Proceedings for Research-in-Progress Papers

The Future of Digital Work: The Challenge of Inequality

IFIP Joint Working Conference

10-11 December, 2020

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8.2 Information Systems and Organizations

9.1 ICT and Work

9.4 Societal Implications of Computers in Developing Countries
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Digital technologies, so much more than mere ‘tools,’ seep into and shape our everyday lives in unprecedented, hence uncharted, manners.

Digitalisation is both an enabler and multiplier for far-reaching transformation of private and professional lives, at individual, community, organizational, industry-wide and societal levels. However, digital transformation also raises challenges of better or worse quality of life and work, social inclusion/exclusion, (non)discrimination, (un)employment, and civic (non)participation.

Digitalisation plays a key role in the way we live our lives and is transforming what it means to work. From new ways of restructuring existing work including an increasing ability to work from virtually anywhere, to collaborating across geographical regions. At the same time, job-matching sites are changing and expanding the way individuals look for work and how companies identify and recruit talent. Independent workers are increasingly choosing to offer their services on digital platforms challenging conventional ideas about how and where work is undertaken. Advances in robotics, artificial intelligence and machine learning are ushering a new age of digitalisation and automation as machines match or outperform human performance in a range of work activities, including ones requiring cognitive capabilities. Digitalization will have far-reaching impact on the global workforce involving independent contractors, freelance gig workers, fissured work and outsourced services. The changing nature of work through digital platforms is leading to new ways of control, coordination and collaboration within and between organisations and individual workers.

The changes will not only challenge the existing work models, but also influence wages, income and skills. Major transitions lie ahead and could lead to income polarisation and inequality. Technology hubs and online work centres tend to be located in urban areas and operate in English, encouraging investment by policy makers in infrastructure such as roads and transport while neglecting to support the more traditional sectors such as agriculture or artisanal industry in rural areas. This implies digitalization is deeply implicated in the changes required to address our global challenges such as the United Nations Millennium Development Goals for health, education, wellbeing and security or as put by Thomas Piketty (2014),* the challenges of inequality*.

The notion of the ‘digital divide’ between the global South and North, while much discussed in academic and policy literature raises numerous issues as a result of the changing nature of work (Allen 2017; Averrou and Walsham 2017; Roberts et al. 2014). Differences in opportunities are presented to individuals, communities, or organisations by technologies, mainly as a consequence of deficits in access to the technologies, capacity to use them, relevant contextual content and appropriate application. How then does inclusion into the digital economy operate? Inclusion is not just a mirror image of exclusion, and that to achieve inclusion, it is not sufficient to curb exclusion mechanisms, but to enhance positive measures of inclusion. As Herbst (1974) put it to underscore the social significance of work, “the product of work is men”. However, participation in work-life is highly varied across a number of dimensions including gender, developed vs developing regions, temporal vs permanent employment, migrant workers, entrepreneurship opportunities. The dichotomy

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between online and ‘real’ life is dismantling, making our online behaviour embedded into rather outside of our everyday lives (Faraj et al. 2011). Digital online platforms are vehicles for community building and sharing, for instance in the form of open source or crowdsourcing. Simultaneously, the traces we willingly if not always consciously leave of our online lives is the source of tech companies’ harvesting of behaviour data for their own commercial purposes (Zuboff 2019).

The IFIP Working Groups 8.2, 9.1 and 9.4 have a long history of supplementing the dominant technology-push accounts of digitalization with socially informed ones. This joint conference brings together these three groups for the much-needed analysis of the social preconditions, engagement and consequences of digitalization visibility. With increasingly vocal proclamations of the consequences of digitalisation, there is a need for socially informed analysis of the uptake of digitalisation for work and everyday life in the manner traditionally promoted by all three of the IFIP working groups. The conference seeks to stimulate and encourage critical discussion of potential shifts in the changing world of work, organisations and its implications in the developing world.

The venue for the joint IFIP conference is Hyderabad, India. Hyderabad and Bangalore are key manifestations of the ongoing struggle of the Global South to tap into, not to say drive, the new digital economy.

The conference will facilitate a reflection and discussion about the experiences with India’s efforts so far. With a population exceeding 1.2 billion, India is important in itself but even more so as an early and ambitious example of engaging in the value generation of the digital economy.

For the joint IFIP WG 8.2, 9.1 and 9.4 conference in 2020 we are seeking rigorous and relevant empirical (qualitative and quantitative) studies as well as conceptual and theoretical papers apprising digitalisation in terms of the future of work, organizing and development.

We solicit full research papers with maximum length of 8000 words. The submission site will open on March 27 and close on May 18, 2020.

Notification about acceptance will be sent on July 30. The accepted full papers will be included in the proceedings book published by Springer.

We also solicit research-in-progress papers in the form of extended abstracts, with a maximum length of 2000 words plus references. The submission deadline for these is September 10, with notification of acceptance on October 20. These papers will be worked on in thematically grouped Paper Development Sessions in a roundtable format. They will not appear in the main conference proceedings, but will be listed in the program and published in separate PDW proceedings prior to the conference.

If coming from a developing country as classified by the UNESCO, authors with accepted papers can apply for travel grants.

References:


IFIP Joint Working Conference 2020


## Program-at-a-Glance

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**Note:** All times are in IST (GMT+5:30) unless otherwise specified.
Keynote I

Overcoming Gender Inequality in the Digital World

Renana Jhabvala
Self employed Women’s Association

I thank the International Federation for Information Processing (IFIP) for inviting me to this conference and would like to commend it for taking up the difficult task of addressing issues of digital inequality. There are many forms of digital inequality, which I am sure the conference will address. However in this talk I would like to focus on a particular form that is gender inequality in the digital world.

I come from SEWA, Self employed Women’s Association, which started as a trade union in India working with women in the informal sector and has developed into a family of organisations which include all kinds of social enterprises and direct capacity building reaching out to SEWA’s 1.7 million members for a variety of functions, from fighting for rights, especially economic rights, to delivering services such as microfinance, health care, child care and helping women to form social enterprises to access the markets. The women who are members of SEWA include rural women such as small farmers, agriculture workers livestock producers and urban workers such as domestic workers, street vendors and of course many more trades. These women constitute over 90% of the female workforce in India. And SEWA is confined not only to India but has also founded international networks and federations such as HomeNet, the international network of homebased workers, StreetNet, the network of street vendors and the International Domestic Workers Federation. These are the women I am going to be talking about today. They are the women at the base of the economic pyramid and so already face social as well as economic inequality, which are now compounded by digital inequality. Digital inequality is both a consequence of the socio-economic inequality, as well as a cause to deepen these other inequalities.

In order to tackle digital inequality, it is really important that we understand the degree of inequality, and are able to measure it. There are many different estimates of gender digital inequality and it becomes quite difficult to actually put all these figures together to come to one conclusion. For example the Kantor IMRB study says that only 30% of women use internet services and 38% use mobile phones as opposed to 71% of men, whereas the a GSMA study says only 16% of women were using internet services. The Pew centre tells us that 34% of men and 15% of women have smartphones, whereas the IAMAI (internet and mobile association of India tells us that double the number of men use the internet as compared to women. There are many more studies which I will not quote here. But looking at the welter of statistics we have, it is obvious that we need reliable figures on the degree of inequality.

Regardless of the exact numbers, it is obvious that there is a high level of difference between men and women on the use of the most common digital assets such as mobile phones, smartphones and all means of accessing the internet. There is no existing data, but observation shows that these differences are even higher among the families who are at the base of the economic pyramid.

The reasons for these differences are well known and mirror the socio-economic inequality that exists in the world in general and in India in particular. Women have lower levels of education,
and especially among older women, a higher level of illiteracy; patriarchal mind-sets which do not allow women freedom to explore the outside world; product contents on digital devices which are more male oriented; a fear of online harassment; lack of digital literacy; a reluctance to spend family funds on women-- when there is a smartphone in the house, it is usually the men who use it.

Although the digital gap affects both the social and economic aspects of a woman’s life, here I would like to focus more on women’s economic status, as women are particularly disadvantaged economically. According to the National Sample Survey (NSS), the female labour force participation rate is only 27%, and women earn, on the average, about 50% of a man’s earnings. If women are to reduce this gap, they need access to digital assets. Digital Assets can be defined as- a) digital infrastructure, tools, hardware or devices, for example, mobile phones, personal computers, digital kiosks etc., that enable access to digital technology, as well as b) digital platforms, processes or entities, for example, e-marketplace, mobile banking, information channels, digital documents, that help access opportunities of gainful employment and entrepreneurship. In other words, digital assets are both tools and processes that facilitate access to information, resources, and opportunities for employment, and better income.

Digital assets do not, however, exist on their own, they need to be embedded into the larger system. An important part of our economy, indeed of our daily life, is the financial sector, and women need to be part of it, as in today’s world, money is the oil which keeps life running. Worldwide there is inequality in financial inclusion although financial inclusion has been a priority in India, and the Government made a big effort to open bank accounts for all. However, with the widespread use of debit and credit cards, and the introduction of fintech, financial inclusion has acquired a digital aspects which excludes most women. Our experience has shown that with some digital literacy women can overcome these barriers and begin to use digital tools with ease. SEWA has trained digital sakhis who work mainly in rural areas and train women (and also men when they request it), in how to use ATM machines, how to access their bank accounts through Bhim and other applications and how to apps like Paytm for all kinds of payments. These digital sakhis are not only highly regarded in their villages, but they themselves perform many digital services for the villagers, thereby earning a living.

Many of the digital sakhis in different states in India have attached themselves to banks as business correspondents and are able to provide important banking services. During the COVID-19 crisis and lockdown for example, most people were unable to access banks due to lack of transport, and it was these women who reached families with their pensions, with cash relief from the Government and helped them access their savings.

Over 65% of India’s population still lives in villages, and a large proportion of them is dependent on agriculture. In fact, about 75% of rural working women are engaged in agriculture. There is a feminization of agriculture as men move to more lucrative employment, or migrate to urban areas, women have been taking care of the farms and the livestock. Digitization has played an important part in imparting information and in marketing of crops, vegetables and milk, and the digital gender gap means that these women farmers tend to get left behind with lower productivity and lower prices for their produce. Our interventions in these areas have shown that agriculture can be made more productive. Firstly, we have collaborated with meteorological department to bring women weather updates on their mobile phones, which enables them to decide when to plant, when to give water, when to harvest etc.
Second we have linked them with available apps and websites which give the prices on that day in the local mandis. This has made a big difference as mostly women farmers tend to sell their produce to local traders, and by knowing the price at the mandi they can obtain a fair price. Thirdly, we have an IVR system whereby they receive messages and small talks from experts about existing agricultural practices in their area, which can increase their yield.

In both urban and rural areas, many women are self employed micro entrepreneurs, and often the whole family is involved in the enterprise. They need to reach the market to sell their products. Marketing is getting increasingly digitised too, many of us order our food, clothes and other items from marketing platforms such as Amazon, Big Bazaar, Swiggy and many many more. These too, are causing increasing gaps, as the goods which are supplied on these platforms tend to be from bigger enterprises which are controlled by men. Women’s enterprises tend to be small, often micro, and they are unable to access these platforms. However many women microentrepreneurs have found a way around this by using free apps such as Whatsapp and Facebook and have created local marketing channels through which they have been able to service their customers. Some platforms have been able to reach out to women who provide services, for example Urban Clap has on-boarded beauticians who will offer personalised services in people’s houses. Other services include child care, domestic work and old age care.

India is a young country, with about one-third of its population being below the age of 24 years. Girls education has grown by leaps and bounds, primary education is near universal, and although girls lag behind boys in middle, secondary and college education, this too has grown tremendously for girls in the last two decades. These girls are better prepared to access the internet than their previous generation. However, for young girls there is an additional barrier. Their families are over protective, and do not want to allow them access to the internet or to smartphones. We have found that young girls often have to depend on their brothers even to get important information like their own exam results.

When young educated girls are able to overcome the barrier of family they use it to enhance both their knowledge and their opportunities. For example, some girls earn extra money by doing tuitions, having learnt on how to teach others through Youtube videos; others take designs off the internet to stitch clothes for themselves and others; still others use Youtube to learn to dance or sing or cook. Some young girls have learnt Kobo, a data collection digital tool and collect data for research agencies; others help their families and neighbours to book train tickets or order products off platforms. Access to the internet can tap the huge potential that exists in these young, first generation educated girls.

2020 has been the year that the menace of COVID-19 has hit the whole world, leading to lockdowns, economic slowdowns and social distancing. During this year digital tools have been perhaps the most important way that people have been able to connect with one another. Women have been frontline workers using tools like Whatsapp and IVR to reach health messages to large numbers, to ensure Government benefits of food and cash were reaching those in need, to reach nutrition and immunization to children, to ensure pregnant women got to hospital and in general trying to make life for people a little easier during one of the most difficult times.

Society will not progress if half the world gets left further and further behind due to digital inequalities. Digital assets in the hands of women will not only empower them but will add to employment, GDP and an enrichment of society as a whole. This inequality must be overcome.
Keynote II

Riskscapes and the scaling of digital innovation: Trajectory dynamics of mobile payments in times of crisis

Michael Barrett
Cambridge Judge Business School
University of Cambridge
Cambridge CB2 1AG

Keywords: Digital Innovation, Trajectory, Dynamics, Scaling, Riskscapes, Climate change, Mobile Payments, Crisis

Over the last decade, a wave of crises – financial crisis, climate change, and COVID-19 pandemic, antiracism movement - have amplified and made visible the challenges of inequality in our society and global economy. In the West, the scale of covid-19 pandemic has made visible the inequality in access to healthcare by ethnic minorities. For example, black Americans are 3.5 times more likely to develop COVID-19 and to have a poor outcome from the infection while Latino Americans are almost twofold higher in that probability. In a developing countries context, the development and scaling of mobile payments have been deployed to address challenges of financial exclusion (Oborn, Barrett, Orlikowski and Kim 2019) to reduce inequalities associated with accessing financial markets. However, the trajectory of mobile payments as it scales across different geographical places is not uniform in addressing inequality of financial exclusion. Mobile technology are also being used to enable carbon payments to farmer networks in developing countries who are participating in reforestation programmes to help address the riskscape associated with the crisis of climate change. We propose that the conceptual merging of riskscapes and scaling are useful in conducting practice-based studies which seek to contribute to our understanding of the challenges of inequality in contemporary contexts.

In this talk, I will explore the challenges (and opportunities) of using mobile payments to promote financial and social inclusion, as well as in supporting climate action in crises of sustainability. The role of mobile payments as a digital innovation in promoting economic and social development has garnered considerable attention (Aker and Mbiti 2010) over the last decade. Studies have examined the quality of healthcare (Hoffman et al. 2010, access to financial services (Shamim 2007, Duncombe and Boateng 2009, Mas and Morawczynski 2009), amongst many other areas of deployment. A central focus of the digital innovation literature has been on the characteristic nature of convergence (across digital platforms) and generativity (associated with reprogrammability) in enabling different forms of innovation across time and in different contexts. Studies have noted the potential of user innovation and new capabilities being incorporated after initial design (Von Hippel 1988, Yoo et al. 2012) in scaling the digital innovation (Huang et al. 2017). At the same time, other studies (Orlikowski and Barrett 2014) have recognized that there may be significant challenges in the scaling of digital innovation in addressing financial exclusion across different contexts.

In examining the empirical phenomenon of scaling the deployment of mobile payments for financial inclusion we draw on the concept of trajectory dynamics (Oborn et al. 2019) to theorize the ways in which the innovation trajectory intermingles with and is transformed by
interactions with local trajectories in a specific place. We discuss how this concept can be used to explore the challenges in scaling mobile payments across similar yet distinct developing country contexts. In so doing, we build on the insight that phenomena are shaped by different trajectories that influence outcomes (Timmermans 1998), and suggest that place(s) has an important influence on the innovation trajectory (Oborn et al. 2019). Such trajectory dynamics emerge in and over time and place.

We discuss the wider implications of our findings for developing practice-based studies that explore the scaling of digital phenomena. Specifically, we suggest that the sociomaterial enactment of contemporary digital phenomena must account for the multiple, situated places where work is now being performed through emerging technologies, for example, the provision of correspondent banking services in remote locations (Leonardi et al., 2016). With respect to mobile payments, Oborn et al. (2019) adopts a sociomaterial practice perspective to understand how a digital innovation (mobile money) was transformed in multiple and unexpected ways as it moved from a specific locale of development (in the UK) to distant places of implementation and use (different countries in sub-Saharan Africa) where it interacted with multiple different local conditions and practices. This enactment over time and in multiple places reconfigured both the specific digital innovation as well as the conditions of possibility for financial inclusion. The study highlights that while digital innovations are transferable across contexts, it is the active engagement of the innovation with local conditions that matter for the specific accomplishments that are enacted in practice. These insights underscore the criticality of asking where, when, and how specific digital innovations are developed, implemented and engaged with on the ground.

We discuss the different enactments of scale of mobile money in Kenya and Tanzania which yielded different trajectory dynamics in these developing country contexts despite the similarities of geography (neighbouring countries in sub-Saharan Africa), and which were expected to yield a similar scaling dynamic (Orlikowski and Barrett 2014). Furthermore, we reflect on and discuss the scaling of digital innovations in addressing different risks. For example, in addition to addressing financial exclusion, mobile payments can enable social inclusion such as access to clean energy through business models that combine mobile loans and payments (e.g. M-Kopa). Furthermore, mobile money can help address climate change through the provision of carbon payments at scale across different places over time.

In addition to scaling, we suggest that practice-based studies should better account for riskscapes which focus on the consequenceality of risk to account for crisis in contemporary society. Risk is more than just a concept which helps to rationalize future gains and losses, but also a concept which performatively shapes practice and space. While phenomena such as climate change may well be global in extent, their impacts are spatially differentiated. Riskscapes include a scalar dimension of risk. More specifically, riskscapes recognize the mutually constitutive relations between risk and space and can be understood as socially produced ‘temporal spatial’ phenomena. They are temporal spatial phenomena, because they combine the material and practice components of risk and relate them to space. They link the material dimension of physical threats, the discursive dimension of how people perceive and communicate risks, and the dimension of agency, i.e. how people are dealing with risk. We suggest that riskscapes, like the nexuses of practice, are open and fluid, multiple and subjective. And they overlap, leading to the emergence of new combinations and dynamics of risk. Practice based studies which examine riskscapes should therefore account for connections between risk, meaning, practice, time and space (Mueller-Mahn, Everts, Stephan)
We propose that the conceptual merging of riskscapes and scale allows us to appreciate the consequentiality of risk in practice-based studies through its focus on the scalar negotiations of risk (Aadlers 2018). Empirically, we draw on ongoing research which examines how mobile money may provide carbon payments to scale farmer networks. These farmers in developing countries are participating in climate action efforts globally through the development of reforestation networks. In so doing they are participating together with large corporations in the West to help address climate change as a quintessential crisis of our times. The case study examines how farmer networks through their reforestation projects are providing carbon offsets for organizations in the West who are aiming to achieve carbon neutrality.

In these carbon sequestration projects, mobile money is an important mechanism by which farmers can receive carbon payments for trees planted. Moreover, our study shows how mobile payments are also integral to the organizing of farmer network meetings, and are a critical enabler to scaling sustainable growth across farmer networks over time. While the use of mobile payments is important for facilitating the disbursement of financial resources to farmers in a timely manner it is not necessarily sufficient for responsible scaling. There are challenges and risks to scaling the reforestation program responsibly. For example, as a bottom up partnership guided by the local subsistence farmers, there is a need to assure a commitment to core values by keeping the farmers vision and needs central while reinforcing local leadership. Our ongoing study is also exploring the risks and challenges of ensuring timely payments which depend on effective quantification strategies and capabilities on the ground while depending on the volatile and unpredictability of carbon markets which are at an early stage of development.

In addition to these conceptual developments on riskscapes and scaling, we reflect on the practical challenges of conducting practice-based studies to examine the scaling of digital innovations. Specifically, we discuss the challenges of conducting practice-based studies to examine the rapid scaling of the digital innovation deployed in different places and over time, and in times of crisis characterized by evolving riskscapes.

References


Full Papers: S1-S7

S1-B: The social significance of digital platforms
Surviving the Gig Economy in the Global South: How Cape Town Domestic Workers Cope
Boitumelo Lesala Khethisa, Pitso Tsibolane, and Jean-Paul Van Belle
Social Enablers and Constraints Related to the Publication and Use of Open Government Data in a Developing Country
Hubeidatu Nuhu, Jean-Paul Van Belle, and Marita Turpin
Attitudes toward and Experiences of Digital Labour in South Africa
Cuthbert Chidoori and Jean-Paul Van Belle

S2-D: Transforming healthcare
Power, Technology and Empowerment: A Case Study of Community Health Workers in India,
Priyanka Pandey and Yingqin Zheng
Practical Affordance: EMR Use Within Outpatient Consulting on Women’s Health,
Ayushi Tandon
Sustainability qualifiers of Health Management Information Systems implementation: case study of DHIS2 in India
Jyotsna Sahay, Sundeep Sahay, and Arunima Sehgal Mukherjee

S3-A: Innovation and entrepreneurship
Review of the Nexus between Trust and Respect in Entrepreneurs’ Information-Seeking Behaviour
Thao Orrensalo and Shahrokh Nikou
Entrepreneurs and ICT Technology in the Dzaleka Refugee Camp
Suzana Brown and Patience Desire
Perceptions of Rwanda’s research environment in the context of digitalization: reflections on deficit discourses
Pamela Abbott and Andrew Cox

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S3-G: The dark side of digitalisation
Digital technology for unmasking labour exploitation in supply chains
*Hannah Thinyane and Francisca Sassetti*

In Technology We Trust? Human Skills & Intermediaries in Digital Retail Banking
*Soumyo Das and Bidisha Chaudhuri*

The Five-dimensional Space of the Futures of Work: A View to 2030
*Erran Carmel and Steve Sawyer*

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Data and Network in Digital Work
Abstract. This article is about a longitudinal ongoing effort in Lao PDR to improve the Health Information System (HIS) through annual evaluations followed by identification of interventions for improvements. This process will be analysed with an aim to explore how practice and research can be synthesized through action research approaches [1] and to contribute to the field of information systems action research [2]. This article describes and analyses the cyclical process of interventions, trials, errors and successes within a framework of applying action research approaches in multi-stakeholder efforts of system strengthening at national scale in a developing country context. While the wider HIS is addressed in this process, our focus is on the efforts to strengthen the HIS for vaccinations and Mother and Child Health, which presents particular challenges related to data quality and problems of service coverage calculation, particularly in rural areas and target populations reached.

Keywords: Action research, Health Information Systems, Developing countries, ICT4D

1 Introduction

This article is about an action research project to carry out repeated evaluations of the Health Information System in Lao PDR with the aims to identify shortcomings and areas for improvement and on this basis, design for and initiate needed changes. The next round of evaluation will focus on the results of initiated changes and will suggest further improvements, which will then be evaluated in the next round in a cyclical process. This research-in-progress paper contributes to existing action research literature by presenting a new approach to carry out evaluation for improvement within an action research framework.

In describing the process under study, we highlight key innovations resulting from the evaluation for improvement approach, starting with transforming the Microsoft Excel based data reporting to database management of aggregate data using the District Health Information Software (DHIS2) platform, via integration with logistics systems to current initiatives for implementing case-based tracking.

2 Background

Under the framework of the health sector reform, the Ministry of Health (MOH) in Lao PDR approved the introduction of DHIS2 – a web-based, open source software for health information system (HIS) in early 2014 to replace the previous, Excel based
Health Management Information System (HMIS). By the end of 2017, the HMIS/DHIS2 collected HMIS aggregated data with 9 health programmes taking part and data from 100% of the public health facilities nationwide. The system has also started producing national health statistics reports on an annual basis beginning in 2015. This effort has brought HIS into a new high level of attention by policymakers, programme managers and development partners. Mother and Child Health (MCH) and Immunisation (EPI) programmes are the two national priorities, and their outcome indicators are on the national social development monitoring list. This provides additional reasons to share the data on the national HIS platform.

Immunisation data is one of the key pieces for proper monitoring of performance and the base for decision-making processes in the Immunisation Programme. Lao PDR had EPI coverages amongst the lowest in the region and the use of data was mainly for reporting, hence not being connected with effective intervention based on the reports made. EPI continued to use the Excel based reporting in parallel to DHIS2 for several years longer than the other programs (until 2018), despite a Ministerial Decree stating that all data should be integrated in DHIS2.

An important reason for the parallel reporting was that the two systems generated different results in which the DHIS2 based EPI report generated lower values and managers, health workers were kept unsure of which data source to use, let alone the burden of data collection and reporting at health facilities. There were several reasons identified by EPI for keeping a silo, parallel data systems:

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1 https://www.gavi.org/programmes-impact/country-hub/west-pacific/lao-pdr
2 HIS review report 2016, 2017 - Lao WHO/MOH
DHIS2/HMIS is designed to provide health facility service coverage while EPI needs population coverage of vaccination,

- There are missing components that the EPI programme requires: vaccines stocks; campaign data,
- There are multiple data quality problems.

Data collection in the EPI programme is complicated and data quality is a challenge. This is illustrated by the number of data collection tools shown in the figure, where each village under a health facility has one log book for writing up each immunisation and another book for MCH services. The effort was made to track the vaccination for each child through both the child’s record at their residence and a chain of records and consolidation of indicators back and forth in the facility hierarchy. This effort, however, has the side effects of compromising data quality, worsening it on the short term.

Methodology

While the area of focus of the evaluation is on quality and use of immunisation data, also other health program areas are included. The evaluation carried out in 2018 forms the basis for the case description and analysis, from which we look back at the evaluations in 2016 and 2017 and we look forward to the current situation, 2020.

The project aims at applying DHIS2 based interventions to improve issues that were identified by health information system assessment, in this case, the annual HMIS assessment. The assessments applied the same framework to ensure consistency and compatibility throughout the period 2016 - 2020:

- Legal and policy framework: data governance, coordination, legislation and support
- Human Capacity: training, supportive supervision, back up, guidance and aids
- Standardisation: metadata standards, SOPs, analytic dashboard, data quality assurance
- Funding: planning, partners/donors harmonisation, costing
- Infrastructure: computers, internet, electricity, mobile phones, 3G
- Data use: reports, feedback, review

Fig. 2. Collection of active log books and paper tools in one health centre
In the evaluation conducted in 2018, additional evaluation questions were introduced in the annual review to identify root causes of the reasons for the immunisation programme to keep a parallel Excel system instead of investing in strengthening the online reporting system in DHIS2. But most importantly addressing problems will contribute to better use of data for programme outcome improvement.

In the 2018 evaluation, apart from meeting with stakeholders in central level, 10 health centres, 8 districts in 4 provinces were visited. The logbooks, registry and data entry paper forms were verified and compared with data available on DHIS2. The use of information was discussed, especially at sub-sub national level to identify user needs.

### 3 Findings & Interventions

We illustrate the annual evaluation and intervention for improvements approach through a few examples followed over several cycles of evaluation. The 2018 evaluation was a follow-up of the annual HIS review carried out in both 2016 and 2017 with the aim to see whether recommendations had led to improvements. During these annual reviews some systematic problems related to data quality were identified within the EPI and MCH program as well as in other areas. While the general problem identified was that it was complicated and error prone to calculate aggregate data for reporting from log books, the specific problem for both EPI and MCH was that it was difficult to calculate area based coverage indicators because many children and pregnant women came from outside the catchment area for immunisation and ANC visits in the district or province capital.

