): Investigating the resistance to telemedicine in Ethiopia. *International Journal of Medical Informatics* 84 (8), pp. 537–547.