The Lao MOH has divided villages into three zones where zone 2 and 3 represent areas that are hard to reach and which are a priority for health programs such as the EPI and ANC to cover. But immunisation and ANC coverage by area and by zone was difficult to calculate. For pregnancies, zone 3 is associated with risk. Additionally, the ANC program had data quality problems related to TT vaccines and teenage pregnancy.

The solution recommended for addressing both problems was to establish case based data capture at facility level (solving aggregation problem) and to link each case to village of living, solving the area coverage problem. Case based data capture in the health centres was also suggested as a first step towards reducing and rationalizing the plethora of log books in use. One problem, however, was that the Internet would not be available in most of the health centres and there were no available solutions for offline computerised data capture that could be synchronised with the online and web based DHIS2. The solution was to recommend the development of an offline data capture app that could push data to DHIS2 when the Internet was available (e.g. take the laptop and go to a place with network).

Another recommendation from previous reviews has been to establish core DHIS2 teams in all provinces as an approach to address the poor capacity to manage computer based systems such as the DHIS2 in Lao. The core team already functioning in Luang Prabang province was the model for this recommendation.

The result of this string of recommendations was that the offline case based data capture app had been implemented in all health centres in Luang Prabang province.
since March 2018. Hence the selection of Luang Prabang as one of the provinces for the assessment with an aim to study the results of the implementation of the recommended solutions.

This is also our overall evaluation methodology; recommendations from one evaluation should lead to interventions, which will then need to be followed up in a later evaluation. Consequently, recommendations from e.g. the 2018 evaluation will need to be followed up in a later evaluation.

Data capture app. The solution suggested to solve the problem of low or no internet coverage was to develop an offline version of the DHIS2 event capture and implement computer based data capture at facility level. Offline means that it can be used for data entry without the Internet, which is generally important for being able to move data entry to the health facilities in rural Laos. Users can enter data when they have no Internet and send data directly to hmis.gov.la when they are online. If health centres in Laos have laptops, users will typically go with their laptops to a place with the Internet in the case that connection is not available in the health centre. The app was developed by the HISP Vietnam team and implemented in all health facilities in 2 provinces in 2018. The offline app includes the entire list of 9200 villages in Lao with coordinates, so cases can be linked to the correct village. When the Internet is available, the online app can be used. Later evaluations showed that this online feature became the most important part of the app.

The event capture app is implemented in the following services: EPI child and EPI women, inpatients, deliveries, ANC first visit. It is important that ‘computerisation’ of data entry and data management in health centres includes many health services so that the system reaches a certain volume of use and usefulness. It is our view that this high volume of use will help ensure sustainability.

Historically, as most of LMIC, Lao PDR had silo, separate programme reporting systems and an HMIS that despite collecting almost the same indicators for RMNCH, Immunisation and Nutrition, is parallel with other existing systems in the country. The introduction of DHIS2 in 2014 as an integrated platform opened up an opportunity for all different systems to clean up duplication and encourage data use. This shift requires a strong centred legal structure that enables compliance.
The interventions described in Fig. 3 are selected from the interventions that were developed in agreement with the Ministry and concerned partners in order to address the issues raised by the Immunisation programmes managers as well as by health staff at facilities that the review mission visited.

To be able to put these interventions in place, as the rules of integrated HIS, the systematic improvements and interventions are constantly running to set the foundation and supportive environment. In the past 5 years, the Lao Ministry of Health in its effort to reform the health sector has invested and introduced important and essential actions to ensure the HIS moving forward as a whole system.

These actions include:

1. Organisational structure:
   - Significant progress in strengthening the national HIS using DHIS2 covers 100% government health facilities (health, army and police sectors) and selected private ones.
   - Ministerial decree legalised integrated HIS as the national data sources is a legal benchmark for the system in 2017.
   - Coordination mechanism was established to create a forum for data review, feedback and report.
   - Continuing legal documents have been developed and issued to create enabling environment for HIS strengthening, data use and accessibility.
Partners coordination and alignment of support contribute a strong sense of collaboration and partnership amongst all stakeholders to support the government. 

There has been increases in the use of data, especially amongst programmes that require immediate response e.g. surveillance, malaria but generally, the health managers could have made better use of available data and data products.

2. Policy and Planning:

- Annual review and planning is conducted, in combination with reports of the HIS progress and the health statistics year book.
- National HIS strategy 2018 - 2025 was approved and published, including the eHealth roadmap.

3. Standard Operating Procedures

- Metadata standards; data flow and reporting procedures were developed, documents and disseminated
- All health data staff are trained to use the standards,
- Routine quarterly data review organised at all levels
- Annual health statistics report published
- Guidance are updated and regulated

4. Data Quality

- Data quality assurance procedures were put in place as part of the SOPs
- Validation rules and other data quality parameters were configured and created on dashboards
- Data verification and validation is conducted in facilities as part of the supportive supervision and annual review

5. Capacity Building

- There’s a national HIS core team, including DHIS2 trained staff,
- All data managers, data handling staff nationwide have been trained with follow up and supportive supervision
- Training materials are available
- Immunisation:
  - Forms are distributed but no systematic training nor backup for data collection on paper forms

6. Infrastructure

- Mobilise government funding to provide 3G for health facilities that do not have internet
- Centralise funding and management of internet at district and province, to maximise the investment in internet connectivity at district and provincial levels
- Coordinate with partners to ensure all health centres will receive a laptop for integrated reporting.
The introduction of DHIS2 has revolutionised the way data is presented and used, but the impact it could have had in planning and decision making can be further improved.

4 Conclusion and contribution

The use of EPI reporting systems demonstrates the complexity of routine health information systems, especially when the focus of it is to support and strengthen the data use at all levels. On the other hand, Lao’s situation has proven that the efforts to strengthen any programme routine reporting system will not be possible without strengthening the system foundation of it which is the framework of the annual review.

The evaluation research was appreciated by its practicality and partners engagement, thus enhancing the implementation and assessment after each round. It also highlights the importance of the need to have a multipartner involved, in this case, it contains MOH, EPI programme, UiO, WHO, WB, UNICEF.

The process in Lao PDR has been driven by practitioners following an evaluation-intervention cyclic approach which is a kind of a de facto action research approach. The work to start analysing these ‘emerging’ action research practices as ‘real’ action research started only after the process had been going on for 2 years and in this way the process may illustrate a practice-to-research and research-to-practice variety of what Smith and Wilkins label action research as practice based research [3]. The participating researchers have advised and influenced the process, but never been able to control it, which will be the typical case in real world large scale processes. Learning from the case of Lao PDR, the role of researchers in large scale action research processes will be to try to influence the direction situationally in real time rather than to be able to fully plan everything beforehand. In this way practice and research may be synthesized through action research [1]. The Lao PDR approach to action research has been far from ‘canonical’ [4], but it has contributed by showing how large scale action research projects may be carried out.

References

Networks of Action during the COVID-19 Crisis: Lessons learned from the HISP network

Abstract: The ongoing COVID-19 pandemic has created numerous challenges to health care services, including challenges related to data management in developing countries. Revisiting the notion of networks of action, this paper illuminates the crucial role of networks in reproducing the necessary peer learning and collaboration among stakeholders in managing health information under crisis times. Empirically we base our analysis on the ongoing project of adopting information systems for managing COVID-19 data in Kenya and its neighbouring countries. The study contributes to the existing literature on action research in health information systems by identifying the pivotal importance of establishing and maintaining a network of sites to facilitate the necessary process of learning under crisis.

Keywords: Network; Information System; COVID-19; HISP

1 Introduction

There are several disease outbreaks significantly affecting public health in various parts of the world. These outbreaks, if not well managed, can cost lives and significantly erode development achievements. Adequate management of these outbreaks relies heavily on data. Health providers, managers and planners involved in the outbreak response collect data at various levels to support service delivery, contact tracing, financing and policy development. Arguably, appropriate data management during infectious disease outbreaks and other emergencies is a key public health principle for the control of outbreaks [1,2].

The outbreak of the severe acute respiratory syndrome coronavirus (COVID-19) was first reported in China in late 2019 [3]. It rapidly spread globally, making the World Health Organisation (WHO) declare it a pandemic [4]. The disease has neither a specific cure nor a vaccine for prevention. Infected persons are provided with symptomatic or supportive treatment. Globally, ministries of health have introduced stringent public health control measures, including enhancement of hygienic practices and restriction of both national and international travels. In addition, countries have set up laboratory testing procedures, isolation centres for positive cases, contact tracing mechanisms for those in close contact with positive cases and quarantine sites for suspected cases. All these control measures require adequate data management. As with any type of emergency, the COVID-19 pandemic saw the emergence of several data management systems, particularly mobile phone applications and electronic reporting systems, often without adequate stakeholder involvement. This had the propensity of creating fragmented information systems resulting in coordination and data security challenges, ultimately affecting the smooth flow of data for informed decision making.

In this article, we describe and discuss efforts of the ministry of health in Kenya, implementing a digital solution for managing COVID-19 data with the support from its neighbours and the global HISP network. Using an action research approach and the notion of networks of action, we explore the crucial role of networks in reproducing necessary peer learning and collaboration among stakeholders in managing health information under crisis periods. The article contributes to the emerging literature on digital platforms and socio-economic development, illustrating how establishing and maintaining a network of sites facilitates the process of learning and collaboration among stakeholders under crisis times.

2 Review of key concepts

Action research is an approach that has been extensively used since the mid-twentieth century for discovering and studying change processes in organisations and is characterised by the researchers taking an active and engaged role in implementing and studying change rather than taking a bystander and observational role [5]. Avison et al. argue that researchers should try out their concepts and notions with practitioners in real situations and organisations to make their research more relevant [6]. Action research is an iterative plan-act-reflect
process combining theory and practice which involves diagnosing the source of the problem, planning remedial actions, implementing the actions, and reflecting on actions taken, their outcomes and lessons learnt [5,6]. Importantly, the approach associates research and practice, in a way that research is informed by practice and research informs practice synergistically.

Carrying out action research simultaneously in multiple sites requires and allows for a different research approach. These projects are far from linear and often lack clear phases and stages. The ‘network of action’ research approach outlines how one can base research on experience from multiple countries and locations [7]. The multi-site and longitudinal view allows one to gain in-depth insights into the investigated phenomenon across parallel projects that are deployed in widely different contexts. The shift to a network approach has emerged due to the need for situating actions within networks rather than on a singular unit. For interventions to be robust and scaled rapidly even under crisis, they need to be part of a larger network. Establishing networks creates opportunities for sharing of experience, knowledge, technology, and value between the various nodes of the experience [7]. The HISP network is unique and rich in research potential and involves interacting with more than one project in series providing additional learning and cross-contextual understanding of the investigated phenomenon. The following section will describe the project context in which this study draws empirical data.

3 Empirical Context

3.1 Development of DHIS2 COVID-19 package

HISP is a longitudinal, over 20 years’ action research programme involved in strengthening HISs, predominately in low and middle-income countries [7]. HISP is hosted by the University of Oslo, Norway and aims at developing sustainable solutions that empower communities and decision-makers to improve coverage and quality of health services. The programme pioneers the development and implementation of free and open-source software, District Health Information Software 2 (DHIS 2). DHIS 2 is used at a national scale by the Ministry of Health (MoH) in 72 countries, for reporting, analysing and disseminating health information including countries in East Africa. In response to the rapid growth of the network, HISP has forged alliances with its long-term partners, namely HISP groups, to strengthen the support of national and regional DHIS 2 implementations and capacity building activities.

At the onset of the COVID-19 pandemic, the HISP network in collaboration with HISP groups implemented a DHIS2 digital package to accelerate case detection, situational reporting, active surveillance and response for COVID-19. The digital package includes, among other things, standard metadata aligned with the WHO technical guidance on COVID-19 surveillance and case definition and implementation guidance to enable rapid deployment in countries. At the time of writing this paper, the digital package is operational in 36 countries globally. The following sections outline the adoption of the digital package in Kenya and its neighbouring countries in East Africa.

3.2 Uganda and Rwanda implementation of the DHIS2 Digital Package

Uganda is a landlocked country depending on its neighbouring countries for most of its international imports, including petroleum products. As the first COVID-19 case was reported in March 2020, Uganda took drastic measures to control importation and community spread of the disease such as the introducing partial lockdown and limiting borders movements. To capture health information generated from the COVID-19 pandemic, Uganda extended its health information system for investigating travellers crossing Uganda borders. Uganda adopted DHIS2 as its main health information system since 2013 with the support from HISP Uganda.

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1 https://www.dhis2.org/in-action
2 https://www.dhis2.org/covid-19
3 https://covid19.who.int/region.afro/country/ug
The efforts of strengthening border screening and tracking of truck drivers led to the configuration of DHIS2 for real-time data capture and printing of traveller’s passes for drivers and truck occupants who were cleared for entry in Uganda. A DHIS2 android application was used to capture traveller demographic information and requests for sample testing. The lab information, however, was processed in a different information system. This led to HISp Uganda integrating the lab information system with the DHIS2, linking the lab results to the case investigation. The use of DHIS2 and integration with the laboratory system facilitated the tracking of travellers who crossed borders leading to appropriate management of the community spread of the disease.

In Rwanda, a different approach was used. As the COVID-19 pandemic emerged, Rwanda convened a task force team to plan and coordinate the country’s response. The team, among other things, wanted to address quickly the spread of the disease among health personnel involved in managing COVID-19 patients as well as reducing the turnaround time from sample collection to results distribution. The solution was to extend the national health information system, which uses DHIS2. The DHIS2 android application was used to capture COVID-19 surveillance data, entirely replacing the physical forms. The use of tablets and the DHIS2 Android application facilitated health workers to work offline and synchronised information to the national health information system whenever the internet was available. At the national laboratory, a DHIS2 workstation was set-up facilitating lab processes such as sample reception, processing, and results return. Once the tests are processed, results are automatically sent out by DHIS2 via SMS. This reduced significantly, the turnaround time, i.e. from sample collection to processing to results reporting.

3.3 Kenya Implementation of the Digital package

Upon declaration of the COVID-19 outbreak, Kenya put up several control measures, including a number of surveillance systems. For example, the COVID-19 tracking mobile app and KenyaEMR COVID-19 system are some of the systems deployed to facilitate the identification and notification of the COVID-19 cases. In addition, the Laboratory Management Information system (LMIS) at the national lab was used for sample processing, testing and disseminating results. The Kenya EMRCTS has been integrated with other solutions used for COVID-19 surveillance and is also capable of data exchange with the Emergency alerts & Response (EARS) self-quarantine solution, and the visualisation solutions.

Due to coordination challenges and the assurance of security to the highly sensitive health data among the fragmented information systems, the ministry of health decided to extend its national reporting system (using DHIS 2) and adopt the DHIS2 digital package. Prior to embarking on the mission, the ministry of health engaged the HISp network with the aim of gathering learning from the deployment of the digital package in other countries. Members from the University of Oslo, HISp Rwanda, Uganda and Tanzania shared experience of deploying the digital package with the opportunities and challenges faced. Subsequently, the COVID-19 digital tools were rapidly customised in the national health information system with the regional support facilitating data generation, compilation, analysis and synthesis, communication and use.

4 Findings and Discussions

The key finding this study makes is how a network facilitates learning to be shared and distributed among stakeholders leading to a rapid adoption of information systems under crisis times. The DHIS2 COVID-19 digital package developed by the network was shared for countries to implement and support local efforts of monitoring the pandemic. The adoption of the package, however, met different approaches. In Uganda, the package was deployed for monitoring individuals travelling into Uganda. Furthermore, the package was integrated with other local systems such as the Laboratory information system linking the lab results to the investigated case. On the other hand, Rwanda adopted the package fully by using the package to collect demographic and clinical information of COVID-19 suspects as well as capturing the lab results, reducing the turnaround time from sample collection to processing to results reporting.

https://www.dhis2.org/uganda-covid-surveillance
The adoption of the digital package by Kenya underscores the importance of sites aligning with the network as generated knowledge and skills are easily transferred and applied. At the onset of the COVID-19 pandemic in Kenya, several systems were deployed for collecting data. However, the ministry of health realised the need to own the generated data based on the challenges observed and the knowledge shared from neighbouring countries. This prompted MoH to take an alternative approach by customising the DHIS2 package for monitoring COVID-19 data. The insights and knowledge shared by the regional peers guided the in-country implementation of the COVID-19 package. At the time of writing this abstract, the in-country team was engaged with deploying the package under the leadership of the ministry of health.

5 Conclusion

In this paper, we have presented the process of adopting the DHIS2 digital package for managing COVID-19 in Kenya and its neighbouring countries. The article contributes to the emerging literature on digital platforms and socio-economic development by identifying the pivotal importance of establishing and maintaining networks of sites to facilitate the necessary process of learning under crisis. The paper argues that a South-South-North collaborative network provides scalable interventions which can be rapidly adopted in multiple sites under crisis times.

Reference:

“Use of Open source information system to build early warning and early response system”

Kirti Thakur1*, Arunima Mukherjee1

1 HISP India, New Delhi, India
drkirtithakur8425@gmail.com

Abstract. The use of information system has been substantially increasing over the last few years and many studies have reported the use of information system and their benefits and effectiveness of using the system. In this paper discussion will focus on how the Open source information system can play a pivotal role in responding to human right abuses which will help the people living in the fragile and conflict zones to appeal for the help and also to address the grievances.

This case study is about the deployment of an information system using the free and open source platform, DHIS2 (District Health Information System) in Kenya. It is being used as a risk management tool which alerts the responsible authority about a potential outbreak, escalation of violent conflict based on which necessary interventions will be triggered to curb down the situation. These responders are from the community who has been recognized by the government agencies who help in maintaining peace in the community.

The focus of this paper will be use of open source information system as a platform to build an early warning system with low-cost, high available communication methods available in low resource setting in LMIC (Low- and middle-income countries) and the challenges encountered while implementation of the project in Kenya. DHIS2 can be used in low resource setting using minimalistic technology for conflict early warning and early response system (CEWERS).

Keywords: Open source, SMS, Low resource setting, Implementation challenges, Kenya.

1. Introduction

The evolution of the District Health Information System (DHIS2) over a 20-year time period starting from the mid-nineties to date, has undergone significant technological transitions, starting from a standalone application based on Microsoft Office to an open source web-based platform on which national and global systems are running. It was, and continues to be, a digital software platform primarily to
support decentralized routine health management. The functionalities support all stages of the information cycle, from data collection, through processing, to analysis and presentation. The system has been designed for primarily for health data reporting, with fewer instances of it being used for data reporting in other domains. Hence, not much understanding is available on challenges and constraints experienced in using DHIS2 in other domains. This paper is based on our experience of using DHIS2 for conflict early warning and early response system (CEWERS).

As ethnic violence continue to flare, researchers and practitioners are exploring ways of integrating ICTs in violence prevention and peacebuilding mechanisms (Kelly, 2019). ICTs are electronic devices and software programs used to find, analyse, create, communicate, disseminate and store information. They include mobile phones, the internet, social media platforms such as WhatsApp, Facebook and Twitter, satellites and GIS mapping applications [1]. ICTs use have the potential of preventing and assuaging violent ethnic conflicts. Some ICT4D researchers have reported on positive uses of mobile phones to help manage & prevent violence. They have been used to support mapping and countering hate speech and rumours, mapping risks and likely causes of conflict and violent incidents, tracking armed groups, providing early warning, and identifying examples of peaceful behavior [2]. Berman and Shapiro demonstrate in their study that pro-government civilians can collaborate with security forces through ICTs allowing them to suppress rebels more effectively, thereby decreasing violence. Without communication networks, it is much more difficult and dangerous for civilians to inform on rebel groups, who can therefore hide within the civilian population more easily[3]. Mobile phone-based applications have also been effectively used in Latin America.

In Kenya, there have been various ICT based initiatives, such as Ushahidi that was used to map election violence. FPFEK EWS is a mobile phone-based system for early warning and early response. Uwiano Platform for Peace was launched in 2010 by the government and UNDP. Umati for monitoring hate speech; Elections Iwitness Kenya was used to share experiences of election malpractice or violence. Sisi Ni Amani was a programme to improve civic education and prevent violence using SMS messaging in the election [4].This paper focuses on Kenya, and how ICTs are being used by peace networks to mitigate violent actions in different inter-ethnic group settings.

In this paper we focus on lessons drawn from customising DHIS2 platform for community-based peace networks to use simple messaging feature of phones for early warning for conflicts.

2. Research Methods:

Methodologically, we draw upon an action research approach to CEWERS design involving design DHIS2 for conflict early warning system. Specifically, we draw upon the Canonical Action Research approach which has the following characteristics: i) the research process takes place in collaboration with the research team and the organization, to solve a problem which the organization recognizes as significant, leading to improvements in research and practice. The collaboration is defined formally in an agreement called the “client system infrastructure”; ii) the research pro-
cess will involve action research cycles of problem definition, diagnosis, design of interventions, conducting the interventions, assessing them, and generating new practical and theoretical knowledge; iii) the research will be guided by a theory of change; and, iv) the aim of the research initiative was to generate new theoretical (around design strategies for scalable CEWERS platforms) and practical knowledge (concerning designing of the platform and building technical guidelines for its use).

We describe our research in the form of two broad action research cycles: 1) designing the CEWERS platform and its field testing; 2) building for scale. As is common in action research, learnings from the first cycle served as inputs to the second cycle, and in the future these iterative learning cycles will continue.

3 Case Study:
An NGO working in north-west Kenya in areas inflicted with ethnic violence, initiated the process building community-based peace network. This peace network initiated a process sharing early warning messages in case of any conflict, with this idea of application of ICT in violence prevention was born. Three locally based ICT specialists were incorporated in the brainstorming session. The project team presented to the ICT team the indicators and how they escalated towards violence. They were asked to conceptualize how a computer-based system could be used to share information in anonymous way to the stakeholders by the community members. A technical working group was formed comprising of the conflict management practitioners and the ICT specialists to analyze the dialogue reports and extract all indicators. Participants in intra and inter community dialogues had pointed out that they were always aware whenever there were going to be attacks but when they report to relevant authorities, they became victims and the perceived victims became witnesses. This inculcated fear of reporting by the community members hindering intervention before escalation of violence. Also established from the participants that most community members were never aware of conflicts and even the indicators. They were got unawares. The group made use of literature to refine the indicators that were validated during the training of survivors. The indicators were coded by the system experts into Levels 0, 1, 2 and 3, respectively. At Level 0 and 1, these indicators were to signify peace and calmness. Level 2 was a bit serious and needed action while any Level 3 was treated as a serious indicator likely to trigger tribal clashes or chaos or any indicator that could cause serious security problems in an area. Response procedures were designed, and responders identified.

To customize DHIS2, design process was created with the workflow which reports the signals and incidents of specific codes defined for the conflicts as and when occurred through SMS. This was done to enable a rapid action by understanding the level of intervention which is required by the responsible person or responder to comprehend the situation and intervene as and when required. The system was needed to capture the information sent by the field monitors through SMS as its one of the fastest and effective method of communication where the local community can be part of the system to have an effective implementation of the system.

This information is shared by the community through SMS are then grouped together and appropriate security official rapidly respond as they act as initial respond-
ers understanding the situation which they further raise to the higher authority to take the necessary action through the system. This is done by verification and validation of the information captured in the system where the data analyst will verify if the information is correct or not which then can be further escalated to the higher authorities or the responders of that area who will do necessary interventions.

The information captured in the system is then be analyzed and can be interpreted to understand the maximum number of areas reporting the conflict so that necessary interventions can be taken by the responders and the government agencies. Dashboards were designed to monitor the indicators of SMS received.

Building of an offline component:
In Kenya due to various infrastructural and internet connectivity challenges there is a shift in focus to develop an offline system where the SMS can be received in the application and it can work on the same workflow as the online system. In DHIS2 SMS gateway was used where Web API supports sending outgoing SMS using the POST method. SMS can be sent to single or multiple destinations. One or more gateways need to be configured before using the service. The SMS commands can be used to receive messages also this can be used when there is no internet connectivity.

4. Conclusion

Understanding of the field level needs can impart better understanding in designing the system and can further help reducing the gap between the user demands and the system design. Engagement of end-users also helped in building the system as per their requirements but still many technical and software challenges were present which can be reduced by imparting regular trainings. Information system was designed to work independent of the internet environment to work effectively in the low resource setting.

With this we tried to identify various underlying issues and logics that need to be conceptualized in the context of early warning system. It was also identified that through sensitive understanding of the nature of the challenges, the potential for change can be positively leveraged.

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Reflections, learnings and proposed interventions on data validation and data use for action in health: A case of Mozambique

Nilza Collinson1,2 [0000-0002-6907-4054], Zeferino Saugene1,2 [0000-0003-4993-8801], Jørn Braa2 [0000-0001-6329-4593], Sundeep Sahay2 [0000-0002-4374-9551] and Emilio Mosse1 [0000-0003-1087-9365]

1 University Eduardo Mondlane, Av. Julius Nyerere, nr. 3453, Maputo City, Mozambique
2 University of Oslo, Ole-Johan Dahls Hus, Gaustadalléen 23 B, 0373, Oslo, Norway

nilzac@ifi.uio.no

Abstract. Availability and use of quality health data is recognized to be one of the key elements for driving health reform processes in many Low and Middle Income Countries (LMICs). The Ministry of Health (MOH) in Mozambique has been, since the 90’s, using digital platforms to report and analyse health data. The transition from paper registers to digital platforms carry the promise of empowering health providers at every level of the healthcare system to better manage and deliver health care services. Research has shown that in many cases, we find this potential to be largely under-utilized. This makes it important for Information System (IS) research to focus on understanding the reasons why this is the case and how these impediments to data use can be better addressed. In this paper, we reflect upon the data use processes in Mozambique after nearly two decades of the digital interventions being initiated, and how the identified challenges can be addressed. These findings can be of relevance to other LMICs also facing similar challenges.

Keywords: information systems, health data, data use, data for action.

1 Introduction

One of the drivers for the huge investments to the implementation of Health Information Systems (HIS) is the recognition of the power of data to improve health care related informational practices. According to Lohr [6] “data should be the vital raw material that strengthens and improves the machinery of decision making”. However, “the data paradox is that a world richer and richer in data has so far yielded little payoff in most fields” [6], including in health. Thus, while the supply of data races ahead, its use lags badly for various social-technical and political reasons.

As an integrated data repository District Health Information System 2 (DHIS2) has proven to offer many important benefits, including making best use of health data. Facilities, districts, provinces and programmes can view their own data and compare them to information from other programs. Districts can compare facilities within their area and against facilities in other districts. Similarly, information can be aggregated at the national level to give an overall picture or to compare provinces.

In this paper, we explore how this process has unfolded over time in Mozambique, exploring the changes resulting from the introduction of a software platform known as DHIS2, aimed at strengthening health care informational practices. DHIS2 has been and continues to be developed by the Health Information Systems Program (HISP), an action research network from University of Oslo founded in the early 2000s [1, 3]. Currently, DHIS2 finds use in many LMICs for a variety of health related applications and also now increasingly in use in other sectors, such as education [1]. It is not questionable the importance of this software platform, but it is needed to understand in which conditions it becomes useful, strengthens the informational repositories and contributes to promote desirable changes in the settings. In relation to this, we question about the extent of the impacts of digital interventions to strengthen data validation processes and use. Therefore, we pursue deeper understanding on the extent the Mozambican HIS was affected or not with the digital interventions implemented over a two decade period, specifically after the introduction of DHIS2.

This study was conducted as a formal assessment exercise carried out in 2019 by a joint team of researchers from University of Oslo from Norway and Eduardo Mondlane University from Mozambique, including representatives from the Ministry of Health (MOH) and province delegations. The paper reports from the findings of this assessment exercise, while expecting to contribute practically with innovative processes coming from the setting.
2 Background

The Ministry of Health (MOH) in Mozambique has been, since the 90’s, using digital platforms to report and analyse health data [2]. In the early 2000, DHIS (District Health Information Software) in its first desktop-based version, was introduced by HISI to the country as a project, after its successful development and implementation in South Africa. This occurred during a period when various long-term reforms were being conducted within the country HIS, with focus on decentralization, and attempting to gradually empower local authorities at lower levels of the HIS while also reorganizing several health programmes [4]. At the time, the country HIS database located at the National level was fed with collations of aggregated data sent upwards by provinces, based on what was being collected from health facilities at district level [2]. Several studies conducted during the implementation revealed several challenges imposed to and by the setting to guarantee quality of data, analysis and reporting to the upper levels, spanning from technical, social, organizational aspects of the setting to the HIS itself with the non-integrated vertical health programmes in place [2, 4, 5]. Despite the interest shown regarding DHIS and printed efforts to implement this software platform, it was only with its second version (DHIS2) that it was adopted, several years after.

Although some of the actual innovative practices institutionalized within the country HIS evolved since then, such as the monthly validation meetings and the roles played by the Nucleus of Statistics and Planning (NEP) [5]. It is understood that the contributions of the software platform to the HIS are present along the years, as seen through one of the major gains related with the possibility to send information directly from the District to the central database, located at the MoH level and provide data in real time to all the other levels of the HIS. Even though issues related with DHIS2 ability to support data evaluation, data visualisation and data use, to strengthen the actual HIS, persists.

3 Method

An action research approach, as advocated by HISI [3], is being adopted to understand the routines and practices of the health staff at every level of the health information system, being conducted overtime. Thus, a combination of techniques are adopted including field visits, interviews, observations and focus groups discussions.

3.1 Data collection

The fieldwork covered six provinces, including three where DHIS2 was firstly introduced, twelve districts and several facilities. The team had the opportunity to participate in several routine meetings in course: a validation routine meetings, a statistical meeting and several meetings organized by the provincial delegations from Extended Program for Immunization (EPI). In all these opportunities the team observed and at the end engaged in discussions regarding some of the issues that were reported in relation with the technical aspects of the software platform and use of other technological resources available and being used in the daily operations.

It is worth mentioning that, in all of these opportunities, the team was able to gather sensibilities from different stakeholders that are involved in the process of data collection, validation and use. For instance, in the statistical meeting, which is organized at the District level and led by the head doctor of the District, the participants reached a number of 20 people including the head statistician from the district, representatives from several health programs and the head doctor of the main Hospital of the District.

During the visits to the facilities the team discussed with doctors and technicians, while also beside observation of the environment and practices in course was able to engage with the nurses during their activities and data collection. These visits were also used as an opportunity to consult some of the paper based instruments (books and charts) being used to collect and present daily registries and to see some of the digital instruments that some had received as part of the support from particular programs to collect particular data. The overall fieldwork enabled the team to gather an overview of the processes of data collection, validation, capture, presentation and use, while also having access to various data reports and official documents that were included in the study.

3.2 Process of Analysis

During the analysis process, we adopted such a conceptual framework of analysis aligned with a social-technical perspective to identify new approaches and solutions to address the issues being raised from the current DHIS2 design. The information gathered was systematically organized into categories of issues to be analysed and, by adopting a social perspective we searched for different aspects in need of revision, either from the procedures perspective or from
the design itself. After the analysis process those aspects were categorized into specific key findings, which we initially included in a field report that was shared with the different parts interested in the process and, later, presented in the annual meeting to the DHIS2 community, in order to consolidate and enrich some of the approaches that were raised by the team. It is worth mentioning that all the information gathered along this research is also being used as insights to build a longitudinal research case study.

4 Key findings and Discussion

While the current design of the HIS in Mozambique still unfolds in the existing four levels of management, it is being perceived to have improved: from the ways data is being collected, to the flows of information till the availability of data to action. Though, the current assessment enabled the research team to observe and identify both positive outcomes and some aspects that may need further interventions. The key findings from this research study, so far, are categorized as follows:

1) **DHIS2 primarily used for data storage and not for data use:** The rationale behind the successful adoption of the DHIS2 adoption by LMICs has been its determination on providing data to empower the lower levels. This has received very little attention by many health information systems. The current assessment has demonstrated how DHIS2 has democratized access to data in Mozambique. Despite these potentials we have observed that the system is primarily as data storage. The vast analytic tools developed to facilitate data visualization are barely used by the lower levels. Instead DHIS2 users prefer to download the data to excel and make charts and tables. These could have been easily generated from within the DHIS2 system. Main problems are related to visualization features that are not flexible enough or not fitting the use cases. MoH and district level people are using Excel and not DHIS2 for analysing DHIS2 data. This makes it recognize the importance of functionalities that makes offline use of data possible, having data ‘locally’ is important and the key reason why people prefer Excel. Therefore, offline apps such as ‘My datamart’, where data can be analysed while offline, is much needed.

2) **Continued use of existing tools of Excel and paper:** Since DHIS2 is not being used to prepare the data reports discussed either in the routine meetings or in the statistical meetings, we discovered also that it is not being used for data output. Instead other tools are playing this role and providing these functionalities. The design of such generic instruments need to be adjusted to local needs, and sometimes providing adjusted templates for reports that are automatically updated or introducing better ways to produce and share useful district and facility dashboards would make dashboards more useful. We acknowledge in this process, the need to also understand how the indicators are being produced, as for instance in Mozambique the standard district and facility dashboards would make dashboards more useful. MoH and district level people are using Excel and not DHIS2 for analysing DHIS2 data. This makes it recognize the importance of functionalities that makes offline use of data possible, having data ‘locally’ is important and the key reason why people prefer Excel. Therefore, offline apps such as ‘My datamart’, where data can be analysed while offline, is much needed.

3) **Ambiguity in what population data to use:** One aspect that should be recalled as well is related with the indicators being used as key to promote good data use and achieve intended goals. As such, we identified that in Mozambique at district level key indicators are being used to monitor data reported since the Facility level. In this case, adjustments in the instrument should be configured accordingly, introducing facility based indicators with the inclusion of parameters such as, for instance, Facility population. We have seen that good district level data use relies upon indicators by facility, which again relies upon facility based target population. Being able to compare facilities – monitoring facility based indicators - is important for using data at district level. It is important to mention that the source for these parameters are already available in Mozambique, as facility populations are distributed and included at district level. These facility populations, however, are not included in DHIS2. In fact, population data is not included at all making it difficult to use DHIS2 for calculating coverage indicators.

4) **Poor mechanisms of technical support, particularly in remote areas:** This study revealed another issue that is constantly underestimated, provision of support and continuous capacity building for the practitioners in the field. In order to keep the system flowing there is a need to establish stronger bridges between the different teams providing support at all levels of the HIS. The focus should be on the local levels, in particular to the districts and facilities, maintaining field visits on a routinely basis to better understand the local needs and requirements, as part of the participatory design approach. For instance, the DHIS2 teams could easily have noticed that targets were used as indicator denominators by visiting a district and a province, but this was not done before. More generally; assessment of system status should be implemented as seen from the field not only from headquarters and needs to be carried out continuously, as part of a continuous participatory approach. Continuous capacity building should be encouraged within the teams supporting the implementations of any software platform. Space and time for recycling and update of knowledge is critical
to maintenance of the systems. At the moment, for instance, we identified weaknesses in this component in the field, as the supporting team is facing difficulties managing metadata and keeping their database ‘clean’. Ultimately to reduce some of these routine tasks and provide additional support to the teams to sensible tasks the system may incorporate this as functionalities. Indeed, these types of initiatives are in place and an app for help managing metadata is being developed by providing a way to manage and navigate between data sets, services and data elements. In DHIS2 categories of metadata are viewed as lists with a hierarchy within them, but not within them, making it difficult to manage and clean the metadata.

5 Reflections on future strengthening

In Mozambique, DHIS2 has been implemented and it is being used in a different manner from the initial intents, to support data evaluation, data visualisation and data use. This probes the flexibility of the tool but reveals another insight to the developers that need to rethink the needs to take the whole workflow and social system in the targeted context into account. Here, some approaches such as the User participation and Participatory design are perceived to meet the task and need to be applied along the development and implementations. The information system is best understood as a social system – not a technical system. DHIS2 implementation has so far been carried out as a ‘technical’ implementation of software and needs to change to address the whole targeted context of use; the social system and relevant work practices.

Moreover, the routine data use meetings in place are key to institutionalization of good data use. These meetings occur on a routine basis following a monthly calendar scheduled at the national level and followed at district and province level, using data collected at the facilities and are seen key to institutionalized data use practices. We perceive more generally, that data use indeed needs to become a natural part of all routine procedures such as routine data review, planning and M&E meetings and various quarterly and annual meetings and reporting procedures. We also found that DHIS2 was not customized to support these meetings and data use situations with appropriate dashboards, score cards and reporting templates. In this scenario we oversee a potential insight from a practice to the redesign of the instrument in such a way to support and improve these data use practices.

In general, any software platform is required to be flexible in various forms to accommodate adjustments and incorporate solutions to identified issues in the actual design. We have seen from the case that some of the main problems reported during the field visits are related to metadata management and difficulties in cleaning the database, making it problematic to run the system. In such cases, if the system does not provide internal functionalities, one option would be to suggest the incorporation of external apps developed to provide those functionalities inside DHIS2, like metadata management and metadata navigation apps for instance. This is made possible also, though the existing portfolio of external apps being developed in other countries, which can be reviewed to elicit design ideas and requirements.

References

Improving data use and participatory action and design to support data use: The case of DHIS2 in Rwanda

Abstract. This article reports from an ongoing ‘evaluation for improvement’ action research and participatory design project in Rwanda, where the aim is to improve data use practices and the capabilities of the District Health Information Software 2 (DHIS2), an open source health information management platform, to support data use. The study of data use at health facility and district level showed that while data was used routinely at, for example, monthly coordination meetings, the DHIS2 dashboards and other analytical tools were in limited use because users preferred to use Microsoft Excel for data analysis and use. Given such findings, a major focus of the project has been directed towards identifying shortcomings in data use practices and in the software platform and to suggest, design and eventually implement changes. While the practical work on implementing improvements have been slow due to the COVID-19 pandemic, the suggested design improvements involve many levels of system design and participation, from the global core DHIS2 software team, the country DHIS2 team and local app development, the Rwanda Ministry of Health, and health workers at local level.

Keywords: Participatory action research, HIS, multi-level design, data use

1 Introduction

This article is about an ongoing action research and participatory design project in Rwanda, which has the twofold aim to both assess and improve the use of data and the use and usefulness of the District Health Information Software 2 (DHIS2) software platform, which is the standard software tool in the health services in the country. DHIS2 is the world’s largest Health Management Information System (HMIS) platform, currently in use by 72 low and middle-income countries and operating an open source system for web-based data management. The overall cyclic research approach is as follows:

1) Identify situations and venues for routine data use at facility and district levels and assess data use with a particular focus on assessing the way the DHIS2 software platform and other digital tools are used, or not used, to support and enhance data use,

2) Identify shortcomings in how DHIS2 is used and designed to support data use and suggest improvements in software design and use practices,

3) Implement and evaluate suggested changes, and repeat the cycle of through 1, 2 and 3. This last cycle of implementing changes, however, has been somewhat halted due to the COVID-19 pandemic.
Improvement in the DHIS2 technical design is going on both at local and global levels. While the DHIS2 country team is configuring the DHIS2 to suit the identified requirements within the generic capabilities of the platform, other requirements need involvement by the DHIS2 global team. Using DHIS2 as a platform and developing apps to address specific features and user requirements represent a third 'in between' opportunity. Apps can, and are, developed both locally in Rwanda as well as in other countries and shared. We present examples of all these types and levels of responding to user requirements and discuss the findings related to challenges and opportunities in engaging - and being dependent upon - both local and global system developers in participatory design going on in a real world context where not all factors are controlled, such as for example the ongoing pandemic.

This research will contribute to the theory and practices of participatory design and action research in a global-local multi-level perspective [1, 2, 3], and to the role of app development to provide more agile responses to identified user needs [4].

2 Background

Since 2012, the Ministry of Health has been implementing the DHIS2 powered Health Information Management System (HMIS) to manage countrywide health related data. The HMIS system includes health facility level data from all health service areas and programs. Although much effort has been invested in improving the quality of data, timeliness of routine reporting as well as data use for informed decisions, supervisions and assessments conducted have shown that data use at health facility and district levels is far from optimal and that the various analytic tools in the DHIS2 were in limited use. These gaps and challenges faced had to be addressed and documented to guide the next steps.

As DHIS2 is designed and developed to be used across multiple countries and user organizations, design unfolds on multiple levels. A core team is responsible for the design and development of the generic software features and caters for the wide audience of use-cases, forming a level of generic design. Further, for each implementation, the DHIS2 is configured and customized according to the more specific circumstances, and this forms a process of implementation-level design [5]. DHIS2 has a flexible metadata structure and can be configured for a variety of needs and system requirements [4] When addressing user needs, new functionalities and requirements not covered by the generic features can basically be met in three ways; 1) customisation of the generic functionalities in DHIS2, done locally, 2) request changes in the core platform through interacting with global teams, and 3) develop specific apps, which can be developed locally, regionally and globally.

The objectives of the research reported in this paper are to evaluate and document gaps and challenges faced by local level users at districts and health facilities, to use DHIS2 analytics apps for data analysis and other features in their use of data for management, planning and service delivery. Furthermore, having identified the requirements, interventions will be designed and implemented on the basis of the three approaches of local customisation, DHIS2 core development and/or app development.
Given the above objectives, a team from the University of Oslo in collaboration with HISP Rwanda under the guidance of the MoH/HMIS conducted an assessment on the status of data use in Rwanda. We used a data use checklist developed by the University of Oslo to guide countries in assessing the level of use of data and dashboards.

3 Methods

The research approach has included both qualitative fieldwork and user interaction at district and health facility levels using a semi-structured interview guide and a quantitative approach using questionnaires. A WhatsApp group has been created bringing together the Data Managers of Health centers and District Hospitals to freely and openly keep sharing their experiences and providing feedback to inform improvements in DHIS2. Requirements identified through the WhatsApp group were both addressing needs for global level changes in DHIS2, i.e. input to new releases, and requests to the local DHIS2 team.

The team visited three district offices and 6 health facilities in Kigali, the capital, and in Gisenyi, in the north-west of the country. Here focus group discussions were conducted and digital information practices were investigated hands-on. A series of planning meetings organized at National level with the global DHIS2 team (HISP Rwanda, Uio, MOH) to ensure more issues are identified and feedback are shared. The team also attended monthly meetings (DHMTs, coordination meetings, quality assurance meetings) and in-depth interviews with data managers and facility managers to identify best practices, challenges, and user requests. We conducted group discussions with key players at health facilities and district offices following a check-list which included investigation and discussion of the computerised tool they used, such as reports, dashboards, graphs and tables. The questionnaire was shared with additional 36 District Hospital Data Managers who were asked to provide feedback and request new features to support their data use needs.

4 Findings

An important finding is that all districts in Rwanda are conducting monthly meetings where health facility and district managers and data managers come together at the district level in a meeting called ‘coordination meeting’ and evaluate last month’s data, look at trends and discuss needed action. This routine event is identified as a key area for DHIS2 to provide information support. However, while the finding was that the level of use of data from the DHIS2, for example at the coordination meetings, was maybe surprisingly high, use of DHIS2 for analysing and presenting data, for example through dashboards, was surprisingly poor. The data managers preferred to download the data from DHIS2 to Excel and analyse and present the data using Excel as the preferred tool. Given this finding, ways to improve the DHIS2 as a tool for data managers and other users and to improve data practices using the DHIS2 became the focus for the participatory design and action research part of the project.
One example of why users preferred Excel to DHIS2 is from a posting on the WhatsApp group where a data manager explained that he needed to be able to add comments as text and colours as, for example, red for poor performance, in a table of an overview of health facilities’ performance, as in the figure.

Fig. 1. Excerpt – health facility data presentation, Rwanda

Adding text and colours in a table in a web based system such as DHIS2 is not straightforward. This is an example of an user request that requires involvement of the core DHIS2 development team. Other identified requirements are also addressing core DHIS2 features and global involvement, for example to be able to build reports combining visuals and text and which is populated with data from DHIS2.

The results from the questionnaires confirmed the findings from the field visits, with four notable pointers:

- Most of the Health Facilities and district offices download data from DHIS2 pivot table to Excel for doing their reports by-passing DHIS2 limitations like to be able to manipulate charts and tables, to add text and colours etc.
- Nearly all know how to make pivot tables, charts, maps, and dashboards in DHIS2, but due to the limitations in DHIS2, pivot tables are generated as a means to download data to Excel.
- An additional reason for downloading to Excel was that target population denominator data were not available in DHIS2 for sub-units like health posts under the health centres. The local users will know the figures and then it is easier to enter them directly in Excel.
- Most to all respondents wanted the ability to: mix colours and text in tables as in the figure above; share dashboards to predefined groups of users; print dashboards and use as reports; build reports where visuals are dynamically generated and text
Addressing issues through design: generic and implementation-level design and development

The evaluation revealed several important requirements for new features and performance that would need to be addressed before the DHIS2 platform may effectively support the identified data use situation. Some of the requested improvements can be carried out locally on the level of implementation through customisation of the DHIS2, such as the ability to print out reporting forms dynamically filled with data for signature and archiving. The local HISP Rwanda team is capable of optimally configuring and customising the DHIS2 platform, but many requirements go beyond the current customisation capabilities of the DHIS2. These can either be addressed through design on the generic level by the global developer team, or on the level of implementation by building custom apps.

Addressing issues on the generic level of design and development

DHIS2 and dashboard enhancements requested need to be considered for in the core platform development. This includes among the other features that can allow/support print and downloading of dashboard or dashboard items. A community participatory design approach is employed for this in which the requirements are gathered from the field via a lead implementer in HISP Rwanda. Those requirements are then passed to the platform owner through which collates all field requests. Representatives from all HISPs then vote on the collated requirements to produce a development roadmap that is then produced by the core developers. The DHIS2 platform owners must take into account what is technically achievable for the core developers to accomplish. In this case study from the direct field requirements coming from Rwanda the core developers appreciated that dashboard download and printing was a realistically achievable for the next DHIS2 core release; however, editing cell color and adding comments in a pivot table required an extensive expansion of the current pivot tables functionality and would not be possible in the release. It also is not possible for the core development team with limited resources and many demands to reproduce Excel into DHIS2, so the priority of this request is relatively low given its technical achievability.

Given the inherent inertia and understandable slow pace of change of the DHIS2 platform, local participatory design efforts need to look elsewhere to be able to respond fast enough to users requests.

Implementation-level participatory design

Implementation-level participatory design processes require a constant agile response by way of new features and solutions to be fed back and tested by the users. When, as in our case, the generic features in DHIS2 cannot fully be used to respond to user requirements and the generic-level design process of the global developer team is too slow to achieve, app development is a way to bridge the gap. Rwanda has already
developed several apps and have both expertise and experience in this regard, for example:

- When implementing the DHIS2 Tracker for the immunisation program vaccine stock management was not part of the package, and was immediately identified as a gap. HISP Rwanda then developed an app for managing vaccine stocks and requests for vaccines and distribution from available sources; central and regional warehouses and hospitals. This app is now being developed as a generic central DHIS2 app.

- An app including a certificate for having tested negative for COVID-19 and linked to laboratories was developed in collaboration with HISP Uganda and is now used by truck drivers and other travelers crossing the borders between the two countries. Tanzania, neighbouring both countries, is now adopting and adapting this app.

Analysing the requirements and responses from the DHIS2 core team, we see that they fall into two levels:

1) Generic level design and apps by DHIS2 core team apps. Very few user requirements identified during the process can be met by generic features and apps within a participatory timeframe, as fast responses are required. Ability to print dashboards is one example of a generic app which will be made available soon.

2) Implementation level design, as described in Rwanda. Three options are available;
   2.1) customise solutions based on generic features, and 2.2) request generic features from the core team, which we have seen may be too slow. 2.3) Building custom apps. As with requesting features from the core team, the other options also imply challenges. Customizing generic apps requires an understanding of their existing codebase and will later result in issues with updating to new versions released by the core team. Building custom apps provide a flexible alternative, yet development and future maintenance must be done locally, which could be costly.

Of the requirements identified, the ability to print reporting forms filled dynamically with data is a ‘low hanging’ fruit. This is a most wanted feature and can be done by customisation or a small app. Other requirements, such as a more advanced report builder than the previous example need to be addressed through building custom apps. Rwanda and regional partners have proven their ability to build apps, but as described, it will involve development and maintenance work locally.

6 Conclusion - and further research

The traditional means of conducting participatory design using the DHIS2 platform has been to address needs through generic features, and when that is not possible, to request changes by the core team. A conclusion of this research, however, is that participatory design and addressing emerging needs in a mature DHIS2 user country such as Rwanda, where the generic features are already exhausted, needs to rely on custom app development. In a global perspective, then, local custom apps will inform
development of core generic apps and features. There are however challenges related to local apps development, such as for example, maintenance. Our further research will explore challenges and opportunities for a custom app development strategy.

The contributions of the research reported in this paper are in 1) developing practical action research approaches synthesising research and practice in developing information systems in developing country settings [5, 2], and 2) providing approaches and analysis of multi-levelled participatory design and interaction across local site, country and global levels [1, 4, 7, 3]. At the practical level contributions are on how tension can be eased between slow global responses on generic platform features and local needs through local app development.

References

T2

Platforms and Apps
Chatbots at Work: An Employees’ Perspective

Lorentsa Gkinko1 and Amany Elbanna2

1 Royal Holloway University of London, TW20 0EX, Egham, UK
Lorentsa.Gkinko.2015@live.rhul.ac.uk
2 Royal Holloway University of London, TW20 0EX, Egham, UK
Amany.Elbanna@rhul.ac.uk

Abstract. Artificial Intelligence (AI) applications adoption in organisations is emerging and growing rapidly. As these applications have the ability to learn from their use, the ways that users adopt and use them have significant impact on their future evolution. This study focuses on Chatbots as one type of AI applications in organisations. Chatbots learn and evolve from the way users interact with them. Hence, it is critical to understand its adoption and use. Therefore, this study questions how users perceive and appropriate chatbots in organisations. To answer the research questions, we collect, and report here on an ongoing research, rich qualitative data from different sources in a work setting and employ inductive approach in order to identify use patterns. The study theoretically contributes to the understanding of chatbots appropriation and use in organisations. Our understanding of the use of chatbots in an organisational context provides guidelines for organisations to improve its adoption and use.

Keywords: Chatbots, Future of Work, Artificial Intelligence, AI Adoption, AI Use, Smart Organisation, Smart Technology, Technology Appropriation

1 Introduction

Advances in Natural Language Processing and Machine Learning have enabled the proliferation of chatbots in various domains and the establishment of partnerships between computers and humans [20]. Chatbots are increasingly being implemented in the workplace to enhance the productivity of the employees by helping them obtain timely and efficient assistance of information [1]. It is argued that chatbots could reduce information overload, reduce stress and provide employees with assistance [10], [8]. The term ‘chatbot’ refers to any software application that engages in a dialog with a human using natural language [5]. ‘Chatbots’ are a derivative of ‘chat robots’ and they serve as natural language user interfaces to data and services via text or voice [1]. Chatbots use machine learning and artificial intelligence methods to simulate human-like behaviours and provide a task-oriented framework with evolving dialogue, able to participate in a conversation [11]. The chatbot architecture integrates a language model and computational algorithms to emulate informal chat communication between a human user and a computer using natural language [19].
While the use of chatbots in organisations is increasing, current research focuses on the technological aspects of building them and their potential application areas in the digital workplaces. Recently, Von Wolff et al. (2019) elucidated some potential application areas and tasks that chatbots can carry in organisations. The application areas include the internal/external support as well as supporting the employee self-service by providing information and executing processes [10]. Research in understanding the use of Chatbots is emerging particularly in customer services and customer-facing applications. However, little we know about the internal use of chatbots in organisations despite its importance. As chatbots are AI applications, they consistently learn from their users and the ways they interact with them. Therefore, understanding their use is of particular importance. This study explores the use of chatbots in the workplace from the employees’ perspective. It questions how users perceive and appropriate chatbots in organisational settings.

To answer the research questions, we adopt qualitative interpretive approach that allows for an in-depth understanding of human thought and action in an organisational context [9]. We investigate the case study of an internal chatbot in a global organisation that was designed to provide IT technical support for employees. The rationale behind the choice of an interpretive approach is that it allows researchers to gain an in-depth understanding of the subject under study, by exploring the subjective meanings that participants assign to it [14]. A qualitative study allows the researcher to observe and focus on a single phenomenon within its real-life context and generate an in-depth, multifaceted understanding of a complex issue in its real-life context. The case study approach is suitable for capturing information on more explanatory ‘how’ and ‘why’ questions since such questions deal with the tracing of operational processes over time [21].

We collect rich qualitative data from different sources including semi-structured interviews, participant observation and documents review and follow the guidelines for interpretive research by Klein and Myers (1999). In terms of data analysis, we use inductive data analysis techniques based on Gioia’s method [7]. Hence, we code usage patterns and behaviours of users with their interaction with the chatbot.

This research contributes to technology adoption research by extending it to the new area of AI applications and the understanding of users in this context. This paper reports on Research-in-Progress and is structured as follows. First, we elaborate on the theoretical foundation of the study by presenting the concept of technology appropriation. This is followed by a description of the case study, the methodology and the preliminary findings.

2 Theoretical Foundation: Technology Appropriation

The theory of Technology Appropriation was first introduced in IS by Poole and De-Sanctis (1989) as part of their theory development of technology use, based on structuration and appropriation [15]. Since then the theory has been widely adopted in understanding the use of different types of technology [2], [6], [16], [18]. The core focus of the research adopting this theory is that users make technology their own, in a process
of adaptation, by which technology, individual and collective practices are transformed [17].

The model of technology appropriation explains the transformation process of a technology as it is envisaged by its designer (technology-as-designed) into technology as it is being used (technology-in-use). The nature of this change defines the process of appropriation, where technology is transformed by differentiating between technology-as-designed and technology-in-use. This evaluation process results in rejection or adoption, adaptation and integration of the technology into the users' everyday activities [4].

Carroll et al. (2002) suggest that users evaluate a technology at three levels which reflects different degrees of familiarity with the technology as shown in Fig. 1 [2]:

Level 1: At this level, initial judgements are made with the user’s first encounter with a new technology. The outcome is users’ decision of non-appropriation, where users are not interested in this technology, or adoption, where the appropriation process continues.

Level 2: Through the process of appropriation, users explore the technology in depth. The outcome of this process is either the appropriation, where the users take possession of its capabilities in order to satisfy their needs, or the disappropriation, where users at some stage during the appropriation process, choose not to persist with the technology.

Level 3: The technology is appropriated and integrated into users’ everyday practices based on the long-term use of the technology. However, changes in users’ evaluation of the technology may lead to disappropriation [4].

The use of technology is strongly influenced by user’s understandings of the capabilities of the technology [13]. Users adapt by changing their practices and situations of use to fit in with the technology in both intended and unintended ways [3]. Consequently, they might not use it in ways that are initially expected by the developers [13].

Technology appropriation involves the evaluation by users as they encounter (Level 1), adopt and adapt (Level 2) then integrate (Level 3) a technology into their everyday practices [4]. We adopt the theoretical lens of technology appropriation to explain the employees’ perceptions of the chatbot and how they adapt their use in intended and unintended ways. This theory provides a suitable lens for the study of users as it renders...
views about the role of technology in human activity and includes different elements about the behaviour of users, such as the expected activities, resources and norms [12].

3 Methodology, Case Study and Preliminary Findings

Zeta is a global organisation that has developed an internal chatbot for its employees to support them in IT issues. We gained access to the development team and users in December 2019. 24 semi-structured interviews with users and developers have been conducted. We also have access to the different documents and internal links. The first round of interviews included the product owner and professionals from the development team. The focus of these interviews was on understanding the initial purpose of the creation of the chatbot and how the development cycle works. In the second round of interviews, which took place from the beginning of July until the end of August 2020, we conducted 20 interviews with users; they were randomly selected from different teams, who agreed to participate in the study. The interviews lasted between 20 mins to one hour. All identification data from the interviews in addition to the organisation’s name have been anonymized for confidentiality purposes.

The main reason for the creation of the chatbot was initially the reduction of costs; later it evolved to provide seamless work experience. The principal use by design was to provide employees support in IT technical queries, which was previously held by the IT helpdesk team, and enable the users to be self-sufficient. The chatbot was developed based on the Microsoft Bot Framework, which, in the beginning of the project, presented challenges, due to the cognitive services used in the bot. Once the team acquired the necessary skills, they started to expand the functionalities of the chatbot. Building the chatbot on Azure Cloud Services made the initial phase of the project to progress rapidly. The utilization of the cognitive services helps the chatbot to continuously learn, based on users’ input. However, the team implemented supervised learning in order to be able to review and approve the suggestions they receive from the cognitive services.

The preliminary findings indicate a difference in the way employees use chatbots in their day-to-day activities at work. They highlight the different use patterns that we classify into four types of users. Due to the limitations of this abstract, we will present and seek feedback on the identified patterns during the conference. We will also discuss how the current use of the chatbot (technology-in-use) has expanded from the initial purpose of its creation (technology by design). In addition to the appropriation of the chatbot, we will also discuss its disappropriation and the reasons behind it. The study contributes to the understanding of this new class of AI applications and provides guidelines for organisations to improve their adoption.

References


Dashboards and Information responses to COVID-19 in Indonesia: Integrating multiple data sources

Taufiq Sitompul, Wilfred Senyoni, Jørn Braa, and Farida Sibuea

1 University of Oslo, Oslo, Norway
2 Pusdatin MoH of Indonesia, Jakarta, Indonesia
taufiqhs@ifi.uio.no

Abstract. Data visualisation is essential to make sense of health data under crisis. In this paper we draw on a large open-source platform, the District Health Information Software 2 (DHIS2), currently being used to create visualisation dashboards on COVID-19 data. Our research, centered on the use of DHIS2 in Indonesia, illuminates the crucial role of platform-enabled dashboards in integrating and coordinating data sources, a crucial function especially in the emergency situation generated by the ongoing pandemic. By doing so we contribute to the emerging literature on digital platforms for socio-economic development, with a focus on the role of platforms in performing health data management under crisis.

Keywords: Integration; Dashboard; COVID-19; DHIS2; Indonesia.

1 Introduction

There has never been a greater demand for timely access to information for data managers to analyse and make informed decisions as in the ongoing pandemic. The outbreak of the novel coronavirus in late 2019 is an example where data from multiple sources globally facilitate effective allocation and utilisation of scarce resources. This function is particularly crucial in situations of technical and infrastructural constraints found in developing countries, where effective data management is key to facing the dire conditions that the pandemic determines. Information dashboards are lauded to facilitate access of information from multiple data sources within and across organisations, especially in environments characterised by fragmented Health Information Systems (HISs) [1]. Dashboards refer to the visual display of important information from one or multiple data sources needed to achieve organisational objectives that can be easily accessed and monitored at a glance [2]. Previous studies illustrate how information dashboards were used for improving health service delivery [3] as well as providing timely information to organisations [4]. However, implementing and maintaining dashboards is a non-trivial challenge given the fragmentation of health information and emergency nature of pandemics. This article attempts to explore the challenges and opportunities related to establishing an integrated system collecting data from multiple sources on the COVID-19 pandemic and disseminating them through information dashboards and other analytics at all levels of the health system. Drawing from the empirical work of implementing integrated dashboards by Indonesia’s Ministry of Health (MoH), integration approaches and coordination among stakeholders are discussed and analysed. The article contributes to the emerging literature on digital platforms and socio-economic development, illustrating how incremental and evolutionary approaches and piecemeal implementation are essential for establishing and maintaining integrated solutions leading to timely access to key information.

2 Review of Key Concepts

Fragmented health information and lack of coordination often lead to overlapping and inefficient national HIS which eventually undermine the efforts towards providing better health [5]. One of the major reasons for HIS fragmentation is the tendency to implement new, independent vertical information systems, even when information is captured from existing information systems [1,5]. In Indonesia, similar challenges are identified with vertical health programmes implementing their own reporting structures and HISs with little to no involvement from the MoH. In their study of establishing an integrated HIS, Ellingsen and Monteiro pointed out that integration is a potential remedy for the problems that fragmentation produces [6]. An integrated solution provides managers with means for accessing key information from multiple data sources, facilitating a comprehensive overview of the organisation’s performance. However, the integration process in the healthcare domain is less than trivial. The integration process takes place at different levels, that is, from purely technical to organisational and institutional; and with a continuous interplay between these levels [7]. A notion that has recently attracted attention for data integration is that of information
dashboards. Dashboards attract and engage stakeholders in discourse for integrating and sharing information across fragmented information systems. The use of dashboards motivates and mobilises diverse stakeholders as they realise the potential and possibility of integrating information among fragmented systems and data sources, and commit to the integration process.

3 Empirical Context

Indonesia is a large developing country with the fourth largest population globally. Its health sector is heterogeneous, consisting of multiple subsystems such as health programs (for example, HIV, TB and Malaria), and multiple administrative hierarchy levels. Indonesia has adopted decentralized and regional autonomy governance, providing opportunities for independent decision making at sub-national levels i.e. provinces and districts, which add to the fragmentation and complexities of the HIS. Indonesia’s HIS is fairly typical with multiple vertical health program-specific systems with their own platforms working in ‘silos’ with little data sharing. For example, health programmes such as TB, HIV/AIDS and Malaria have their own reporting systems running in silos with minimum information sharing.

Previous efforts by the information and ICT department team in the MoH called Pusdatin involved the development and implementation of an integrated dashboard for routine and essential health services [1]. The dashboards were built on a web-based open source District Health Information Software 2 (DHIS2). Ten districts were selected from five provinces across Indonesia as pilot sites to test the district dashboard concept. As the project progressed, the dashboard strategy was found to be useful in aligning stakeholders and become part of the national policy i.e. “Aplikasi Satu Data Kesehatan” (ASDK) meaning One Health Data Application.

However, at the onset of the coronavirus pandemic, multiple systems were established to collect data with little coordination. New governance structures and information systems were established with little involvement of the Pusdatin unit such as the president’s office COVID-19 task force dissemination platform. Realising the challenge, Pusdatin decided to integrate its ASDK with the national COVID-19 task force dissemination platform to provide an end to end solution aiding decision making at various levels in the MoH. The information was later used by Pusdatin to view daily the province-based distribution of COVID-19 tests and cases and perform other statistical analysis. In addition, COVID-19 data were analysed by juxtaposing with other essential health services such as MCH, HIV, TB, Immunisation, Human Resource of Health which had been previously integrated and functioning in ASDK. For example, the availability of health resources such as health workers and beds availability in hospitals were triangulated and analysed with COVID-19 information giving valuable insights to managers at the national and province level. In addition, the integrated data were visualised graphically through dashboards enabling users with different backgrounds to easily understand information facilitating collaboration among stakeholders towards achieving shared goals.

However, the integration process between ASDK and the national COVID-19 task force dissemination platform was not a trivial process. Efforts were made to extract data daily and load into the ASDK for analysis and visualisation through dashboards. Initially, excel based files were extracted from the dissemination platform, transposed and loaded in the ASDK. However, as the dissemination platform was regularly being updated, there was a need for automatics data transfer using Web API. Using DHIS2 stable Web API, Pusdatin was able to make automatic data transfer from the COVID-19 task force dissemination platform. The data was used for analysis and shared with other units in the MoH, including the human resources department for further analysis. For example, identification of health workforce volunteers, prospective health workers who will graduate from university, availability of treatment rooms in national and regional hospitals, military and police hospitals in correlation with areas most affected by the pandemic offered in-depth insight to data managers. Data completeness, however, was a challenge observed from the reported data. Due to the emergency nature of pandemics, data governance was not implemented properly, such that not all information was properly completed by the reporting health facilities.

4 Findings

The key finding from our work is that establishing an integrated dashboard requires an evolutionary and incremental process, especially during emergency periods. The DHIS2 dashboards were used to collect routine health information from different health programs such as HIV, TB, Malaria, Maternal and Child Healthcare, and Immunisation. The outbreak of the novel coronavirus posed a dilemma of collecting and disseminating information leading to other stakeholders building their software systems. However, as custodian of health information, Pusdatin was not managing these other systems apart from accessing them in the dissemination platform. This led to Pusdatin to creatively extend their DHIS2 dashboard to cater for the COVID-19 reporting
Learning from the experience of implementing district dashboards in 20 of districts[1], Pusdatin with their stakeholders engaged the COVID-19 national task force unit and explored means of actively accessing the COVID-19 data by province. The integration facilitated a comprehensive analysis of COVID-19 data with other key health-related information such as human resources, referral hospital, and primary healthcare. The integration process, however, met several challenges. While the data were transferred to the ASDK dashboards for visualisation, the quality of shared information was questionable. Some facilities failed to report complete information required from the data collection tools. This was partly due to how structures were quickly set up to accommodate the reporting of health statistics during the emergency period.

The use of robust, flexible and scalable system architectures are essential for systems development in contexts of high complexity and uncertainty as it allows for adding new components. Designing and implementing an information system takes time, and piecemeal development and learning were needed to help guide further work. Previous work engaged by Pusdatin in implementing integrated dashboards was useful and allowed Pusdatin to extend what they have and include a new set of information i.e COVID-19. This facilitated the visualisation of COVID-19 information within MoH reducing the ongoing fragmentation of health-related information.

5 Conclusion

In this paper, we present an integrated dashboard used by the MoH in Indonesia to analyse and visualize COVID-19 data under crisis. The article contributes to the emerging literature on digital platforms and socio-economic development, illustrating how incremental and evolutionary approaches and piecemeal implementation are essential for establishing and maintaining integrated solutions leading to timely access to integrated information. Further exploration is required to extend our understanding of how integrated dashboard approaches can be rapidly scaled even under crisis.

References

“Online Action”: Implementing information systems in the time of COVID-19 pandemic

Abstract. Data collection and management using Excel data sheets exposes health programs to the risk of serious challenges in data management. The Immunisation Program of the Indonesia Ministry of Health (MoH) has been using Excel data sheets for data collection and the management of its aggregate immunisation data for the last decades. To improve data quality and be consistent with the national “One Health Data Policy”, the Immunisation Program decided to shift to District Health Information Software (DHIS2), a platform that has been used by the MoH for One Health Data Application for data integration and visualisation. During the process, the COVID-19 pandemic started to affect the country. Since then it has changed the DHIS2 for Immunisation implementation plan. It forced the implementation team to restart the processes with ‘online action’: online meetings for project planning, technical support, online training as well as ‘distant and online’ implementation. In this paper we narrate our experience of sustaining DHIS2 implementation during the crisis, making a twofold contribution: to practice through the notion of “adaptive project management”, and to the methods of action research with the notion of “adaptive action research”.

Keywords: adaptive governance, online action, information systems implementation, action research, COVID-19 response.

1 Introduction

The Immunisation Program of the Indonesia Ministry of Health (MoH) has been using Excel data sheet method to collect and manage its aggregate Immunisation data for the last few decades. Using Excel as a database methodology has serious flaws: as data is aggregated at each level, drill down to the data source at the health centre is not possible and data quality cannot be checked. To improve data quality and to be consistent with the new MoH “One Health Data policy”, which focuses on data interoperability and data standards [1], the Immunisation Program planned to change from the current Excel method to the One Health Data Application (ASDK) database system during 2020. This approach is based on health center data and will allow the Immunisation Program to better manage, analyze and use its data through dashboards and data visualisation.

With this transition in mind, the Immunisation Program requested the Global Alliance for Vaccines and Immunisation (GAVI) to provide technical assistance from the University of Oslo (UiO), in partnership with the Pusdatin health centre and the University of Gadjah Mada (UGM), to operationalize this “transition 2020” concept. ASDK uses DHIS2 (District Health Information Software) developed by UiO. The country uses DHIS2 to integrate and visualise health-related data from different programs in the MoH and across sectors.

The pilot project was ongoing when the country reported its first case of COVID-19 in early March. Several local governments in Indonesia enact large-scale social restriction (LSSR) that affects work and program management. Immunisation is one among many health programs in Indonesia of which performance is slumped because of COVID-19. Immunisation for other preventable diseases remains critical, yet immunisation coverage fell during the pandemic [2]. Immunisation program and the implementation team agreed to move the project forward despite the challenges.

The team members are split across Jakarta and Yogyakarta (Indonesia) and Oslo (Norway). Despite the pandemic, the project’s objectives remained the same. We need to enable hundreds of users across the country to implement the information systems and improve data quality.

Through this project, we demonstrate how we can apply adaptive project management to implement information systems nation-wide during COVID-19 crisis. In this paper, first we present our project storyline. We then detail our methodology approach to collect and analyse our data, then illustrate the expected contribution from this research and the related implementation project. This research-in-progress paper aims to contribute both in practical ways managing the project and in addressing challenges to IS research and action researchers in COVID-19 times, where the researchers are collaborating and conducting all assessment, planning, intervention, and evaluation online.
2 The case: From the pilot to the pandemic

2.1 Project baseline and assessment

The Immunisation Data System Assessment Team carried out a two week assessment on 21 October - 1 November 2020. The team consisted of the Immunisation program, Pusdatin (Center of Data and Information, MoH), UiO and WHO. We conducted field visit assessment to 5 health care facilities (PKM), 4 district health offices (DHO) and 3 provinces (PHO).

Through the assessment, we learned that program managers at the districts have to enter immunisation data several times to different systems, e.g. KOMDAT (Data Communication), PWS (Local Area Monitoring). PWS is the main reporting format in the Immunisation program that uses Excel spreadsheets. The format of the PWS spreadsheet itself does not allow name-based reporting and this is challenging when target population is needed. Other pitfalls include typical spreadsheet challenges: versioning, integration and work collaborations.

Based on this assessment, we recommended to carry out a pilot project in DKI Jakarta, set up a WhatsApp group, revise the Excel format to import the data, use aggregate data in November and December 2019. On top of it, we designed our implementation by employing two main strategies to optimise resources.

The first is cascade training where the training would have been conducted from central level, to provincial, then district, then facility level. The second strategy is digital learning. Digital learning are practically everything digital that is needed to support the training above. This may include but not limited to tutorial, lecture, or assignments, workbooks, quizzes, assignments, certificates, discussion forums, etc. These strategies were drafted in the February in “Transition 2020 Proposal” to GAVI.

2.2 Phase 1 Pilot Implementation

In this phase, we piloted DHIS2 platform for Immunisation in the DKI Jakarta province. This province is where the country capital and central government offices are located. The province is also one of the provinces in Indonesia with the smallest area and fewest districts (6 districts). This province is the most developed area of the country. Given the condition above, the implementation team appraised that DKI Jakarta is one of the provinces that would be the most ready for new technology/innovation.

After we set up the Excel importer for the Immunisation program, we sent out the new Excel format for the districts to fill in, then invited them for a face-to-face hands-on session. At this stage, we were still using our traditional curriculum for information systems training. This includes overviewing the applications, entering data, and creating visualisations using charts and dashboards. Here, we gathered inputs from the participants about the import process and format.

2.3 COVID-19 Pandemic

Two weeks after the first COVID-19 cases were reported in Indonesia, General Secretary of Ministry of Health published measures to prevent the transmission of COVID-19 including LSSR. For economic reasons, the central government did not permit total lock down. LSSR includes closing public places, restricting public transport, and limiting travel to and from the restricted regions [3]. LSSR policies keep on changing, however, some offices are still applying minimum and/or maximum work from home/office percentage.

Indonesia has been in a prolonged first wave of COVID-19. Confirmed cases regularly increase, while the number of tests does not seem to increase significantly. Considering the frequent changes in policy and regulation, it is challenging to adapt the plans and implementation activities for both the action research and the practical information system project. We found it critical to respond to the crisis while also observing and complying with central regulations. At least until the LSSR is fully lifted, the need to develop a framework for adaptive action research for project management is important. This should include all aspects of project management, such as online planning, online coordination and collaboration, and online training.

2.4 Adjusting the implementation plan

Traditionally, we roll out the platform through local government buy-ins, followed by training of the health office staff [4]. In this situation, we will continue doing the cascade capacity building online. The Data Team will train the Immunisation staff at the Ministry, the central staff will then train the provincial and district staff, and the provincial and district staff will form a team of trainers who will train the health care facility staff. However, as online training is relatively new for the local staff, Immunisation Data System Team members in the central level will design the activity and provide guidance and assistance throughout the process.
The whole project implementation is being carried out remotely. Daily communication occurs mostly via WhatsApp with 5 hours time difference between Indonesia and Norway, in some cases communication happens via email. Meetings are conducted via Zoom. Project documentation is managed with and work collaboration continues via Google Drive (Document, Sheet, and Slide). In the future steps of this research, we will describe how the online planning, online coordination (cross country, cross city), and online training take place.

Based on our experience in previous implementation with Pusdatin [5] and also given the limited time, we changed our approach to the project implementation. We no longer teach staff the technical skills to use the platform. We focus on teaching data use and data quality using premade dashboards in the platform.

2.5 Change Management

The Immunisation Data Team works under the Head of Immunisation Sub Directorate, particularly under the Planning Division. The management in the Immunisation program changed in May 2020. The former Head of Division who promoted this activity first time was assigned to a different division. His supervisor was also rotated to different directorate. Management rotation is a common practice in the ministry.

Project implementation went slowly as we continued our assistance remotely from Yogyakarta, Indonesia and Oslo, Norway. Staff are coping with remote and office work, along with other challenges that come with restrictions, homeschooling, etc. Government offices hold multiple meetings per day, from one to over three hours per meeting. Nearly all scheduled meetings needed to be rescheduled because the Immunisation Data Team was overwhelmed by other work. After almost three months of their appointment, in August 2020 the new Head of Subdirectorate and Head of Division joined our virtual preparation meeting for the first time, via Zoom. Since then they have been following the progress closely, facilitating us to finalise each decisions along the way, although sometimes involved detailed and rigorous technical explanation regarding our concept of adaptive action research and project management.

<table>
<thead>
<tr>
<th>Date</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 21 - November 1, 2019</td>
<td>Assessment of Immunisation Data Systems</td>
</tr>
<tr>
<td>November 10, 2019 - February 27, 2020</td>
<td>Pilot project DKI Jakarta</td>
</tr>
<tr>
<td>March 2, 2020</td>
<td>Indonesia reported their first COVID-19 cases</td>
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<tr>
<td>March 16, 2020</td>
<td>Circular letter from the General Secretary of Ministry of Health number 991/2020 regarding prevention of COVID-19 transmission</td>
</tr>
<tr>
<td>March 17, 2020 onwards</td>
<td>Pivoting strategy to fully Online Action (online planning, online meeting, online training)</td>
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<tr>
<td>May 25, 2020</td>
<td>Management change</td>
</tr>
<tr>
<td>September 25 - October 1, 2020</td>
<td>Trial training: Delivering learning for Central level</td>
</tr>
</tbody>
</table>

3 Proposed Methodology

In this paper, we conduct “adaptive action research”. We derive this method from action research, where we plan and conduct each phase of the action research cycle remotely. This is a response to the abrupt changes caused by the pandemic. In the future steps of this research, we will describe the challenges, considerations, and interventions. From there, we are expecting to generate a prescriptive solutions. The adaptive concept is drawn from adaptive governance notion from the organisational research field [6].

Our research follows the phases of action research, but remotely, taking advantage of digital technology to bridge the limits for traveling, to the least. Data are being gathered through, but not limited to, recorded meeting sessions through Zoom, ethnological observations, implementation notes, interviews, and also the learning management system used for the training.
4 Expected Contributions

When the pandemic hit, plans and approaches had to change. Key contributions from the research will be in the area of action research in a changing context and in a time of uncertainty, which at a general level we may label as *adaptive action research*. At a more concrete level contributions will include lessons on how to carry out remote and online action research, online training - and even online field work and project implementation, which we term *adaptive project management*.

5 Questions for discussions

While level of ‘technical’ success can be measured using the database to calculate completeness rate of data from health centres, more qualitative data on user satisfaction and data use, need to be gathered through engaging users at different levels through focus group discussions as well as through direct observation and fieldwork.

What will be the best way to evaluate the impact of the new strategy during the COVID-19 pandemic to the implementation? How should information systems be governed for sustainable implementation even in crisis like COVID-19? Does this method apply for general sustainability even without crisis?

References

Non-verbal Communication on the Web: Digital Gestures

Suhyeong Kim¹, Hwajoon Choi¹, Simeon Vidolov² and Jungwoo Lee¹

¹ Yonsei University, Seoul, Republic of Korea
² University College, Dublin, Ireland

Abstract. Social media provides a new ‘online’ frame of interaction that constantly connects people to each other. Thus, virtual communication is proliferating beyond imagination via diverse social media. As these platforms advance and thrive, new features are added to enrich the interaction experiences beyond the intended primary message delivery. These features range from a simple button such as ‘like’ to a complicated series of responses and comments, which is augmenting the primary message delivery mechanism. In this paper, a concept of ‘digital gesture’ will be developed and defined by covering these secondary message delivery features developed in the social media arena. First, existing digital gestures were collected by reviewing five popular social media: Facebook, YouTube, Naver Line, Instagram, and LinkedIn. Second, a theoretical classification framework of non-verbal communication from traditional media studies was borrowed and used as a basis for the feature analysis of the collected digital gestures. The resulting set of digital gestures will be compared against this theoretical framework, and a new typology of digital gestures will be constructed and presented.

Keywords: Digital Gesture, Nonverbal Communication Cues, Social Media.

1 Introduction

The world has never been so connected than now (Statista, 2020). As the number of mobile users increases and the Internet becomes more accessible to people, social media is continuously gaining popularity and influencing the way people live on a global scale (Hootsuite, 2019). The number of users has been steadily growing, and this trend is expected to continue in the future (Statista, 2020). However, it is not only the number of users, but also the amount of time people spent on social media changed over time, which clearly shows that much of the communication done in phone calls and text messages are now replaced into social media (Salim, 2019).

Just like when the Internet first appeared and people started to communicate through emails, SNS is also changing the form of interactions between users. People in modern society are not just using social media for networking, but there are additional identified uses and gratifications of social media like information sharing (Whiting & Williams, 2013). McLuhan’s Extension Theory states that the medium influences differently de-
pending on the characteristics of the medium rather than the content delivered (McLu-
han, 1964). In accordance with what McLuhan argued, the characteristics of social me-
dia (using likes, thumbs up, etc.) are defining social media, changing the way people
interact, and ultimately affecting society as a whole.

In this research, our goal is to investigate practices that enhance the meaning devel-
opment process in online communication without texts. Non-verbal communication
contains more meaningful implications during conversations and allows one to com-
municate more effectively and precisely with others (Knapp et al., 1978). Non-verbal
communication has been associated with face to face interactions that have been con-
sidered the ‘richest’ medium (Ngwenyama & Lee, 1997). At the same time virtual com-
munication has been considered as inferior to face to face one (Dubé & Robey, 2009).
Yet, there have been empirical cases of complex distributed work arrangements that
have been successfully accomplished without face-to-face communication (A Malhotra
et al., 2001; Metiu, 2006). Such empirical findings have led to moving away from
attributing the ‘richness’ of interactions to the technology per se, and thereby refuting
the idea of face to face meetings as an “easy fix-fix solution” to virtual communication
(M. O’Leary et al., 2002, p. 18). Consequently, there have been arguments that virtual
communication is a qualitatively different form of communication that performs non-
verbal aspects in a novel way (Hinds & Kiesler, 2002; Nardi & Whittaker, 2002). More
recently, studies have tried to account for the variance across studies and move away
from simplistic technologist explanations. For instance, Malhotra and Majchrzak
(2014) have problematized the practice of associating negative performance with the
level of reliance on the ICTs, and argued instead that performance depends on the ways
team members use ICTs. Building on prior critique on techno-centric perspectives
(Carlson & Zmud, 1999), they focus on different uses of technology and the ways they
afford the development of situational awareness necessary for coordinating activities,
and making virtual behaviours predictable. While previously studies have pointed out
the inferiority of virtual communicating, being less companionable and frequent, but
more effortful (M. B. O’Leary & Mortensen, 2010), these authors argue that ICTs and
particularly social media constitute affordances of synchronicity, rehearsability and re-
processability that offer new opportunities for communication.

Overall, current research endeavors in explaining how virtual communication and
particularly its non-verbal dimension operate through technology is still insufficient. At
the same time, the growing role of social media in successfully supporting new forms
of organizing and communicating (Dobusch & Schoeneborn, 2015) has made it even
more pressing to understand the micro dynamics of using social media and enacting
new forms of productive and non-verbal communication.

Therefore, we focus on the following questions:

1. How is social media used to afford rich and productive forms of communi-
cation?
2. What are the digital gestures (micro practices) through which the non-verbal aspects of communication are materialized through social media?

Our work is premised on the understanding that non-verbal interactions are neither tied to face to face settings nor are completely a matter of in situ social practices and in this way being agnostic of the particular communication medium. Instead, we understand social media communication as re-materializing in novel ways, which is the non-verbal aspects of human interactions (Beane & Orlikowski, 2015; Introna & Hayes, 2011).

2 Social Media

It is hard to precisely point out where social media came from and to define social media. Social media in itself is inherently multifaceted, and its identity has changed a lot in the rapidly changing online media environment (Edosomwan et al., 2011). However, there are a couple of leading opinions on the origin of social media. One is that social media has its root in SNS (Social Network Sites) of the late 1990s with some specific examples of SixDegrees.com (Boyd & Ellison, 2007). Albarran, in his book The Social Media Industries, suggests that web-blogs also can be regarded as a significant starting point of social media in that blog is where contents are produced and consumed by the public on the Internet (Albarran, 2013). Some socio-technology studies view Apple’s iTunes as a first social media service in that it acted as a digital hub using a computer-connected system of end-users (Van Dijck, 2013). Some extensive viewpoints date back to even the 1970s; for example, a study in computer technologies states that MUD, originally known as Multi-User Dungeon, Multi-User Dimension, or Multi-User Domain and BBS, known as Bulletin Board System, is a prototype of today’s social media in that they allowed for real-time interactions in a virtual world for the first time (Edosomwan et al., 2011).

While there are different viewpoints on the origin of social media, the most received argument for today is that social media stems from SNS. SNS is a web-based service where individuals interact, form, and share social relation networks (Boyd & Ellison, 2007). The study defines SNS with three main features: (1) users can create and share a profile account within a bounded system; (2) a list of other users can be shared through connection; (3) users can view, interact or connect with other users in the system. Even though their nature varies from place to place, SNS have these features in common. SNS has been catalyzed by Web 2.0 and User Generated Contents to become social media (Obar & Wildman, 2015). The rapid diffusion of Web 2.0 functionalities, applications and the popularity of online user-generated contents play a significant role in reframing SNS into a more advanced media entity today.

As various social media services emerge, social media serve additional features and functions facilitate information flow. Users consume non-verbal communications to
deliver their intended meaning even without texting. Emotions become social cues beyond what a text appears to deliver and help facilitate social information flow in Computer Mediated Communication (CMC) (Thompson & Foulger, 1996). Emoticons can act as a paralinguistic component and as a non-verbal surrogate to facial expression (Derks et al., 2007, 2008). Users use emoticons as visual cues to enhance the meaning of textual electronic messages (Rezabek & Cochenour, 1998).

While social media services were said to directly compete with each other for the mass population in the past, which was supported by the displacement theory, recent studies indicate that social media platforms live together in the reciprocally inter-related ecosystem, which is supported by the complementary and niche theories of media evolution (Boyd & Ellison, 2007; McIntyre, 2014). This trend is prevalent across different areas (Palekar & Sedera, 2012; Hanna et al., 2011; Boczkowski et al., 2018).

3 Non-verbal Communication

The young generation of these days is experiencing a whole new sensory environment. Fundamentally, Channel Expansion Theory explains that the level of richness and development of media tools are shaped mainly by individual experiences (Carlson & Zmud, 1999). Unnatural media users would adapt to the media in a complementary way and develop a channel. In this paper, we have termed such complementary tools (non-verbal communication cues) in social media: digital gestures. Just as several non-verbal cues in a face-to-face conversation create a more effective communicative environment, so do digital gestures in social media.

NVC can be classified in numerous ways according to the person who defines the idea or the field of study. In our paper, we classified NVC based on Nonverbal Communication in Human Interaction 8th edition by Mark L. Knapp (Knapp et al, 2013). The criteria for selection was to cover both the knowledge from the past and new ideas appearing today. We looked at the evaluation criteria in detail and cleared the concepts that cannot be represented in today’s technology.

4 Research Method

The key aim of a focus-group interview is to understand the meanings of attitudes and behaviors of individuals. Participants for focused group interview are those who have something to say about the research topic or share similar socio-trait, and comfortable communicating with one another (Richardson & Rabiee, 2001). The biggest characteristic of focus group interviews is group dynamics. Thus, the type of data generated through the social interactions of the group provides richer data than those obtained from one-on-one interviews. (Thomas et al., 1995).
Since this study is trying to view users’ behaviors on the web, in-depth discussion will make people more engaged in the issue and acknowledge the ideas or actions that they have not yet noticed. Also, this method will illuminate the differences between the participants from various age, gender, and hierarchy. The key to focus groups is the ability to generate data based on the synergies of interactions between groups. (Green et al., 2003). The ideal number of participants may vary upon the subject of matter, but 3-4 members or 6-10 members are suggested to get a variety of opinions within a manageable size. Lastly, each group’s interview should be completed in 1–2 hours.

In our research, the framework of non-verbal communication will be shared in advance of the interview and researchers will spend 10 to 15 minutes in the beginning of the interview to help people fully understand the objective and topic of our research. The researcher will only interrupt the discussion when there are questions, or the topic has not yet fully discussed.

5 Implications

Implications are discussed by comparing new digital gestures typology with traditional non-verbal communication typology. As of theoretical implications, we are developing a theory of ‘Digital Gesture’. It will be a good preliminary point to understand the interactions among people in an online communication environment. For practical implications, we will find missing NVC cues on the web. People are using social media in various ways, but there are still some complexities in understanding the context fully. Identified digital gestures will discover the missing linkage between offline and online situations, which will help developers regarding what to improve on their platforms.

References

Unraveling the Nature of Digital Labor Platforms: An Institutional Logics Perspective on Features, Affordances and Work Practices

Laura Schulze¹, Adeline Frenzel², Manuel Trenz¹, and Daniel Veit²

¹ University of Goettingen, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany
² University of Augsburg, Universitätsstraße 16, 86159 Augsburg, Germany
laura.schulze@uni-goettingen.de

Abstract. The purpose of this research project is to shed light on the controversial nature of digital labor platforms. While being depicted as markets, digital labor platforms are also referred to as corporations in academic and public discourse. Building on institutional logics and affordances, we contribute to a deeper understanding of the nature of these platforms by a) providing an analysis of the different affordances enabled by platform features, and b) linking them to market and corporation institutional logics as they are perceived by workers and the public. The findings will help policy makers in the classification and regulation of digital labor platforms and provide guidance for platform owners in their choice of platform features.

Keywords: Digital Labor Platform, Affordances, Features, Institutional Logics.

1 Introduction

Labor markets, job seekers and corporations are severely impacted by digital technologies, especially digital platforms. The rising popularity of crowd work and recent developments in artificial intelligence have given rise to a societal phenomenon called ‘gig economy’, in which the exchange of labor for money is mediated, coordinated and controlled by digital labor platforms (DLP). Digital labor platforms are “online environments where digital services are sourced and delivered in exchange for compensation” [1, p. iv]. Individuals use DLPs to find work requested by organizations or other individuals. While the majority of DLPs call themselves marketplaces mediating between independent workers and requesters (e.g., “Uber is a technology platform. The Uber app connects drivers and riders.”[2]), the nature of DLPs, which are ambivalently situated between markets and corporations, is controversial in academic and public discourse (e.g., [3–7]). Although electronic marketplaces and platforms in general are networks of actors where value is created outside the boundaries of the core company [8–10], DLPs differ from other platforms. Rather than enabling the exchange of existing tangible or intangible goods, DLPs mediate work that individuals provide in the form of skills and knowledge. Due to their interactions with and direct effects on humans [11], a controversial debate arose which is reflected in various court decisions [12, 13]. Therefore, the practices of DLPs deserve our special attention to better understand these emergent digital/human configurations [14].
On the one hand, DLPs resemble markets as they serve as intermediaries, facilitating visibility and matchmaking between suppliers of work and demanders for work. They do so by reducing transaction costs for the search for appropriate candidates and appropriate positions respectively [15]. From this perspective, they are electronic marketplaces [16], and follow market logics where the basis of norms lies in self-interest [17]. The view of DLPs as markets is supported by research in economics and information systems (IS) literature, e.g., by the definition of digital platforms as two- or multi-sided markets (e.g., [15, 18–20]) or the notion of flexibility, own work schedules and freelance work (e.g., [5, 21–23]).

On the other hand, DLPs resemble corporations 1, because they facilitate the value creation process by coordination and control. Algorithmic management has been termed to describe the scale and automation of the management that platforms use [24, 25]. The extent of control over the workers and the work processes is one of the characterizing attributes of corporations ([26–28]). The basis of norms in the corporation logic is firm employment [17]. In the public discourse, this view is supported by workers who feel that they are misclassified as independent contractors and should rather be classified as employees [29]. In academic literature, the view of DLPs as corporations is implicitly supported by research in organizational and IS literature, e.g., the analysis of algorithmic management simultaneously on DLPs and corporations (e.g., [30, 31]).

In this research project, we contribute to the elaborate understanding of the nature of DLPs by offering an institutional logics perspective on the affordances of these platforms. As platforms and work on platforms are enabled by digital technology [15], the technological aspects deserve a more prominent role in the analysis of the nature of DLPs. We follow calls for research on the integration of institutional logics and technology [32] and prior studies on this integration (e.g., [33, 34]) by investigating the following research question: How do affordances enabled by platform features contribute to market- and corporation-associated institutional logics on digital labor platforms? To answer this question, we first identify relevant DLPs and the features which afford users to achieve their goals in using the DLP. Then, we uncover IT affordances of DLPs as “focus of attention” of the workers in order to link IT affordances as work practices to institutional logics [17].

Our findings can yield important implications for policy makers, platform owner as well as workers, and advance our theoretical understanding of platform features, affordances and institutional logics.

2 Theoretical Foundation

We build our analysis on institutional logics. Institutions are “patterns of activity through which humans conduct their material life in time and space, and symbolic

1 Of course, platform owners themselves are organized in corporations. For instance, Uber Inc. has employees who are responsible for the management of the corporation (behind the platform). However, we are interested in the work on the platform and the associated perceived institutional logics.
systems through which they categorize activity and infuse it with meaning” [35, p. 232]. While multiple, consistent and contradicting, institutional logics are prevalent in certain institutions [36–39], ideal types can be differentiated as follows: market, corporate, profession, state, family, religion, and community [17, 35, 40].

From a sociological perspective, the institutional logics pertaining to gig and sharing economy platforms, especially markets and corporations, have been studied [6]. Although Frenken et al. exemplify platform features such as algorithmic matching, (dynamic) price-setting, tracking technology and reviews in the discussion of institutional logics [6], they do not take a technological perspective to explain how the perception of institutional logics can be linked to practices, which DLP features afford to their users.

In our study, we focus on the impact of these and other technological features on the perception of institutional logics on DLPs. Slavova and Karanasions [33] argue that the use of ICT-based modalities, such as mobile SMS, mobile voice and the Internet, are rather associated with one institutional logic (value-chain logic - compare corporation logic) than another (smallholder logic - compare market logic). However, Faik et al. [34] find several affordances to be associated with multiple institutional logics (market, corporation, state, profession and community). In the market logic, technology stimulates transactions with new customers or increases the number of transactions with existing customers, and coordinates transactions across value chains. In the corporation logic, technology standardizes and controls operations [34].

IT affordances describe “the ways in which the attention of the users become intertwined with material elements of IT to produce new possibilities of action” [34, p. 1363]. Hence, affordances are possibilities for goal-oriented action afforded by a technical object to users and identify how a user can potentially use the technical object [41–43]. Affordances are not inherent properties of the technology, nor of the user, but refer to the relationship between the user and the technology [44]. For instance, notifications in the Uber App may afford an Uber driver who wants to improve her or his customer relations to monitor the customer feedback. At the same time, the notifications may afford nothing to another Uber driver whose only goal is to complete as many rides as possible in a certain period.

We argue that platforms evoke affordances that correspond to different institutional logics. Platform features are elements which give rise to an affordance, such that users can achieve their goals [41, 42, 44]. For example, DLPs afford users to find work, enabled by, for example, platform features such as “search for jobs” on Upwork or “accept a ride” on Uber. Actualizing this affordance can correspond to a market logic as well as a corporation logic depending on the design of the platform features as well as the interpretation of the features by users. Building on the previous example, the “search for jobs” feature could afford that workers can act in their self-interest in choosing their preferred jobs and thus, this affordance corresponds to a market logic. The “accept a ride” feature could afford that workers feel forced to accept assigned jobs because of negative consequences if they do not accept the job. This affordance rather corresponds to hierarchical structures prevalent in corporations.

Summarized, prior literature suggests that DLPs might be associated with multiple institutional logics, especially market and corporation logics. Prior literature lacks an understanding of affordances of DLPs and their enabling platform features. Additionally, the configuration of the technological features can lead to an association...
with one institutional logic and related consequences, such as regulations, over others. In our perspective, DLPs offer features which enable several affordances. Psychological needs of workers motivate the use of certain affordances [41] (and actualization of affordances thus fulfills the needs of workers). A set of affordances enables configurations of work practices which shape institutional logics, e.g. such as acting in a market logic (e.g., autonomous freelancer) or acting in a corporate logic (e.g., adhering to certain policies, being controlled). Furthermore, society members perceive institutional logics as well as DLPs. The differing perceptions of DLPs stimulate a controversial debate in the societal and political discourses which themselves determines DLPs and lead DLPs to re-shape their features. Fig. 1 depicts the relationships between the concepts that are central to our study.

Fig. 1. Relationship between platform features, affordances and institutional logics.

3 Methodology

As presented in the previous section, current research provides little theoretical guidance for understanding the controversial nature of DLPs. We choose a qualitative research approach, which enables us to study social and organizational phenomena of DLPs, their affordances and the enabling platform features.

We use several data sources to answer our research question. For the identification of platform features and affordances, data collection and analysis evolves in three steps (compare [41, 44]). First, we will identify the most popular and most relevant DLPs. Second, we will identify the variety of platform features that are mentioned on the platforms’ websites/apps, studied in the academic literature, and discussed in the media with a feature analysis. This data analysis will identify platform features and give us a
preunderstanding of the affordances, which will be systematically coded by multiple coders to satisfy reliability measures.

Third, to unravel how platform features contribute to the perception of DLPs as markets or corporations, we will conduct an explanatory multiple-case study [45, 46]. Primary data will be collected by interviewing workers of the selected platforms. The goal of the semi-structured interviews is to find out what affordances workers perceive and which institutional logics they emphasize: do they have the self-concept of an independent freelancer or an employee and due to which affordances? Additionally, we triangulate the primary data analysis with secondary data analysis of the public discourse [47]. Through coding and memoing of the arguments found in newspapers, blogs, and forums, we will find out DLP features contribute to the perception of a market or a corporation. With this approach, we might also find a reversed logic, where the pre-existing mindsets and self-concepts of workers as independent contractors (market logic) versus platform employees (corporation logic) determine how they use (affordances) the platform features.

4 Expected Contribution

We envision the results of our research project as follows: Based on the large set of qualitative data we collect, as well as the described data analysis, we expect to identify the DLP features that enable workers’ affordances. Additionally, we will analyze the self-concepts of workers, and the public perception of DLPs to identify which affordances pertain more to a market logic, and which pertain more to a corporation logic. Therefore, we will be able to draw conclusions on the influence of different platform features on the perception as corporate or market logic from the workers perspective as well as in the broader societal view.

To exemplify the rather abstract procedure, we draw on a simplified illustration of the digital labor platform Uber:

- **Platform selection**: Uber is a platform which is prominently discussed as a DLP in the academic literature (e.g., [48]) and in the public discourse (e.g., [49]).
- **Identification of platform features**: the Uber website describes the mobile app features ([50], appendix A), such as: profile page, automated matching with requesters, tracking of earnings, notifications, standardized contract with requester, and star rating.
- **Identification of platform affordances**: the platform’s notification feature could be perceived by workers as a way to generate new customers for their own business or as an assignment of a job by the platform, with which they have to comply.
- **Corresponding institutional logics**: The first aforementioned affordance would rather be associated with a market logic and the second affordance would rather be associated with a corporation logic.

Our findings will guide policy makers in the regulation of DLPs, because regulations and laws are tied to certain institutional logics, e.g., employment laws hold for corporations, but not for markets. Platform owners could use our finding to implement those platform features, which support the institutional logic (and regulations) they
want to be associated with. An example is the Danish cleaning platform Hilfr, which evolved from a market logic to a corporate logic. Consequently, they treat the platform workers as employees and grant them social security benefits, such as a “minimum salary, pension, holiday pay and access to sickness benefit”[51]. Ultimately, workers will benefit from a clearer distinction in the regulation and presentation of the platforms, because this helps them making better informed decision about the status and benefits they want to profit from when choosing a DLP: autonomy (market) versus security (corporation). Theoretically, we contribute to the research stream on the influences of affordances on institutional logics (e.g., [6, 34]). We also advance research on technological affordances and features by (e.g., [41, 44]) investigating a different type of digital platforms. Future research opportunities include the investigation of the topic from a multi-level perspective, in which not only the workers’ goals and affordances, but also the platform owners’ goals and affordances could be investigated [44].

References


Appendix

Appendix A: Identification of Platform Features

Example: Uber Driver App [50]
T3

Digital Work
This research explores how the idea of facets of work can be used to understand digital work as something more than a slogan, buzzword, or umbrella term for interesting examples. The research question: How can facets of work help in analyzing digital work? This abstract summarizes the idea of facets of work and shows that 18 different facets of work apply to digital work that is totally automated and digital work done by people with the help of machines.

Work and digital work. Work in business settings can be defined as the application of human, technical, informational, and/or other resources to produce results that matter to customers or stakeholders (Alter, 2013). To be more than a slogan or buzzword, digital work needs to be defined. Here are two alternative definitions:

- work performed entirely by automated means using digital technologies.
- IT-enabled work that is performed by people

By the first definition digital work includes: an automatic vacuum cleaner vacuuming the floor; an information system calculating monthly pay for employees and transferring funds to their bank accounts; an autopilot controlling the landing of an airplane.

By the second definition digital work includes: a physician using software to select a pharmaceutical; a manager running a meeting by videoconference; a novelist producing a novel using word processing.

Those examples illustrate possibly paradoxical questions about whether digital work necessarily involves people and whether people using digital technologies necessarily are doing digital work. We bypass those distinctions by defining digital work as work in which digital technologies play an important role regardless of whether the work is executed by a person or machine.

Facets of work. The idea of facets of work is a lens for looking at digital work in depth. It emerged from research attempting to bring richer and more evocative concepts to systems analysis and design, thereby facilitating analyst/stakeholder interactions and providing useful guidance to process- and system-related discussions without requiring attention to burdensome details, precision, and notation that are useful after initial understandings are attained. As explained in Alter (2019, 2020a), the resulting idea of facets of work is best illustrated through a series of tables that summarize important topics related to specific facets of work. Due to length limitations, only one of those tables can be shown here. Tables not shown here identify concepts associated with individual facets of work, evaluation criteria, design trade-offs, sub-facets, and open-ended questions to starting discussions.

Facets of work satisfy the following criteria:

Focus on activity. Each facet of work is identified using a verb or verb phrase since work in business settings always involves activities that are expressed using verbs.

Multiplicity of facets. Work has many facets. E.g., work related to hiring new employees involves making decisions, communicating, processing information, etc. Table 1 shows 18 facets of work, although the main point is about the idea of facets of work rather than whether the best number of facets is 14, 18, or 27.
**Broad applicability.** The various facets of work can be applied for thinking about real-world activities, capabilities, processes, and operational systems.

**Generic concept.** The concept of facet of work is generic. I.e., the same facets and related ideas can apply to many different situations even though a given facet may not apply significantly to work in specific situations.

**Selection criteria for which facets to include in a set of facets of work.** These include understandability, wide applicability, and direct association with concepts and knowledge not as closely related to other facets.

**Independence not required.** Specific facets of work may overlap, as when making decisions requires processing information and communicating (two other facets). Making decisions is a separate facet of work because many concepts are much more related to making decisions than to any other facet.

**Selection of current 18 facets.** The 18 facets in Table 1 were selected in an iterative manner described in Alter (2019). Iterative inspection of articles and case studies identified possible facets of work that were missing. The current set of facets might be improved based on discussion and trial application.

**Applicability to sociotechnical and totally automated systems.** Almost all facets apply equally to sociotechnical work by people and totally automated work by machines. The main exception is the facet interacting socially, and in the future even that one might apply to quasi-social interactions of automated entities. (see Table 1)

**Facet-related concepts and knowledge.** Each facet brings concepts and other knowledge that is not typically associated with other facets.

**Evaluation criteria and design trade-offs.** Most facets imply evaluation criteria and design trade-offs more related to that facet than to other facets.

**Sub-facets.** Many facets have broadly applicable sub-facets. E.g., sub-facets of information processing include capturing, transmitting, storing, retrieving, manipulating, displaying, and deleting information.

**Open-ended questions.** Most facets imply open-ended questions and follow-ons that can be used in initial stages of describing or analyzing systems.

Table 1 shows that each of 18 facets applies to both sociotechnical systems with human participants and totally automated systems in which all of the work is performed by machines or robots. The main exception is the facet interacting socially, and even that might appear in some form in networks and ecosystems consisting of automated entities that interact in a quasi-social manner. (People who create and maintain automated systems typically perform that work in separate work systems that are devoted to creating and maintaining the automated systems.) Table 1 uses the word robot instead of as computer, machine, or model because that emphasizes the idea of automated work.
<table>
<thead>
<tr>
<th>Facet</th>
<th>Sociotechnical work performed by people</th>
<th>Automated work performed by robots or machines controlled by software</th>
</tr>
</thead>
</table>
| Making decisions                          | People make decisions based on available information.  
**Example**: A marketing manager decides on the allocation of advertising budget.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot uses software algorithms to make decisions automatically.  
**Example**: A robot uses a marketing model to allocate an advertising budget.                                                                                                                                                                                                                                                                                                                                     |
| Communicating                             | People communicate with other people as part of collaboration.  
**Example**: Sales managers meet to discuss issues, problems, and trade-offs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Robots in various locations consolidate and transmit data collected using sensors.  
**Example**: A robotic inventory management system transmits inventory usage data.                                                                                                                                                                                                                                                                                                                                  |
| Processing information                    | People capture, transmit, store, delete, retrieve, display, or manipulate data.  
**Example**: A researcher collects, filters and summarizes information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot or other device performs information processing activities.  
**Example**: Robotic information processing via RFID system, MRI system, or digital camera                                                                                                                                                                                                                                                                                                                                  |
| Thinking                                   | People think about a situation, decide what is important, and make decisions.  
**Example**: A doctor considers medical evidence and decides what to prescribe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot analyses the same situation and uses an algorithm to suggest an approach.  
**Example**: A robot uses an algorithm to make a recommendation from the same evidence.                                                                                                                                                                                                                                                                                                                                  |
| Representing reality                      | People create, update, and use representations of reality.  
**Example**: Accountants perform financial analysis and create financial reports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot uses software and data to create a representation of reality.  
**Example**: A facial recognition system identifies people in a location.                                                                                                                                                                                                                                                                                                                                      |
| Providing information                     | People provide information upon request or on a periodic basis.  
**Example**: An employee submits a progress report before a weekly meeting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot provides information, either by subscription or on demand.  
**Example**: A robotic news service provides a customized daily newspaper.                                                                                                                                                                                                                                                                                                                                      |
| Applying knowledge                        | People use expert knowledge to perform a complex analysis task.  
**Example**: A physician determines that a patient has an unusual medical problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot uses a neural network to perform a complex diagnosis task.  
**Example**: The robot’s neural network based on 50,000 cases diagnoses a medical problem                                                                                                                                                                                                                                                                                                                                      |
| Planning                                  | People use information and knowledge to create plans.  
**Example**: A manager plans factory production to satisfy existing orders.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot uses information and algorithms to create plans.  
**Example**: A robot uses an algorithm to plan factory production to satisfy existing orders.                                                                                                                                                                                                                                                                                                                                      |
| Controlling execution                     | Managers use information and incentives to motivate employees.  
**Example**: Daily incentives push employees to meet daily goals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot uses business rules to control execution of processes.  
**Example**: A robot uses BPM logic to enable the next step after a previous step completes.                                                                                                                                                                                                                                                                                                                                      |
| Improvising                               | People decide how to proceed based on intuition and resources that are available in the situation facing them.  
**Example**: A police team responds to an unfolding public safety threat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A robot decides how to proceed based on algorithms and resources that are available in a current situation.  
**Example**: A robotic autonomous vehicle identifies and avoids obstacles in the road.                                                                                                                                                                                                                                                                                                                                      |
| Coordinating                              | People produce mutual benefit by coordinating activities and resource use.  
**Example**: Two teams coordinate work to share resources needed by both.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Robots use algorithms to coordinate activities and resource use.  
**Example**: Two autonomous robots take turns using a resource needed by both.                                                                                                                                                                                                                                                                                                                                      |
| Performing physical work                  | People perform work requiring physical activity beyond processing information.  
**Example**: People move packages from one location to another.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Robots perform work requiring physical activity beyond processing information.  
**Example**: Robots move packages from one location to another.                                                                                                                                                                                                                                                                                                                                      |
| Performing support work                   | People assure that others have resources they need to perform their work.  
**Example**: Support staff assures that computers are working properly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Robotic linkages assure that people have resources they need to perform their work.  
**Example**: A robotic update services assures that users’ software is up to date.                                                                                                                                                                                                                                                                                                                                      |
Interacting socially
People enact everyday social relations while participating in organizations.
Example: People chat during work breaks or during meetings.
Interacting socially does not describe how current robots operate. At some point "social-like" interactions might help robots coordinate in enterprises or ecosystems.

Providing service
People perform activities for the benefit of others.
Example: "Super-users" help others understand software features.
Robots perform activities for specific users, typically responding to requests.
Example: A robot uses a search algorithm to compile search results.

Creating value
People produce product/services that matter to customers or users
Example: An artist produces a painting that a buyer enjoys and values.
Robots produce product/services that matter to customers or users
Example: A robotic alarm system produces a feeling of safety.

Co-creating value
People work together to produce outcomes that are mutually valuable.
Example: A software firm produces customized software with the help of customers who ordered the software.
Robots serve as agents of people who want to co-create value.
Example: Advertising robots assign ads to web pages based on cookie data, characteristics of ads, and advertisers’ willingness to pay.

Maintaining security
Undisciplined computer usage generates opportunities for crime and sabotage.
Example: Provide security training to minimize data thefts or sabotage.
Computerized robots enforce data standards and access restrictions.
Example: Digital rights management (DRM) robots restrict access using access rights.

Table 1. Relevance of facets of work to both sociotechnical systems and totally automated systems

Next Steps.
Facets of work is a highly adaptable idea that can be used in many ways related to describing, analyzing, designing, and evaluating work systems (Alter, 2019). Uses related to digital work include:

- Characterize specific instances of digital work in a deeper way than just saying that digital work involves significant use of IT, e.g., noticing that some digital work is mostly about processing information while other digital work is about making decisions, communicating, coordinating, and so on.

- Compare instances of digital work to explore whether this is a real phenomenon or just a buzzword.

- Analyze groups of instances of digital work to look for qualitative differences. E.g., comparing digital work in large international firms versus small firms in less developed countries might show differences based on how different facets of work are pursued.

- Use concepts related to different facets of work as the basis of training material or interactive tools that can be used for designing or executing digital work in real world work systems. An example appears in Alter (2020b).

References.
Working in the Analytical Cage: The Decline of Transformative Agency in the Age of Datification

Abstract. Research on transformative agency focuses on the conditions under which individual employees can shape the context of their work and the evaluation of their performance. Until now, the stream of research has paid relatively little attention to how the increasing use of datification technologies in organizational settings conditions transformative agency with significant consequences especially for knowledge work. We draw on the theory of reactivity to study how the use of people analytics reconfigures agency at the individual and collective level in a higher education institution. We show that the pervasive use of datification technologies in workplaces alters the agency of employees through reactive discipline, dynamic standardization and datified acceleration and theorize these as a new kind of a bureaucratic cage. Analytical cage works by limiting individual reflexivity, binding it with collective agency through data relations, and by making it susceptible to wider industry patterns that impinge on internal organizing particularly in work that requires creativity or otherwise has to cope with uncertainty and task ambiguity. The conditions we describe as an analytical cage would seem to empower employees to carry out less ambiguous tasks more effectively but, at the same time, covertly limits transformative agency bringing inequalities in data to bear on employees and their work.

Keywords: Agency, analytics, datification, iron cage, knowledge work

1 Introduction

Researchers working in different fields have analyzed how the applications of big data, analytics and algorithms are accompanied by changes to how work is organized, coordinated, managed and governed in and beyond organizations (Lycett, 2013; Faraj, Pachidi and Sayegh, 2018). The use of these technologies is largely motivated and made possible by datification that refers to the widespread rendering of various phenomena as digital data (Kennedy, Poell and van Dijck, 2015; Newell and Marabelli, 2015). Accordingly, we refer to systems and infrastructures that make the unprecedented quantification of socioeconomic life possible as datification technologies. The proliferation of such technologies is often believed to imply that substantially more managerial monitoring and decisions can in the near future be shifted to digital systems making organizations more efficient and less susceptible to human biases in their operation. However, the picture that emerges from careful studies of algorithmic management or coordination (Rosenblat and Stark, 2016; Schildt, 2017; Faraj, Pachidi and Sayegh, 2018), data capitalism (Myers West, 2019), surveillance capitalism (Zuboff, 2015), and algorithmic governance (Campbell-Verduyn, Goguen and Porter,
2017; Danaher et al., 2017) is more complex and, to some degree, conflicted concerning the merits of datification. Datification technologies make possible substantial improvements to organizing and organizational efficiency, yet these are nearly always accompanied by tensions and conflicts around what is datified, in what way, and for what purposes.

In this paper, we focus on what happens to the agency of highly skilled knowledge workers in the context of pervasive use of datification technologies. Much of the literature has until now focused on algorithmic management that occurs after datification has already taken place in the context of repetitive, relatively unambiguous tasks. By contrast, work that requires creativity or otherwise must cope with uncertainty and task ambiguity tends to be less compatible with rigid, intrusive forms of control typically introduced with datification technologies. To capture such tendencies in contemporary knowledge work, we draw upon the classic idea of a ‘cage’ that has been frequently deployed in organizational studies to analyze the interplay of authority, organizational forms and agency. Weber (1958, 1978) originally defined the iron cage as an expanding bureaucratic framework that, in response to the desire for predictability and control, progressively subordinates human behavior to rules and procedures, reducing people to cogs in a machine (Maley, 2004). For instance, Faraj et al. (2018) analyze how algorithms result in transforming expertise within organizations, reshaping work, engendering new forms of control, and enhancing coordination. The authors note that “algorithms offer a surface-level similarity to the Weberian bureaucracy in that they create a new digital iron-cage, yet whose bars are not readily graspable for bending – where the rules underpinning the system are not readily understood or available for interpretation and scrutiny” (Faraj, Pachidi and Sayegh, 2018). The cage can be thus understood as a metaphor for the way in which organizations come to frame the agency of their employees (DiMaggio and Powell, 1983; Boiral, 2003; Greenwood and Lawrence, 2005; Maley, 2004). The datification technologies that come before algorithms – not to mention algorithmic management – lay the groundwork for the cage.

Of course, the cage does not determine how employees perform their work and, consequently as it may have different implications on the different dimensions of organizational members’ agency. To this end, we make a difference between the capacity of organizational members to carry out their assigned duties and the capacity of organizational members to shape the context of their work, including how it is organized. The latter form of agency is known as ‘transformative agency’ (Tuominen and Lehtonen, 2018). It captures the relationship between individuals and their organizational settings in terms of how people are able to either individually or collectively shape organizing that conditions their work. Until now, limited attention has been paid to datification technologies at work and how they shape, condition, and structure transformative agency that is often necessary to successfully carry out knowledge work that entails dealing with ambiguity and uncertainty with innovations and creativity. In particular, we know little about the impact of datification technologies on reflexivity as the ability to reflect upon and deliberate on one’s own circumstances (Archer, 1995; Alvesson, Hardy and Harley, 2008). Reflexivity is a key prerequisite for transformative agency (Tuominen and Lehtonen, 2018). It is also an increasingly
popular view, for instance, in the field of human-computer interaction that human agency is shared with technological artifacts involved in work performances, which further underscores the importance of understanding changes to the work environment that are associated with datification technologies (Nissen and Segupta, 2006). Thus, we set out to answer the following research question:

How do datification technologies shape knowledge workers’ transformative agency?

2 Theoretical framework

Our investigation draws upon an intensive case study based on the theory of reactivity (Espeland and Sauder 2007) to analyze the implications of learning analytics on transformative agency in an internationally recognized business school. Higher education is a prime example of a knowledge-intensive workplace where employees perform creative tasks and must respond to varying levels of uncertainty and ambiguity. The theory suggests that all measurement and measures may lead to reactivity, which means that individuals may alter their behavior in reaction to being evaluated, observed or measured “because people are reflexive beings who continually monitor and interpret the world and adjust their actions accordingly” (2007, p. 2). Reactivity is thus seen as a narrower form of reflexivity, which has inspired a substantial amount of social theorizing (e.g. Espeland and Sauder 2007, Foucault 1979, Hacking 1995), but has not been extensively studied with respect to datification and its technologies. To this end, we find the idea of reactivity particularly useful in the way they captures reflexivity from the perspective of individual agency: “the concept emphasizes how people react to efforts to study them” (2007, p. 7). More specifically, rankings have been found to impact agency by four mechanisms according to the theory: commensuration, self-fulfilling prophecies, reverse engineering, and narratives. The theory suggests that reactive mechanisms become expressed as four types of reactive effects present at individual and collective levels: re-allocation of resources, redefining work and practices, gaming, and change of values.

3 Research design

The generic mechanisms and their effects described above provide a starting point from which we pursue to analyze the relationship between a new datification technology and changing transformative agency at different levels. We conduct a multi-level, single case study to identify and assess a new kind of reflexivity associated with the adoption of learning analytics (Yin, 1994; Flyvbjerg, 2006). Learning analytics (LA) is a sub-field of big data analytics (Clow, 2014; Selwyn, 2015) that refers to the measurement, collection, analysis, and reporting of data about learning and teaching to better understand educational contexts (Siemens, 2013). As a form people analytics, LA offers a window into transformative agency in the context of knowledge work and workers have traditionally been substantially involved in shaping the organizational context of
their work. In this sense, academics and university teachers have historically enjoyed some of the most substantial forms of transformative agency at the individual and collective levels (Kallio and Kallio, 2014; Kallio et al., 2016), which may be coming under threat as learning analytics empowers employees to carry out narrower roles as teachers, administrators, developers, and managers. We use the theory of reactivity to sensitize the analysis to mechanisms and effects that emerge from individual awareness – or reflexivity – of being measured and their consequences on transformative agency.

### Table 1. Sources of data.

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount and type of data</th>
<th>Data collection period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: The description of the relevant organizational environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University and School website and blogs</td>
<td>Screenshots and saved documents, 13 web pages</td>
<td>August 2018</td>
</tr>
<tr>
<td>Secondary data sources</td>
<td>Institutional websites, including Department for Education, Office for Students, Jisc</td>
<td>August 2018</td>
</tr>
<tr>
<td><strong>Step 2: Understanding the organizational setting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User interfaces of the learning management system and LA system</td>
<td>Observation notes and 8 screenshots from the learning management system on various teaching modules and their associated LA features at the research site</td>
<td>March to June 2017</td>
</tr>
<tr>
<td>Technology Strategy Committee (TSC) minutes</td>
<td>700 pages of minutes and their appendixes covering 30 meetings held between 2013 and 2017</td>
<td>September 2017 to February 2018</td>
</tr>
<tr>
<td><strong>Step 3: The analysis of transformative agency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>31 interviews with 29 informants, totaling 1,528 minutes</td>
<td>June to September 2017</td>
</tr>
<tr>
<td>Group interview with the Senior Management Team</td>
<td>Group interview with six senior managers of the School to validate findings</td>
<td>April 2018</td>
</tr>
<tr>
<td>Technology Strategy Committee (TSC) minutes</td>
<td>(same as above)</td>
<td>(same as above)</td>
</tr>
</tbody>
</table>

The types and quantity of empirical evidence analyzed in each study phase are catalogued in Table 1. Overall, we adopt a narrative approach in Step 1 and 2 to provide a compact account of structural conditions under which the use of LA takes place at the research site. We then move to the analysis of specific reactive mechanisms that emerge from the use of the new datification system, and to the implications of LA on transformative agency at the individual and collective levels (Step 3). The analysis of
transformative agency is based on 31 semi-structured interviews that allow us to build a detailed picture of the intended and actual uses of LA by different staff members, which were complemented by a group interview with six members of the Senior Management Team to validate and extend the findings. The interviewees were chosen using a snowball sampling approach (Robson, 2011).

4 Preliminary findings

We find that LA channels specific influences of datification technologies to everyday work. These influences work through four mechanisms of reactivity, which, in turn, shape transformative agency at individual and collective levels. A summary of these findings is presented in Table 2 in Appendix 1 and we further conceptualize the effects of datification technologies in terms of three emerging patterns: reactive discipline, dynamic standardization and analytical acceleration.

Reactive discipline largely puts the onus of monitoring, observation, evaluation, control and correction of behavior on actors themselves. Rather than responding to formal (or indeed informal) expectations and requirements, actors need to engage in self-regulation and self-discipline driven by commensuration, self-fulfilling prophecies, reverse engineering and specific narratives embedded in the datification technology. Actors then become bound to comparisons whether their work practices and activities generate data that conform with analytical requirements embedded in the technology. At the same time, they have to participate in further, better aligned generation of data to enable further comparisons.

Under dynamic standardization automatically generated means, quartiles, medians, frequencies, projections and predictions do the standardizing by pulling subjects toward the mean. Dynamic standardization relies on the constant generation of data by actors resulting in automatically calculated, constantly changing measures against which other actors can then benchmark their own data. Being displayed various statistics in the analytics dashboards, actors work out the right amounts and values of data and adapt their behaviors accordingly. Even without explicitly set performance expectations, statistical processing embedded in datification pulls actors towards the norm based on data of all other actors. Importantly, it is the past data that matters – datification technologies standardize towards data generated on past behaviors, activities and actions.

The real-time character of data leads to datified acceleration. Producing, or generating, just some data by an actor is not enough in the context of a datification technology that operates on the basis of dynamic standardization, as this may lead to falling below crucial statistics. Actors are compelled to ensure that more and more data are generated by their activities. They become aware that the smallest quantities of data can have an impact on how their performance is viewed and thus on their social position in the organization. Ultimately, the issue of data generation becomes part of everyday work. De facto behavioral standards and targets are in constant flux due to dynamic standardization, which emphasizes the need to constantly pay attention to data generation as an inherent part work. As a result, actors change their behaviors to adapt
to the need for faster and faster data generation and dedicate increasing amounts of time to the practices of data generation, which diminishes opportunities for purposeful reflection on their activities. As more data is generated faster, datified standards change faster, and in turn propel the need to generate even more data even faster.

5 Discussion and conclusion

Together, the changes associated with datification technologies amount to what we term an analytical cage: a new kind of context against which organizing increasingly takes place in contemporary organizations (Puranam, Alexy and Reitzig, 2014). Analytical cage empowers organizational members to carry out their functional tasks and roles more effectively but at the same time limits their transformative agency through reactive discipline and datified acceleration leading to lower reflexivity. It also intertwines individual transformative agency with collective transformative agency through dynamic standardization creating new data relations between individuals and resources, and can attribute more operational agency outside organizational boundaries, as datification technologies bring with them external logics. These patterns bear resemblance to the Weberian iron cage that describes the traditional bureaucratic form of organizing. In our case, learning analytics were certainly not implemented with such a grand vision in mind but rather as practical solutions to everyday operational issues. Nevertheless, it emerges from our findings that a datification technology creates the perfect groundwork for the analytical cage. Yet, the focus on reflexivity, coupling individual and collective transformative agency, and the shift of agency outside of organizations differentiate the effects of the analytical cage from Weber’s original concept.

We contribute to literature by analyzing how datification technologies shape transformative agency among knowledge workers. Specifically, we identify patterns through which such technologies narrow opportunities for fully-fledged reflexivity and reflection (upon which transformative agency is based, Alvesson et al. 2008, Archer 1995, 2003, Tuominen and Lehtonen 2018) and identify data relations as a way to strengthen collective agency (Kozlowski and Klein 2000, Tuominen and Lehtonen 2018). These changes are often unanticipated and easily underappreciated at the time when decisions about technology adoption are being made, for the latter are typically driven by the expected (and indeed often realized) benefits for organizational members’ capacity to carry out their functional tasks and roles. As a result, datification technologies may give more capacity to (re)act, but in turn they limit individual and collective transformative agency by impinging on reflexivity and shifting transformative agency more towards analytical technologies. With less transformative agency and working in analytical cages, employees become subjected to new forms of inequalities vis-à-vis data about their work and performance.
References

**Appendix I**

**Table 2. Reactive effects and collective transformative agency.**

<table>
<thead>
<tr>
<th>No. of excerpts</th>
<th>Interview excerpts</th>
<th>Individual-level effects</th>
<th>Collective effects</th>
<th>Limiting impact of analytics on transformative agency</th>
</tr>
</thead>
</table>
| 20              | "[LA] detracts from the job of educating"  
"The move towards e-learning"  
"Teaching then becomes completely oriented around 'well, I need to make sure that the materials are really exciting because they’re going to rate me on that’" | 1. Changes in teaching and teaching-related practices  
2. Move towards e-learning  
3. Restructuring teaching materials | Redefining the context of work and practices | Employees using LA data collectively yet unintendedly transform their working contexts to align them with the requirements of the technological object |
| 13              | "If I look at the online tracking of staff engagement and people are repeatedly not doing what they’re supposed to be doing, they’ll be on the blacklist and they won’t have the contract renewed; it’s a really cut and dried thing”  
"Changes have become measurable and this is why more power and more investment has gone into non-faculty” | 4. Decisions on tutor contract extensions and termination  
5. Growing the size of teams  
6. Investment in non-faculty and teaching staff  
7. Changes to job positions | Resource reallocation | Resources are reallocated (directly or indirectly) on the basis of data from LA rather than decisions previously made by employees themselves |
| 18              | "We employ teaching fellows because they have that focus on teaching rather than being research-focused” | 8. Increasing importance of student feedback  
9. Move away from treating students as adult learners | Change of values | Values are aligned with what is what is measurable in LA, and not established by employees |
Move away from “treating them [students] like an adult learner” to “hand holding to the extreme”

| Move away from “treating them [students] like an adult learner” to “hand holding to the extreme” | 10. Gaming | 11. Reputation and impression management | Gaming the analytics |
| People who actually previously didn’t bother to do that will use a little of their valuable time which could be actually spent getting an education, they’ll actually use that time to play the game | Employees do not have the agency to transform their work contexts but have to manage how their performance is captured in the system |
Between an online Friday bar and efficient work – A life narrative of obligation and technostress in organizations

1 Introduction

Information and Communication Technologies (ICTs) enable us to work and communicate anytime, everywhere [15]. Although ICTs bring many advantages to our work and how we share information, there are also dark sides. For examples, social exclusion [12], over-surveillance [26], over-identification [7], or technostress [3].

In our research, we investigate technostress. We depart from the definition that technostress is a "stress phenomena experienced by employees in organizations due to their interaction with ICTs. This is caused by an individuals' attempts to deal with constantly evolving ICTs and the changing physical, social, and cognitive responses demanded by their use" [23]. In general, stress is shown to lead to high costs for societies, organizations, and individuals. For example, in a highly digitalized country like Denmark, stress costs society over three billion dollars yearly [27]. Research documents that organizations lose 24 days on average for each employee experiencing high stress [14]. For the individual experiencing high levels of stress, stress has an even higher cost, leading to heart problems, diabetes, cancer, sleeping problems, depression, fatigue, and even a reduction in life expectancy [17; 21]. Despite ample evidence about technostress's impact on the individual or the organization [2; 22], technostress seems to not be a part of the discussion as a collective issue.

Since it was first defined in 1982 [6], technostress has attracted much attention from Information Systems (IS) researchers and beyond. However, IS research so far has focused on psychological or neurophysiological quantitative measurements, zooming in either on technostress for the individual [28], ICTs characteristics that create technostress [3], or the dynamic and transactional technostressful interactions between the individual and ICTs [23; 25]. We see the sole focus on psychological or neurophysiological measurements as problematic, as research point that the sociological environment also impacts how employees construct meaning and norms around their usage of ICTs [4; 19]. For example, a study analyzing how employees communicate to conduct their work has shown that it is the norms constructed around technology usage that leads to technostress [4].

In our study, we aim to explore the sociological aspects that lead to employees' experiences of technostress, thus aiming to establish a sociological stream of IS research on technostress, additional to psychological or neurophysiological. To do this, we are employing the analytical lens of obligation [9], borrowed from the discipline Sociology of Emotions [18].

Our research question is: How are the obligations that lead to technostress constructed in the workplace?
2 Obligation

In our paper, we use the analytical lens of obligation to investigate how the rendering of technostress perceptions occurs and is constructed.

Obligation can be defined as a reciprocal social exchange that ensures our belonging to a group [5; 9]. It can be described as a feeling that we owe something to each other or that we "ought to" do something. In some cases, this is due to our feel responsibilities and duties [9], or due to others alter-casting their expectations on us either implicitly or explicitly [9]. Clark (1990) and Bergson (1977) bring to our attention that some of the mechanisms that lead to the creation of obligation are avoidance or seeking up certain feelings. They claim that individuals might carry out their obligations to avoid feelings like shame, guilt, or blame or seek feelings like pride and elevated status.

3 Methodology

To answer our research question, we are conducting qualitative and interpretative research, and we use the analytical concept of obligation to analyze our data.

We are using a longitudinal case study, where we analyze a female leader’s journal entries for six months, from the moment she joins a new company. We couple our data with additional and regular interviews with the same employee. We focus on the experiences of one employee (whom we call Emma).

Our study’s context is Denmark [10], where it is estimated that one in five employees experience high levels of stress daily [16]. However, the national authorities have not yet included technostress in the official stress guidelines [11; 16], which leaves the individual employees and organizations without tools and methods to discuss and handle technostress.

Emma is a recent IT graduate student who quickly received more responsibility in her work within IT consultancy. After two years working for a big international company, Emma decided to switch her workplace and work in a consultancy company where she could travel less. Furthermore, she would have long-term projects that would allow her to better familiarize herself with co-workers, customers, and the project itself. At the same time, Emma receives more responsibility as she leads a team. She starts her work in January 2020, and she begins to write her weekly journal as soon as she starts on her new job. In total, Emma wrote over 25 entries, beginning January and until the 30th of July. Furthermore, we have also interviewed Emma before starting to write, during, and after, in an informal interviewing format with predefined topics [13]. During this period, Emma experiences the Covid-19 lockdown in Denmark and its implications on her work.

We analyze our data following a life-narrative approach [8]. According to this approach, emotions and perceptions are not necessarily addressed directly and explicitly, but they are organized in themes derived from experiences [e.g., 12]. To make sense of all the data, we conducted two rounds of coding in which we analyzed the journal entries and coded it by using the qualitative analysis software Atlas.ti.
In our analysis, we depart from Emma’s articulations that indicate technostress (e.g. feeling inefficient, addiction, ICT errors), and we unfold the obligations connected to these quotes.

4 Preliminary findings and discussion

This chapter presents some of our preliminary findings and relates it to technostress and obligation literature.

An interesting theme is that when simple ICT functions do not work as expected, this leads to feelings of shame, guilt, and self-doubt for Emma (e.g., "On my first day – the login details they gave me for my new work PC did not work. There I was, thinking that I was making repeated typing errors in front of my new colleagues. I had to breathe deeply and convince myself that my fingers were not failing me on the keyboard. (...) I was struggling with my own guilt for not being able to do something as simple as logging in"). As Clark (1990) points out, individuals might develop certain obligations to avoid feeling shame and guilt. Emma explicitly indicates her guilt in the previous quote, and we can notice traces of shame as she explains "as simple as logging in". We feel shame when we are being experienced in our own failure [1]. In this particular case, Emma experiences shame as she is gazed upon by another, in her first week of work. Here we show how the gaze of another intensifies how Emma experiences technostress.

Another surprising theme is that Emma and some of her colleagues identify with the failure or success of technology ("She apologized on behalf of the system and looked a little embarrassed as well"; “Thank god it worked! I felt a small victory but acted very casual about it.”). This lack of distance between the technological artifact and the individual might lead to an over-identification. When the IT artifact fails, we fail, and when it works again, it is our victory. The side effect of this over-identification is that we take upon us the obligations that come with the rhetoric of seamless technology, which can intensify the technostress that employees experience.

Furthermore, what is surprising is that Emma deals with technostress through humor and sarcasm, as she feels that she is not allowed to express anger and frustration ("I realize that this is how we all deal with our frustration over technology - by using humor. There is a certain irony in the fact that we are IT professionals and still have such a hard time working with it"). This is troublesome, as one crucial coping mechanism for dealing with technostress is able to voice frustrations [3].

Another exciting aspect is that Emma deals with technostress by herself. The context of the following quote is that Emma leaves her phone behind when going to a meeting, in an attempt to manage her phone usage: "It made me feel like I was disconnected from the world, both private and work-related. Instead of being disturbed by incoming emails or texts, I was now disturbed by not being able to fulfill my craving to check my phone and feel connected. (...) I realize that I am using vocabulary from the drug addict world". In this quote, we can see how, on the one hand, she feels an obligation to be continuously connected with her work, even while working; on the other hand, this leads to worrying considerations about what she perceives as an addiction.
However, she feels it is her obligation to handle this severe technostrain [24], addiction, on her own.

We also notice a tension between what is a time waste and time for socializing, as employees have to switch to socializing online (e.g., “I have just had the pleasure of my first online Friday bar. It was awkward, as expected (...). I think several of us were working at the same time just to feel like the time was not wasted. (...) We showed up because we had to”). In this quote, we can note a tension between Emma’s felt obligation to not waste time and the obligation to be present to the online Friday bar. One potential explanation could be that either Emma doesn’t see socializing online as part of work or that the expectation to participate in social activities is not articulated and accounted for as part of one’s work in the work environment.

These findings are interesting in relation to what we know about technostress, as what the employees feel is their obligation exacerbates their technostress experiences. We also see how technostress is co-constructed in the social environment, an aspect that has not been previously explored in technostress research within IS, and only partially explored in other fields of research, such as Organizational Science [4; 19].

5 Contributions

We contribute to theory with novel insights derived from using a new-to-IS theory (obligation) on technostress. This allows us to uncover how technostress might be intensified by the following themes: shame, being gazed upon another while experiencing technological malfunctions, overidentification with the technological artefact, the rhetoric of seamless technology, not feeling allowed to express frustration and anger, feeling an individual responsibility to deal with technostress, or unarticulated work.

6 Implications

In line with the focus of the IFIP conference: "The Future of Digital Work: The Challenge of Inequality", we point out that digitalization multiplies obligations in the workplace that contribute to technostress. We want to signal that this might intensify work obligations, and lead to a worse quality of life and work. At the same time, we would want to end our Research-in-Progress paper with the remark that it is also a matter of who is privileged enough to be able to manage their felt obligations, and therefore their technostress. For example, Emma decides to create boundaries around her phone usage, but we believe that not everyone can afford or feel they can afford creating such boundaries.

References


27. Stress Forening. *Stress og statistik*.

The Future of Virtual Teamwork: Adapting Leadership in Response to Dynamic Membership

Petros Chamakiotis, Eeli Saarinen, and Niki Panteli

1 ESCP Business School, c/ Arroyofresno 1, 28035 Madrid, Spain
2 University of Turku, Rehtorinpellonkatu 3, 20500 Turku, Finland
3 Royal Holloway, University of London, Egham TW20 0EX, UK
pchamakiotis@escp.eu

Abstract. In the light of a steep rise of new types of digital work, including virtual teams, in this study we focus on the issue of dynamic membership in the context of virtual teams. In an era of widespread deployment of virtual teams, we argue that members coming and going during the virtual team lifecycle may disrupt the virtual team activities and cohesion and may lead to unequal opportunities within the team. We therefore explore how leadership should be adapted to ensure that new members are properly integrated without causing disruptions to the virtual team operations. We do so by adopting a case study approach with 16 globally distributed virtual teams that experienced an unexpected change of some of their members halfway through the virtual team lifecycle. Our analysis is still underway; however, we anticipate that our findings on how leadership can be adapted under these circumstances will help to advance understanding around the future of virtual teamwork, benefitting scholars, practitioners and educators.

Keywords: virtual teams, leadership, dynamic membership, adaptation.

1 Introduction and Rationale

The continuous growth of information systems (IS)—coupled with unprecedented challenges, such as the Covid-19 pandemic and subsequent lockdowns—has led to a steep rise of new types of digital work, including virtual teams (VT). Although such forms of work have been around for over two decades, their recent popularity raises new types of challenges that remain unexplored. One such challenge is that of dynamic VT membership, whereby VT members may join and leave a VT during the VT lifecycle, disrupting VT operations and probably making it difficult for new joiners to properly integrate and become part of their new VTs. The issue of dynamic membership has been recognized in both early [e.g., 1] and more recent studies [e.g., 2], however limited research exists on the implications of this for team performance and leadership. Dynamic groups are different to stable groups in fundamental ways including their structure, process and performance [3]. In this study, we take the position that dynamic membership may raise unprecedented challenges that VT leaders have to deal with; for
example, Chamakiotis et al. [4] suggest that the presence of locational subgroups within VTs may lead to unequal participation between different VT members, with the voices of some subgroups being heard more than others'. In our effort to explore how leaders can successfully manage VTs characterized by dynamic membership to ensure that (a) VT cohesion is maintained, (b) all VT members have equal opportunities, and (c) VT operations are not disrupted, we address the following question: How can dynamic VTs—those whose members come and go during the VT lifecycle—be effectively led?

In their attempt to identify effective leadership practices, researchers have referred to key phases of the VT lifecycle, describing the practices that leaders should adopt during each phase in terms of facilitating interactions, developing synergies and improving the overall team performance [5–7]. According to this literature, the three phases of the VT lifecycle include: the welcoming, performing and wrapping up phases and within each phase appropriate leadership behavior and practices are identified. Though these VT lifecycle models are useful in showing the different stages of team development and in identifying effective leadership practices within the different stages, the models do not explain how leadership can be exercised when members drop in and out of the team at different phases of the VT lifecycle. As such, existing models do not accommodate for leaders’ adaptation practices and therefore do not show how leaders can build cohesiveness when new members join and disrupt the ‘normal’ VT work process [8].

Here, we aim to examine how leadership behavior plays out in the context of VTs characterized by dynamic membership. We argue that this is particularly challenging in the context of VTs due to the technology-mediated character of work and for the reasons outlined earlier. We are interested in exploring leadership at the team level and for this we use adaptation as our theoretical lens to explore how leadership and team coordination behaviors influence the degree to which a team will be able to adapt [9, 10]. Adding to this argument, there is an implicit acknowledgement that VTs need to demonstrate adaptation behavior [2] due to their reliance on—and changing nature of—the selected collaboration systems [11] and their fluidity in terms of membership and structure [12].

Considering the newness of this topic, we adopted a case study approach, focusing on 16 VTs composed of 204 students dispersed across 5 higher education institutions in 4 countries: Austria, Finland, the USA and the UK. The VTs were set up as part of a known VT project, known as VIBu, introduced in 2.1. In what follows, we present VIBu, along with the methods we adopted to collect and analyze our data, and we then turn to a presentation of our preliminary findings and our expected contributions.

2 Research Design

2.1 Research Site: VIBu presentation and Suitability

An essential criterion for our research site selection was the ability to study VTs whose members change unexpectedly. We therefore took the case of ‘Virtual Teams in International Business’ (VIBu)—an online learning simulation concept that has been utilized globally with over 60 different higher-education institutions and various private
sector organizations [13]. It has its roots in traditional classroom business education but was developed into a fully online collaborative process where students from all over the world join together in VTs, and compete against other teams as well as collaborate with them. VIBu was the ideal research site for this study because it allowed us to make an intervention by switching VT members half-way through the VT lifecycle, as we explain below.

VIBu as a virtual learning environment combines (a) experiential learning around a business process simulation game, (b) globally dispersed real-time teamwork between the learners, (c) use of virtual communication tools in team collaboration, and (d) intensive collaboration between all learners and also the facilitators during the on-going simulation hours. Focal intended learning outcomes relate to virtual work, cultural differences, global teamwork, basic business performance indicators and key figures, and supply chain management.

2.2 The Two VIBu Simulation Days

Our study with VIBu involved 16 VTs which were formed of students from 5 universities in 4 countries (Finland, Austria, UK, and USA). A total of 204 participants played the simulation game in March 2019 on two different days that were three weeks apart.

On the first simulation day, the teams began their more intensive collaboration phase and started to learn about one another’s behavior and personal characteristics in accelerating pace. Both simulation days lasted 14 hours in total. Teams were asked to split the duration of simulation day in such a way that (a) everyone in the team would spend at least 4 hours in the simulation, and (b) there would be at least three to four members online at any given point in time. Between the simulation days, the teams analyzed the results with their own schedule and tried to find ways to perform better as a team as well as a company in the simulation game.

Before the second simulation day, the participants were briefly informed about the changes in their VTs, and were instructed to take along the new members, as, in total, 28 participants changed teams between the simulation days (13.7% of all participants):

"Please evaluate the changed situation together and think about how to familiarize the new team members with your current practices (teams are self-responsible for this). Please put some serious thought into this matter as there is considerable pressure with regard to making the new team fully functional in a very limited time frame” (Facilitators’ guidance).

2.3 Research Strategy and Methods

Case study research is an established research strategy known for its plurality in terms of data collection and analysis methods [14]. Our approach was qualitative and drew on two data collection methods: (a) direct observations, whereby the second author was virtually present throughout the two simulations, spoke with VT participants and answered their questions as the project evolved, and (b) reflective essays. Specifically, participants were asked to write reflective essays at two different points in time during
the simulation (3-4 pages on average, two essays per participant): at the end of each of the two game days. Participants were asked to write an in-depth reflection of their journey with VIBu (up to the point of each essay). The two essays were guided by questions developed by the facilitators/authors, asking participants to focus on their own individual experiences, key issues and critical incidents from their own point of view (covering themes like critical incidents, conflicts, dealing with expectations, decision-making process, trust development, and team dynamics—all briefly explained in the reflective essay guidance). Participants were asked to focus on their own experiences and how they would explain their observations of what happened in their team.

Overall, adopting two data collection methods helped us gain a richer and more complete understanding of the phenomenon under investigation by allowing us to consider not only the participants’ individual perceptions and experiences (as depicted in their reflective essays), but also our own interpretations of how the VTs worked together (through our own direct observations), in line with the interpretive character of our work [15]. We are currently (October 2020) finalizing our data analysis on NVivo on which we have grouped the different data per VT for each of the two simulation days. Our data analysis is influenced by the principles of thematic analysis [16].

3 Preliminary Findings and Expected Contributions

Although our analysis is still underway, preliminary findings begin to show evidence of different types of leadership, including emergent and shared leadership, which the extant VT literature has already identified, and also new forms of leadership, such as silent leadership. The latter was evident when certain participants acted as silent facilitators, informally promoting team cohesion and supporting new members’ integration in parallel with other activities. These members did not self-identify as leaders, but it was found that their actions contributed actively to a smooth new member integration and successful completion of project activities that had to delivered on time:

"My role was as a general facilitator, a contributor. I was not the leader, but I gave my opinion, and how I thought we should proceed based on the results” (R2, T8 participant).

Although seeing members come and go had its challenges, our findings so far reveal that, on some occasions, not only were new members quickly and successfully integrated into their newly assigned VTs, but they were also found to assume a leadership position that was accepted by others. This was, in some cases, due to experience that they brought from their earlier teams that enabled them to transfer knowledge and help their new teams address their challenges and make progress. This was evidenced in teams that experienced high levels of trust:
“Myself [and another two members] were the main [leaders] I identified throughout the simulation. The new members were embraced in the team by the leaders and took leadership positions themselves. We welcomed them in with open arms and they did the same. We immediately offered them trust and they proved themselves worthy of it” (R2, T11 participant).

Though dynamic membership is commonplace in both, global VTs that have been operating for a long time, as well as new types of VTs that have emerged as a result of the Covid-19 lockdown, the literature does not tell us how leadership should be adapted to accommodate the changing flow of incoming and outgoing members during the VT lifecycle. Our study addresses this knowledge gap by focusing on VTs members who were instructed to switch teams halfway through the VT lifecycle and then reflect on their experience. At the time of the IFIP Joint Working Conference 2020, we expect to have completed our analysis and we will be seeking feedback on the framing of our theoretical contributions in the area(s) of VTs and leadership in our effort to contribute to both scholarship and practice by advancing understanding around the future of digital work. In particular, our findings are expected to inform: (a) scholars in the IS and kindred field(s), (b) practitioners working in, or leading, VTs that may experience dynamic membership, (c) human resources (HR) professionals who may want to update their policies on how VTs can or should be managed from an organizational perspective, and (d) tertiary education instructors who teach relevant IS, leadership and/or project management courses.

References


Abstract. The accumulation of large quantities of data and the introduction of algorithmic technologies in organizations has facilitated the emergence of "digital workers" such as data scientists. The epistemological differences between data science and other domains in organizations have apparently generated what we call "knowledge inequalities" (i.e. data science gains an advantageous position due to its emphasis on rationality). This research-in-progress draws on an analysis of interviews with data science practitioners to understand how they make sense of and reflect on data science knowing practices and how these reflections compare to critiques of data science. Our study reveals that data science practitioners seem to be reflective in relation to their knowing practices and, contrary to the common portrayal of the advantageous position of data science, they display particular vulnerabilities. With our research, we aim to critically investigate data science in practice and to thereby go beyond theoretical critiques to an empirically informed analysis of data science as digital work.

Keywords: Data scientists, Data science practices, Digital work, Knowledge inequalities, Digital technologies

1 Introduction

The practice of data science is often characterized by the ability to extract knowledge from data through digital technologies and statistical skills [17, 18]. Consequently, the concept of knowledge in data science is directly related to data and probability, i.e. knowledge is “born from the data” [20, 19, 24, 28]. On the other hand, knowledge in the management field is portrayed as a broader concept that is often related to practices, relationships and interactions [7, 26]. As stated by Orlikowski [26] (p.1), “knowing is not a static embedded capability or stable disposition of actors, but rather an ongoing social accomplishment constituted and reconstituted as actors engage the world in practice”. The epistemological differences between data science and management practitioners generate apparent “knowledge inequalities” in real-world organizations [28, 40, 40], which tend to lean in favor of data science [8, 25, 28]. While emerging studies have explored the “advantageous” position that data science has over other fields regarding knowledge [34, 37], little is known about the perspective of data science practitioners (e.g. data scientists) concerning these apparent inequalities [15, 27]. Thus, in this research in progress, we empirically study data scientists to understand how they reflect on their practices. We compare dominant critiques of data science with this practitioner perspective.
2 Research Context

Over recent years, organizations have produced and accumulated large quantities of data due to the so-called “big data revolution” [16, 19, 22, 36]. Companies realized that useful knowledge could be extracted from these large volumes of data, for which they required the techniques of an ‘emerging’ discipline called data science [13, 18]. The rise of data science in today’s digital economy resulted in the creation of new data-focused occupations, such as data scientists and data analysts [11, 24, 31]. Nowadays, data scientists are being hired by a wide spectrum of organizations [9, 17, 23].

Data science's popularity in real-world organizations, however, has also generated apparent knowledge inequalities [28, 40, 40], which lean in favor of data science practitioners [8, 25, 28]. We use the term “knowledge inequalities” to describe the apparent “advantage” that data science seems to have over other fields. This is because data science practices (e.g. data modelling) are mostly based on a “perfect-model rationality” [21], which allows data science practitioners to perform actions grounded on an assessment of probability without depending on customs, intuitions, or emotions. By supposedly leaving out human irrationalities and inefficiencies, data science is an attractive option for managerial actions and it is often celebrated as a superior means of knowledge [3, 10]. Hence, data science is commonly seen as “dominant” over other fields, leading to knowledge inequalities that can result in power imbalances.

3 Problematizing critiques of data science

This study focuses on knowledge as a theoretical lens for problematizing current literature on data science practices [2]. In the following we analyze how existing literature critiques data science practices for how these conceive of and deal with knowledge.

In data science practices, knowledge is supposedly treated as a narrow and “cumulative” concept that can either be extracted from an expert [15] or be directly inferred from a data set [17, 18, 19, 20, 24, 28]. This view stands in contrast to recent research that sees organizational knowledge as social and embedded in practices, with dependencies between the “tacit” and the “explicit” [26].

Such misalignments regarding the concept of knowledge are central to existing critiques of data science as a discipline. We have summarized such critiques from critical data studies scholarship in Table 1. The knowledge inequalities between data science and other disciplines discussed in these critiques have several consequences such as changes in power dynamics (power asymmetries) and the diffusion of an image of data science as “dominant”.
Initially, Ribes et al. [34] describe the “domain-agnostic” nature of data science. By being domain-independent and having a set of “generalizable tools”, data science secures the role of a neutral intermediary making it capable of intervening (positively or negatively) in any other field. For instance, data science is seen as being able to positively contribute to the optimization and improvement of human processes [14, 32]. On the other hand, data science can also intervene negatively in other domains by generating inequalities related to surveillance [4, 42], automation [1, 12] and unethical consequences of data science systems (e.g. bias in data leading to discrimination in job applications and health services) [5, 39].

Following Ribes et al. [34] logic of domains, Slota et al. [37] (p. 1) argue that being domain agnostic drives the practice of data ‘prospecting’, which allows data science to be “in the middle of all things”. The authors argue that data science is free to absorb and modify any domains’ knowledge without necessarily having to change its own (i.e. bringing “order” to other “messy” domains), thus, creating a “one-way” knowledge advantage. This is exemplified with the analogy of a “parasite”, where data science “positions itself as both consumer of data and, in effect, the arbitrator of interoperability” [37] (p. 9). This critique suggests that data science practitioners might avoid engaging in activities that could affect their core practices (e.g. non-data-related activities, knowledge sharing), focusing only on those activities that perpetuate their mediator position and the relevance of their practices (e.g. knowledge acquisition, generalization of data).

On a higher level, Sadowski [35] claims that “data extractivism” creates power imbalances via the extraction of data at a low cost (sometimes zero cost) from individuals to then turn it into profit using data science techniques. Furthermore, the author touches upon the unevenness of data extractivism, for example, in the disproportional extraction of data from certain groups or the non-representation of other groups in training data. Aligned with this idea, Zuboff [42] warns about the ubiquitous presence and power of data science systems that perpetuate inequality through the extraction and exploitation of data. Likewise, the “data colonialism” critique by Thatcher et al. [38] suggests that the collection of data in today’s digital economies has generated asymmetries between the producers and the owners of data. By using data science techniques to “colonize” individuals’ data from everyday tasks, data science organizations have established a dominant position of power and surveillance, which is also heavily discussed and criticized by Zuboff [42].

<table>
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<tr>
<th>Critique Type</th>
<th>Definition</th>
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<tr>
<td>Domain Agnostic</td>
<td>Data science conceives itself as “domain independent”, which makes it an intermediary capable of intervening (positively or negatively) between domains or disciplines.</td>
<td>[33], [34]</td>
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Prospecting

Data science renders (prospects) the data, knowledge, expertise, and practices of other domains, without the same commitment. Data science follows a “parasitic” relationship with other disciplines.

[37]

Data Extractivism

Inequality is generated due to the collection and circulation of data as capital and its pervasive influence over how organizations behave. Furthermore, data systems that perpetuate inequality, extraction and exploitation are becoming ubiquitous.

[35], [42]

Data Colonialism

The quest for value in today’s digital economy has generated asymmetries of data collection between data producers and owners. The data collection process as ‘accumulation by dispossession’ colonizes and commodifies everyday life.

[38], [42]

While the aforementioned critiques portray the inequalities and power imbalances that data science entails at a fairly abstract level, little is known about the actual data science practices that are taking place in real-world organizations and whether they align with how data science has been portrayed [15, 28]. Furthermore, prior literature would lead us to expect that data science practitioners would not take into consideration the social component of knowledge, something that might not be true. For instance, recent research has found that data scientists do not only rely on “hard” data-intensive skills but also on sharing their knowledge with other domains [29, 41]. This means that, contrary to what is argued by Slota et al. [37], data scientists might not be only consumers of other disciplines’ data and knowledge, but they might relate to a broader knowledge exchange ecosystem. Thus, the knowledge relationship between data science practitioners and other professions may not be unidirectional, but reciprocal.

Hence, the research questions guiding this project are:

RQ1) How do data science practitioners reflect on their practices, and how does this compare to critiques of data science?

In the following sections, we describe our research methodology and the progress of our empirical study. Then, we present our preliminary findings and conclude by discussing the importance of the topic for future research.
Method

The present work is only the starting point of a broader study. This research in progress uses semi-structured interviews and observations with data-related experts that practice data science at a high technical level in a diverse spectrum of industries. So far, 6 interviews have been conducted and the interviewees were selected using snowball sampling [30]. We defined a “data-related expert” as those professionals whose jobs are associated with current data science practices, e.g. data scientists, data analysts, data engineers, and machine learning engineers. We selected semi-structured interviews in order to capture the perception of a broad range of data-related experts around the topic of current data science practices and digital work [30]. The preliminary interviews lasted on average 50 minutes and were audio-recorded, summarized, and transcribed for further analysis and coding. The transcripts were coded inductively using Atlas.ti. This data was collected between 13 of May and 10 July of 2020. Further interviews and observations of data scientists will be collected throughout the year.

Initial Findings & Discussion

The practitioners we spoke with sometimes aligned with elements of the critiques summarized earlier, for instance, some of our interviewees recognized their intermediary role in the development of data science systems, as well as a clear disconnection from other domains. Nevertheless, we have also identified that the academic debate around data scientists appears to be too “black and white”.

For example, we found that data science practitioners are starting to acknowledge the limitations of data for modelling the world. One reason for this might be related to the ‘failures’ that data science practitioners experience when developing their systems. The comments made by one of our interviewees (Data Scientist from MatchingCo [pseudonym]) about the sudden decline of use of an algorithmic tool developed by MatchingCo, suggests that data scientists seem to acknowledge the impossibility to get or infer all the “knowledge” required to make the system a success from data, supporting the view that knowledge isn’t only explicit:

“...you just see that your end user perceives something in a different way than that you intended. And yeah, that has nothing to do with your model or with your product, it has everything to do with just the way things work in the real world...we can never model all the information in the world in a computer algorithm."

Data Scientist - MatchingCo

The interviewee showed awareness of the uncertainty that the real-world involves and how this undermines the “perfect rationality” perspective associated with data science.
Additionally, we learned about the emergence of the “analytics translator” role, which is characterized as the bridge between data scientists and management. This finding suggests that data science processes might not be as straightforward (and advantageous) as it was thought (i.e., data science requires “translation”). The fact that data scientists need support from management to materialize their view challenges the supposed “superior” position of data science in organizations [28, 34, 37, 42]. Concerns were also expressed about data science becoming increasingly automated and commoditized, suggesting that the occupation is not as secure as is sometimes portrayed.

Our initial findings suggest that data science practitioners are reflective on their practices and, contrary to the common portrayal of data science as “superior”, data scientists appear to show certain vulnerabilities and a reliance on others.

With our research, we aim to critically investigate how data scientists reflect on their practice. With this, we aim to understand the key actors who build the digital systems (i.e., AI) that are increasingly shaping our everyday lives. We argue that future research will benefit from going beyond theoretical critiques to a more empirically informed analysis of data science and its practitioners.

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Understanding the Research Landscape of Digital Labor Platforms in Developing Countries

Jiwon Park and Kyung Ryul Park
Graduate School of Science and Technology Policy, KAIST, 291 Daehak-ro, Yuseong, Daejeon, South Korea
{parkjwn, park.kr}@kaist.ac.kr

Abstract. This exploratory study aims to critically review scholarly works and provide a comprehensive summary of current research and assessment of digital labor platforms in developing countries. Despite growing research interest in this field, little is known about the effect of digital labor platforms on the lives of digital workers nor about the influence of political economy and social preconditions. Through a systematic literature review of 34 publications, preliminary results reveal that although existing research acknowledge the contextual differences among developing countries and developed countries, current research showed different assessments on the impact of digital work in developing countries concerning those differences. Furthermore, more literature is necessary to develop methods and theoretical frameworks on studies of digital labor platforms and their impact in developing countries.

Keywords: Digital Labor Platforms, Digital Work, Platform Management, Developing Countries, Systematic Literature Review

1 Introduction

As a digital infrastructure that matches and coordinates clients and workers, digital labor platforms have changed the nature of work by shifting not only the structure of labor markets but also how labor is performed, developed, and organized [1]. This is possible because they expand and limit the quantity and quality of jobs by affording technological features that extend the reach of clients and providers of labor power [2-5]. Although different terminologies are used to describe work mediated by digital labor platforms, this study adopts the classification of commercial digital labor platforms by Schmidt [6], which refers to the service and tasks managed through digital labor platforms that are delivered physically (gig work) or digitally (cloud work) as digital work.

More than half of the service and task requests mediated by digital labor platforms of freelance and microwork come from the United States and other European countries, while digital workers from developing countries such as India, Bangladesh, and Pakistan take up more than half of the occupations [7]. By accommodating digital labor platforms to the traditional transportation and delivery industry (gig work), it lowered the entry barriers and provided more jobs, ultimately expanding the economy size in
developing countries [8-10]. However, current literature reviews on digital labor platforms and digital work focus on mapping out widely used definitions of those concepts and synthesizing cases of mainly high-income countries [4, 11–13] which neglects the influence of the political economy and social preconditions to digital workers [2]. Thus, little is known about the impact of digital labor platforms on the workers’ livelihood, especially those in developing countries.

Our research seeks to fill this research lacuna through a systematic literature review of digital labor platforms in developing countries and aims to answer the following questions: (1) How do academic research identify issues and gaps, and what are their theoretical and empirical implications? (2) How do scholars assess digital labor platforms in developing countries? (3) What future research agenda is needed to understand the effect of digital labor platforms in developing countries? These three research questions have guided the aims, data collection strategy, and data analysis methods of this research.

2 Research Method

To identify the relevant publications for this study, we first looked for key terms associated with digital labor platforms. This stage was particularly important since the concept of digital labor platforms is an emerging theme and various terms are used interchangeably with a lack of consensus [6]. Existing academic publications were investigated to find alternative terms that are widely used to refer to digital works and digital labor platforms. First, the study identified 12 essential search terms. To highlight slight differences in meaning among such terms, they are grouped in four and are presented as shown in Table 1. Second, we relied on these terms (six are combined with labor, labour, work, and platform) to collect targeted literature. Third, to identify the sample literature in a transparent and detailed manner, this study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol centered on the steps of identification, screening, eligibility, and inclusion [14] on peer-reviewed and English language academic literature.

The electronic research database Web of Science was used to find publications in the SSCI collection that contain 12 search terms in their topic field tag. During this screening process, research that did not focus on developing countries or was not in the scope of digital labor platforms categorized by Schmidt [6] were excluded. To apply a holistic approach for defining developing countries, we considered not only the economy size, but also the level of life expectancy, education, and protection of human rights. Thus, in this study, countries outside the OECD member states were determined as developing countries [15]. Out of 281 potentially relevant articles, only 26 were included for a full review. Through the snowballing process of checking titles and abstracts of the relevant peer-reviewed articles from the references of selected publications, 8 articles were additionally included, having 34 articles for the final analysis.
Findings and Discussions

The first part analyzes the research landscape of selected articles through a meta-analysis of research methods, research area, theoretical frameworks, the focus of digital labor platforms and the country studied. The second part analyzes how scholars assess the impact of digital labor platforms in developing countries in terms of the nature of digital labor platforms and their development implications by adopting the framework of discourses on IS innovation and development by Avgerou [16].

The preliminary results suggest that studies of digital labor platforms in developing countries’ contexts are growing, especially from the year 2019. A significant number of publications was funded by two organizations European Research Council (29.6%) and International Development Research Centre (25.9%), and Oxford Internet Institute contributed the most number of publications (20.6%) funded by the two organizations. In addition, our preliminary findings on the research methods suggest that existing studies rely on a broad spectrum of methodological approaches to investigate digital work in the context of developing countries. More than half of the selected publications were conducted through a qualitative method (52.9%), followed by a mixed-method (35.3%), and the least was quantitative method (11.8%), which shows a difference from the general research trend in the field of ICTD [16]. Quantitative studies used statistics to describe the survey results and demographics of digital workers, but they did not go beyond to investigate correlation or causality for theory testing through more developed statistical analysis. This may be due to the methodological limitation of conducting surveys by nonprobability sampling that lacks validity for drawing generalization. Thus, adopting mixed-method while adding interviews with the survey results for triangulation exceeded the number of quantitative method research. Some publications showed potential for overcoming those methodological limitations of studying digital labor platforms through computational support and digital transaction data [7, 17, 18].

Building on the framework of knowledge by Heeks and Bailur [19], our preliminary results show that almost half of the research was classified as non-framework-based work (48.4%). This is because these studies aimed for conceptualizing the empirical findings through an inductive approach or theory building through qualitative research.

<table>
<thead>
<tr>
<th>Group</th>
<th>Search Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(“sharing economy” OR “shareconomy” OR “collaborative economy” OR “platform economy”) AND (labor OR labour OR work) AND (platform)</td>
</tr>
<tr>
<td>2</td>
<td>(“gig economy” OR “on-demand economy”) AND (labor OR labour OR work) AND (platform)</td>
</tr>
<tr>
<td>3</td>
<td>(“digital work” OR cloudwork OR gigwork)</td>
</tr>
<tr>
<td>4</td>
<td>(microtask OR microwork OR crowdwork)</td>
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</tbody>
</table>
Most of the studies centered on a specific country and few major digital labor platforms. For instance, studies on digital labor platforms of transportation and delivery centered on China, while microtasking crowd work and freelance centered on India and the Philippines. This asymmetry reflects the geographical boundaries and language barriers within the use of digital labor platforms.

Finally, the assessment of digital labor platforms in developing countries was investigated through thematic analysis and is summarized as shown in Table 2. Whether digital labor platforms have progressive or disruptive development implications was discussed with the debate on freedom and control by digital labor platforms, and the debate on inequality in the usage of digital labor platforms. The matching system, evaluation system, and pricing system (often referred to as algorithmic or platformic management [20–24]) are the essential technological features that enable effective and efficient coordination of clients and digital workers and allows freedom and flexibility of working time and space. However, regardless of the type of digital labor platforms, many studies found that the algorithmic and platformic management acted as a real-time monitoring tool where all the process and interaction between client and digital workers are stored as data and evaluated [25, 26]. The process of instant and automatic matching and payment systems are perceived as a black box for digital workers and hinder the opportunity for digital workers to intervene [27, 28]. The ratings of digital workers from the clients also lower the structural power of digital workers and require them to provide emotional labor [29-31]. In contrast to flexible working time, low wage, high competition, and difficulty of earning tasks strangle digital workers to stay longer hours in digital labor platforms [32, 33]. On the other hand, studies with a mixed perspective on the development implications found that social interactions and information sharing among digital workers were active in complementary digital innovations such as social media and online forums. This can mitigate the lack of social interactions among digital workers and may have the potential for collective bargaining for retaining basic labor rights [34-37].

<table>
<thead>
<tr>
<th>Development Implications</th>
<th>Nature of Digital Innovation Process</th>
<th>Social-Embeddedness</th>
<th>Not Shown</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Transfer &amp; Diffusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progressive Transformation</td>
<td>S5, S14, S26</td>
<td></td>
<td>S7</td>
</tr>
<tr>
<td>Progressive and Disruptive Transformation</td>
<td>S1, S10, S28</td>
<td>S2, S19, S24, S34</td>
<td></td>
</tr>
<tr>
<td>Disruptive Transformation</td>
<td>S12, S13, S17, S21, S23, S29</td>
<td>S3, S4, S6, S11, S18, S20, S22, S27, S30, S33</td>
<td>S31</td>
</tr>
<tr>
<td>Not Shown</td>
<td>S8, S9, S25, S32</td>
<td>S15, S16</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Categorized by ICT and Development Discourses [16]
Researchers had different assumptions on the nature of digital innovation process, mainly transfer & diffusion perspective and social-embeddedness perspective, which leads to different understandings on the impact of digital labor platforms. Interpretive research based on interviews and observations explained more about the meaning and desirable outcomes from the local perspective. These studies integrated the social and institutional context of developing countries, namely on the fact that these countries encompass a high unemployment rate, job insecurity, absence of social security, and government policy encouraging digital work. They emphasized the aforementioned impact of digital labor platforms, which can reinforce structural inequality and leave digital workers at the bottom of social class, locally and globally. This is especially problematic when digital labor platforms entail high aspirations for solving unemployment and economic growth in developing countries.

4 Conclusion

This study aimed to describe the research landscape of existing literature on digital labor platforms in developing countries. The preliminary results suggest that more literature is needed to develop methods and theoretical frameworks concerning how digital labor platforms are designed, adopted, utilized, and how they affect users in developing countries, as well as how the global diffusion of such platforms bring complexity causing globalized drift where states hardly regulate [11].

To conclude, this research adds to the existing information systems literature in several ways. First, it provides a succinct account on the impact of digital platforms. Second, it provides a future research agenda for digital work in the context of developing countries. Third, it provides potential research questions for empirical studies as well as applications of existing theoretical frameworks of information systems and development studies. As a preliminary systematic review that focuses on the effect of digital labor platforms in developing countries, it contributes to the ICTD literature by deepening the understanding of the interrelation between the development of technology and the socio-political context. Finally, in the long term, this research facilitates debates among the major stakeholders including platform providers, workers, policymakers, and academics.

For what concerns the limitation of this study, we acknowledge that literature was collected through only one database and it was confined to SSCI collection and English language. Although this study cannot present a comprehensive account of all the related theoretical and practical issues related to digital work, it serves as a cornerstone in mapping the research agenda and addressing the lacunae. To do this, we plan to include semi-structured interviews with the academic researchers to engage in in-depth conversations and identify methodological and theoretical challenges as well as with practitioners to discuss policy implications.
References

T4

Human Centeredness in Digital Work
Who’s the boss? Finding the Voice of the Workers in defining their relationships with Gig Economy Digital Platforms

Joseph Taylor¹, Nancy Deng² and KD Joshi³

¹ California State University, Sacramento, Sacramento, CA 95819, USA
² California State University, Dominguez Hills, Carson, CA 90747, USA
³ University of Nevada, Reno, Reno, CA 89557, USA

Abstract.

Many governments and regulatory bodies are investigating ways to improve the equity and security of workers who participate in the gig economy. However, we propose that to effectively design equitable regulatory and governance mechanisms for digital platforms, the nature of the relationship between the worker and the platform must be considered. To the workers, are digital platforms a new type of employer that distributes work to gig economy “employees”, or are digital platforms merely tools that digitize administrative functions for small “entrepreneurs”? In this paper we examine these questions from the perspective of gig workers who participate in semi-skilled and high-skilled digital tasks. Using the framework of the socio-technical view we find that for differing skill levels of worker the nature of worker voice to the platform, to clients and to other platform workers differed. Lower-skill workers displayed greater voice on matters of work opportunity and availability, looking to the platform to facilitate work availability as though the platform were an employer. In contrast, higher-skill workers displayed greater voice on matters of client and communication support as though the platform were an administrative tool. Our findings highlight the need to consider diverse perspectives of stakeholders in defining regulatory and governance structures to support the equitable development of the changing nature of work.

Keywords: Gig Economy, Socio-technical theory, Voice, Platform Governance, Employment Status.

1 Introduction

Digital platforms that connect workers with tasks are a growing segment of the employment market (Noguchi 2018), however concerns persist regarding whether the use of platforms represents empowerment or exploitation of workers [1]. Online platforms
enable workers to participate in various types of work activities. Some platforms, such as Uber or Instacart, connect workers who provide physical tasks (e.g. driving) to provide service to a client. These physical tasks are completed synchronously at a specific location. Many existing regulatory structures, such as taxation or social safety nets, are well suited to monitor and control synchronous, location-dependent activities [2]. In contrast, other online platforms support digital tasks (e.g. coding or data cleansing) to provide services to a client. In these tasks the worker and the client may be located anywhere in the world. The worker and the client need not be governed by the same regulatory bodies, making digital tasks much more challenging to regulate using traditional employment governance mechanisms [3].

As digital platforms change the nature of work, regulators and key employment stakeholders are rushing to design regulatory structures to encourage security and prosperity. For example, in the United States, the state of California has adopted laws that redefine the concept of “employee” status, complete with work protections and insurance, to include gig workers such as Uber drivers [3]. Stakeholders, such as companies that provide digital platforms (referred to as “platform companies”) and labor unions, are actively engaging in policy discussions to define regulatory structures sufficient to protect and enable workers and firms to share in competing views of mutual prosperity. Digital platforms have committed millions of dollars to lobbying for legislative or voter intervention [4]. In response to corporate lobbying, labor unions representing organized employees of industries disrupted by the sharing economy have invested substantial resources with their political allies to pass legislation such as the law put in place in California [5]. While institutions such as labor unions and platform companies have invested substantial resources in advocating a variety of regulatory schemes to offer gig workers legal structures to channel their voice, the workers who directly participate in the gig economy often lack organized structures to elevate and amplify their voices as key stakeholders in regulatory decisions. The lack of input from workers that directly participate in the gig economy can lead to unintended consequences to regulatory actions. For example, after the US state of California passed a law that expanded the legal definition of “employee” to most gig economy workers some workers engaged in digital tasks (which could be complete asynchronously from any location) found their gig economy positions eliminated. In one example a platform that provides sports related media service eliminated around two hundred freelance positions and replaced them with around twenty employees [6].

Part of the challenge of consolidating and amplifying the voice of workers participating in the gig economy is understanding the nature of the relationship between workers, clients and digital platforms. Do the workers function as employees of digital platforms or of the digital platforms’ end clients? Alternatively, are the workers entrepreneurial “service providers” that use digital platforms to provide administrative support for their contracts? Does the relationship between the worker and the platform change for physical versus digital work, or higher-skill versus lower-skill work? In this research we explore these dynamics to address “who is the boss?” in gig economy relationships, and
what factors contribute to power dynamics effecting the voice of workers within work boundaries enabled by digital work platforms.

2 Theoretical Foundation

Leveraging the concepts of Voice and Silence as described by Dyne et al (2003) [7] this research examines the ways in which workers on an online platform for digital tasks voice their opinions, suggestions and concerns to the platform on which they participate, to the clients who they support, and to other workers on the platform. According to the Voice and Silence framework, employee voice is an expression of employees’ challenging but constructive opinions, concerns, or ideas about work-related issues, and different forms of employee voice exist, driven by employees’ different motives, including disengaged, self-protective, and other-oriented. Silence behaviors occur when employees decline to express constructive opinions, concerns or ideas. Silence behaviors may be results of futility, powerlessness or lack of achievement orientation. We further investigate how differences in the perceived role of the platform by workers effects the nature and direction in which workers express their voice. Digital platforms, and labor organizations representing existing “employees”, provide strong institutional support to consolidate and amplify the voice of their respective interests. We propose that effectively understanding the interests of gig economy workers, who fit neatly into neither an “employee” nor “entrepreneur” classification, requires scholars to consider how the relative influence of the platform changes as the level of digitization and skill requirements of tasks change. In our analysis we assess how the nature by which the workers voice their opinions, suggestions, and concerns change as the technical skill level (and corresponding compensation) vary across workers.

Digital tasks involve a wide difference in skills. Data cleansing or validation activities may require little technical ability to complete, while developing security encryption algorithms may require highly specialized skills. Online platforms may support both highly technical and relatively simple digital tasks. We propose that understanding the nature of the ways in which workers interact with digital platforms will provide critical insights to legislators and regulators who seek to develop equitable regulatory designs to insure that the changing nature of work leads to greater levels of economic development and shared prosperity across stakeholders.

3 Research Methodology

In our analysis we collect survey data of open ended questions directly from over fifty gig economy workers who participate in a large multinational platform supporting digital services regarding their experiences with engaging in voice and silence behaviors
We analyze our data using content analysis. We consider the interactions and relationships that connect workers, platforms, clients, and work activities as essential parts of the sociotechnical work system in crowdsourcing [9]. Using a socio-technical perspective [10, 11] we characterize and compare the use of voice and silence by workers in relation to digital platforms, clients of digital platforms, and other workers on digital platforms.

4 Preliminary Findings

We find that while all workers generally reported high levels of satisfaction with the opportunities that the digital platform provided for employment, the most common areas of voice and silence differed between relatively high-skill and relatively low-skill workers. Our findings indicate that lower skill workers participated in relatively more voice activities on topics relating to how the structure of the platform directed work activities such as client acquisition and communication. In contrast, higher skill workers participated in relatively more voice activities that were related to the administrative tasks enabled by platforms. In other words, lower skill workers were more likely to interact with the digital platform in ways related to work availability and assignments, in many ways analogous to the role of an employer providing work to employees. In contrast, higher skilled workers were more likely to interact with the digital platform in ways related to administrative support, such as billing or procurement, in ways analogous to an administrative support subcontractor.

Our findings highlight several key issues that represent important perspectives that should be considered in designing platform governance structures and developing effective regulatory structures to address the changing nature of work. The implications of these findings demonstrate further nuance that should be considered as regulators attempt to increase the equity of digital platforms. Our research demonstrates that neither digital platforms, nor workers are monolithic. There are many voices highlighting the needs of diverse stakeholders in efforts to make gig economy work more sustainable and equitable to workers. Our research demonstrates that gig workers comprise of a broad range of perspectives and interests, and highlight the need for regulatory efforts to consider the needs of all stakeholders, not merely those with existing institutions to consolidate and amplify voice such as firms or labor unions. Our research further demonstrates that gig economy workers should develop greater diversity of voice in identifying appropriate oversight measures to address worker equity in the face of the changing nature of work.

References


An Interpretative Analysis on The Impact of ICT in Knowledge Management of Academic Research in Developing Countries: A Case Study of Nigeria Public Universities

Hilary J. Watsilla¹, Prof Olumide B. Longe² And Dr Narasimha Vajjhala³

¹²³American University of Nigeria, School of IT and Computing, Nigeria

Abstract

Academic research is one of the key functions of a university. researchers all over the world are continuously contributing to both local and global development through the creation of new knowledge that is made readily available on the internet. Over the years various governments across the world have developed policies for the continuous improvement of their economy which has included investing in research and development. The university is embedded with intellectual capital for the creation of knowledge and it has a role to play in the innovative system of an economy. Therefore for developing societies to meet up with the rest of the developed world, it is necessary to utilize all available resources. The purpose of this research is to evaluate how academic knowledge can be utilized in developing countries for economic growth through research. An interpretive approach will be used to investigate the empirical situation of Nigeria's public university research that contributes to society. The absorptive Capacity theory will be employed as a lens in understanding the phenomenon of knowledge creation in an academic environment. The knowledge management capability model and IT capability model will also be used as tools to explain the role of IT in knowledge creation in academics. Data will be collected using various methods such as interviews, qualitative surveys, and focus groups. This research aims to contribute to the body of knowledge in the IS and knowledge management domain and for policy development.

Key Words: Information Technology, Knowledge creation, Knowledge management, Academic Research, University

1. Introduction

University is perceived to contribute to national or regional development through knowledge creation, sharing and transfer[1], [2]. The nature of global economic growth has been changed by the speed of innovation, which has been made possible by speedily developing technology, shorter product lifecycles and a higher rate of new product development[3]. This has encourage research studies on new way in creation of innovative ideas and solution. Since the university is embedded with intellectual capacity for the creation of knowledge it is necessary for the university to be involved in the innovative growth of an economy[2].

The university is assumed to be an institution suitable for knowledge creation, however knowledge sharing culture is perceived to be an issue[4], since knowledge is not easily shared among individuals[5]. The advent of computers and the internet has however transformed the traditional educational landscape into a dynamic knowledge based environment[6]. This have improved and increased communication among faculty, staff and students with various information and communication technology tools (email, social media and online virtual environment) being employed by universities to enhance the learning and teaching.

In today's economy, knowledge is seen as a key resources for development and innovation among industries at different levels[7], [8]. Developing countries are catching up with the rest of the world in term of innovation and technological advancement. To compete with the rest of the world, new knowledge and innovative idea need to be created, disseminated and stored by indigenous organization and academic institutions. The important role the university has to play in innovation and creating new knowledge in an economy has been emphasized in various studies[9]–[11]. However these studies have been carried out mainly in European countries, the USA and recently some part of Middle East[12]–[14]. Therefore, more studies need to be carried out in developing countries due to the different in academic structure and other factors that may affect the production of knowledge.

1.1 Research Purpose

The purpose of this thesis is evaluate the impact of academic research contribution to the economy development of local regions in developing countries, a case study of Nigeria. Nigeria is the most populous country in Africa with an estimated of over 200 million people and vast deposit of natural resources, there are 81 public universities which includes 43 federal universities and 48 state universities in the country. However Nigeria still remains one of the poverty capitals of the world. The academic communities which comprises of higher institutions of learning in the country have a significant role to play in the development in the country. Information Technology has made research activities easier and more effective by providing a means of communication, promotes knowledge sharing and dissemination and many more. But literature on academic knowledge contribution to the development of a nation is limited in Africa. These research will attempt to fill in the literature gap in this area and also provide more understanding on knowledge management application in an academic environment.
1.2 Research Questions

Research Question one (RQ1). What are the underlining factors that determine the value of knowledge created by academia to the development of their local economy and how is replication avoided?

Research Question two (RQ2). How does Information Technology foster knowledge sharing among individuals in an academic environment?

Research Question Three (RQ3). What are the issues with academic knowledge transfer to industries and society in Nigeria?

2. Research Approach

To address the following research questions, an empirical investigation will be carried out to understand the social and technological constructs involved in knowledge production in universities. An inductive strategy will be employed to observe the phenomenon under investigation[15]. A critical research will be carried out using an interpretive case-study design approach[16]. Some selected public universities in Nigeria with access to TETFund intervention will be used for the case-study. Public universities (federal and state) in Nigeria get research intervention from government through TETFund agency. Data will be collected through interviews, observations and document analysis for some selected public universities in Nigeria.

2.1 Theoretical Framework

Absorptive capacity(ACAP) theory is proposed for this study, it is defined as the ability to identify, assimilate, transform, and apply external knowledge[17]. The study of ACAP have take various dimension over the year, from: ability to value, assimilate and use knowledge[18], to human capital and prior knowledge base[19]. However, for the purpose of this study, a reconceptualization approach of ACAP was used[20]. ACAP is viewed as an organizational dynamic capabilities which are made up of knowledge acquisition, assimilation, transformation and exploitation[20]. The reconceptualization suggest two subsets of Potential(PACAP) and Realized(RACAP). PACAP comprises of Knowledge acquisition and assimilation, while RACAP is focused on knowledge transformation and exploitation. But less attention has been given to the PACAP[21]. For the purpose of this study we focused on potential ACAP. Acquisition refer to capability to identify and acquire valuable external knowledge, while assimilation refers to routines or processes used to analyze, process, interpret and understand information obtained from external sources[20]. The ability to develop and refine route process that supports the acquisition and assimilation of existing and new knowledge can be referred to as Transformation, while exploitations is the capability dimension of an organization to apply existing or newly acquired knowledge in the operational activities. Using this theory will give an insight on the knowledge production and application in the academic environment. However, other theories like the knowledge base view(KBV) and Organizational knowledge creation(OKC) theory will also be considered in the process of carrying out the research. KBV is described the capabilities of organization to utilize it knowledge in optimizing its productivity[22]. Knowledge is view as the most strategic asset of an organization. OKC is the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it with an organization’s knowledge system[23].

3. Expected Outcome

The global economy is increasingly becoming more knowledge-centric both in developed and developing economies. Knowledge management has been used by organizations to gain competitive advantage and as a strategic means to effectively and efficiently manage and organization. However, the application of KM in the university system has focus more on promoting knowledge sharing and transfer between universities and industries. There are little literatures on the process of knowledge creation in the university and the application of such knowledge in developing countries. The empirical findings from this study should provide more understanding to the existing body on knowledge in the areas of academic research, the impact of ICT in knowledge creation processes on an academic environment, and impact of knowledge products to the development of a region especially in Africa. We also hope to contribute to existing literature in knowledge management and ACAP. However, this study is limited to Nigerian universities; the outcome may not be generalized to other developing countries. The study is aimed at understanding knowledge creation process by academic researchers using ICT tools.

4. Challenges and Limitations

There are a couple of challenges one will face in carrying out a PhD research. These challenges however may be limited to the researchers understanding, mental state of mind, health and otherwise that cannot be foreseen. Issues with sourcing for research materials, getting participants for empirical data gathering and funding for research cannot be overlooked as well. However, the research will make sure the research is conducted in an ethical way with all the available resourcing they can get.

The limitations of the research will include geographical location that the research will be carried out. Mainly the research will be carried out in Nigeria and may be limited to specific areas and universities in Nigeria that will be used for data collection. The research is also limited to the application of knowledge management in academic which is focused on the...
production of knowledge by academic researchers. Furthermore, this research may focus only on the application of the knowledge produced by academic researchers and its application to the society as it relates to development.

References


A Methodological Framework for Analyzing Home-Based Workspaces during the COVID Pandemic

Pamela Abbott and Angela Lin

1 University of Sheffield, Sheffield, S1 4DP, United Kingdom
(p.y.abbott, a.lin)@sheffield.ac.uk

Abstract. The COVID-19 pandemic has given rise to the uprooting of paid workers from places where their work is normally undertaken to their private homes. What is of present interest to this research area is the relative immediacy with which this relocation of work took place globally and the implications it has for the future of work especially in the context of industrialized economies. During the various ‘lockdown’ situations worldwide, working from home was widely mandated, however, in such emergency situations little consideration would have been given to the effective spatial organization of home-based working. In such situations, the spatio-temporal reorganization of work/life is expected to impact workers’ behaviors, productivity, and well-being. This resonates with recent calls for more attention to be paid to space-time in our understanding of the organization of our working lives especially outside of the boundary of the firm. We present in this paper research in progress on developing a methodological framework utilizing visual methods to address this issue.

Keywords: Home-based Workspaces, post-COVID-19, visual methodologies

1 Introduction

The COVID-19 pandemic has given rise to the uprooting (Koslowski et al., 2019) of paid workers from places where their work is normally undertaken to their private homes. The consequences of this uprooting have included initial disorientation brought about by a disruption of existing work routines (Ralph et al., 2020), encountering new work situations (Kaushik & Guleria, 2020), making sense of these situations (Hallin, 2020), and transitioning to new work arrangements (Willcocks, 2020a). The phenomenon of working away from traditional office settings is not new and has been variously referred to in literature as teleworking (Tietze & Musson, 2003) or homeworking (Baruch & Nicholson, 1997; Felstead & Jewson, 2000). What is of present interest to this research area is the relative immediacy with which this relocation of work took place globally and the implications it has for the future of work especially in the context of industrialized economies (Willcocks, 2020b).

During the various ‘lockdown’ situations worldwide, working from home was widely mandated, however, in such emergency situations little consideration would have been given to the effective spatial organization of home-based working. In such situations, the spatio-temporal reorganization of work/life is expected to impact workers’ behaviors, productivity, and well-being (Ng, 2010, Felstead & Jewson, 2000). This resonates with recent calls for more attention to be paid to space-time in our understanding of the organization of our working lives especially outside of the
boundary of the organization (Baines, 2002; Leung & Zhang, 2017; Ng, 2010). Given the importance of this focus, a key question that arises, is how we can study the spatio-temporal organization of home-based working arrangements? We present in this paper research in progress on developing a methodological framework to address this question.

2 Conceptual Framing

The proposed methodological framework is situated within the broader concerns of the spatio-temporal organization of work in home-based working arrangements. We chose the unit of analysis to be the home-based workspace which we defined as the physical area in a worker’s domestic home where economic activities are undertaken, which could be paid employment of any sort, including but not restricted to office-based work that has been relocated to the home.

Our concept of spatio-temporal organization of work in home-based work settings draws upon seminal literature on homeworking and teleworking (Baruch & Nicholson, 1997; Felstead & Jewson, 2000; Gurstein, 2001) and the physical aspects of the constituents of a workspace at home (Ng, 2010 referring to de Croon et al.’s (2005) study). Four important home-based workspace characteristics were thus derived: location, the physical location of the workspace within a home; layout, the size and aesthetics of the workspace; use, the degree of separation or integration with other household spaces; and job equipment, the physical resources used to perform basic job functions including storage, furniture and technologies (information technologies and communication technologies).

The literature on the social organization of space-time in home-based working arrangements also provided some key concepts to clarify how one could infer from the physical composition of home-based workspaces, aspects about the spatio-temporal organization of work within the home (see Table 1). For example, a key thread in this literature was the assumption that the routine of work could be seen to dominate home life through the imposition of temporal restrictions on work and life activities in the home-based workspace, such that they would be rigidly separated (monochronic strategies) (Nansen et al., 2010; Tietze & Musson, 2003; Wapshott & Mallett, 2012). In the same vein, spatial restrictions would relegate work activities to specific areas of the home where life activities would not be permitted to intervene (monospatial strategies). On the other hand, resistance to this domination could be reasserted by the homeworker or co-resident through appropriation of home-based workspaces for multiple uses (polyspatial strategies) or the homeworker could interweave the temporal rhythms of home and life activities to satisfy their own work/life balance objectives (polychronic strategies). Another key theme was the understanding that these tensions between different strategies of adjusting social relations within the home-based workspace exist in a dialectical relationship producing spatio-temporal work/life arrangements that are fluid, multifaceted, situated and open to negotiation (Baines, 2002; Halford, 2008; Wapshott & Mallett, 2012). Table 1 further elaborates on similar concepts from this literature.
Table 1. Physical aspects of home-based workspaces and spatio-temporal organizing strategies.

<table>
<thead>
<tr>
<th>Physical aspects of home-based workspaces</th>
<th>Key issues extracted from the literature</th>
<th>Spatio-temporal organizing strategies</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Private or shared space and level of negotiation with co-residents</td>
<td>Rigid/permeable boundaries between work and home</td>
<td>(Ng, 2010; Nansen et al., 2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predetermined or negotiated rules around spatial and temporal use of workspace</td>
<td></td>
</tr>
<tr>
<td>Layout</td>
<td>Interaction of the person with the workspace</td>
<td>Personalization or de-personalization of the space</td>
<td>(Ng, 2010; Felstead &amp; Jewson, 2000)</td>
</tr>
<tr>
<td>Use</td>
<td>Level of integration of work/home life in the workspace</td>
<td>Monochronic or polychronic strategies</td>
<td>(Tietze and Musson 2005; Nansen et al., 2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monospatial or polyspatial strategies</td>
<td></td>
</tr>
<tr>
<td>Job Equipment</td>
<td>Use of furniture, technology or the human body in the workspace</td>
<td>Boundary objects eroding or erecting boundaries</td>
<td>(Koslowski et al., 2019)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Affordances of sociotechnical objects to blur/sharpen boundaries between work and home</td>
<td></td>
</tr>
</tbody>
</table>

3 Methodological Framework

The design of the methodological framework was informed by literature promoting the use of visual methodologies to research the spatial aspects of work and organization (Best & Hindmarsh, 2018; Halford, 2008; Munro & Jordan, 2013; Strangleman, 2012). The data collected in this study were based on the visual medium of photographs. Methodologically, there are two means of collecting photographs: primary and secondary collection. The former involves researchers or participants taking photographs at the time of the study in the research setting, while the latter involves scanning photographs into existing collections and/or archives (Ray & Smith, 2011). Given the restrictions on, and ethical considerations about, eliciting data from participants during the period of the pandemic, secondary collection of photographs were found to be a preferred and appropriate method. As such, social media sites which have abundant textual and visual materials in native digital formats were chosen to be the sources of the photographs, which people deliberately selected and self-consciously published and shared for public consumption. These photographs, we think, can reveal...
aspects of home-based workspaces in a nonverbal but substantive way. They tell a story about the meanings and assumptions behind the organization of home-based workspaces (Ray & Smith, 2011).

Content analysis was chosen as the method of analysis due to its applicability to large amounts of visual data, particularly those sourced from mass media outlets (Rose, 2016). Content analysis also provides other useful aspects for our approach: (1) a well-defined systematic set of procedures for extracting data from texts/images; (2) the ability to focus on the material composition of the images, which we deemed important to establish physical components of the home-based workspace; and (3) some degree of interpretative flexibility in making inferences from the manifest (observable) content to the latent (potential) meaning that could be ascribed to that content (Ahuvia, 2001; Krippendorff, 2004; Rose, 2016).

We devised six steps to our methodological framework. Table 2 summarises the procedures involved in each step and criteria that we have applied to approach data collection and analysis systematically and ensure the quality and integrity of the data.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedures</th>
<th>Quality Assurance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Sourcing the visual images</td>
<td></td>
</tr>
</tbody>
</table>
- Identifying data sources  
- Defining the sample size  
- Extracting data automatically using a bespoke Python program  
- Cleaning, recording and storing the data  
- The sample size must be manageable given the resources available to hand  
- Only photographs posted during the period of strict lockdown should be collected  
- Images chosen for content analysis are relevant to the research questions  
- Selected images are representative |
| (2)  | Creating and applying a bespoke ethical protocol |  
- Adhering to ethical standards for extracting social media data  
- Developing ethical protocols to address key ethical concerns about using social media data  
- Use of published ethical guidelines by research institutions |
Devising the content analysis coding frame

- Developing a coding frame on the basis of the conceptual framework
- Coding categories must allow for theorized connection between the images and the broader context in which meaning is made
- Codes are valid given the research questions and literature

Pilot testing the coding frame and developing the interpretative framework

- Conducting a pilot test
- Reviewing, revising, and refining coding categories
- Coding process is replicable
- Coding categories must be unambiguous with clear definitions

Coding the images and texts and resolving discrepancies

- Examining and coding the images and associated texts
- Sampling strategy for a content analysis is systematic
- Coding categories are carefully and systematically applied
- Ensuring inter-coder reliability
- Statistical analyses should align with relationships derived from the conceptual framework.
- The results, interpretations, and explanations should be valid and theoretically interesting.

Performing analyses on the coded data

- Applying descriptive and inferential statistical analyses as appropriate
- Exploring the relations between different coding categories using both quantitative measures and qualitative interpretations

4 Preliminary Outcomes

Steps 1 and 2 of the methodological framework have been completed. We have collected a total of 383 usable images, associated tweets and replies to these tweets from a social media site, Twitter. We ascertained that the data were relevant, representative, and significant to our study (Rose, 2016). Below we illustrate through some sample coding categories and codes, how we are developing the coding framework according to the quality assurance criteria outlined in Table 3 (Step 3). The coding categories are chosen based on their alignment with concepts from the literature and the conceptual framework we discussed in section 2. We have chosen example coding categories that align with each of the physical home-based workspace characteristics derived from the literature. The sample questions are specific and unambiguous and are designed to be coded using mutually exclusive (non-overlapping) and exhaustive (no missing choices) codes. The theoretical concepts to which the coding categories link will allow us to make inferences from our coding back to the broader context of this research. In order to verify and validate our approach, our next
step will be to conduct pilot testing on the codes (Step 4) with a sample of images that are not part of our data set.

<table>
<thead>
<tr>
<th>Coding Category (derived from the conceptual framework)</th>
<th>Sample Questions (valid, unambiguous codes)</th>
<th>Theoretical Concepts (connections to broader context)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatio-temporal characteristics of the home-workspace</td>
<td>Where is the home-workspace located? [Bedroom, Living Room, Kitchen, Study, Dining Room, Utility Room, Outdoors, Other]</td>
<td>Monospatial/Polyspatial strategies</td>
</tr>
<tr>
<td>[Location]</td>
<td>Is there evidence that this location is used solely for the home-workspace? [Y, N, Don’t know]</td>
<td>Rigid/permeable boundaries between work and home</td>
</tr>
<tr>
<td></td>
<td>Is there evidence that this location could be used for different purposes at different times of the day? [Y, N, Don’t know]</td>
<td>Monochronic/Polychronic strategies</td>
</tr>
<tr>
<td>Composition of the home-workspace</td>
<td>Is there evidence that this piece of furniture is used solely for the home-workspace? [Y, N, Don’t know]</td>
<td>Boundary objects eroding or erecting boundaries</td>
</tr>
<tr>
<td>[Layout]</td>
<td>Are physical personal artefacts present in the home-workspace? [Y, N, Don’t know]</td>
<td>Personalization or de-personalization of the space</td>
</tr>
<tr>
<td>Role of co-residents in creating the home-workspace</td>
<td>Are there any physical artefacts that could be associated with co-residents visible in the home-workspace location? [Y, N, N/A]</td>
<td>Predetermined or negotiated rules around spatial and temporal use of workspace</td>
</tr>
<tr>
<td>[Use]</td>
<td>Are there any mobile technological artefacts? [Y, N, N/A]</td>
<td>Affordances of sociotechnical objects to blur/sharpen boundaries between work and home</td>
</tr>
<tr>
<td>Technology and its role in creating the home-workspace</td>
<td>Is there evidence of the technological artefacts being used for personal/leisure activities? [Y, N, Can’t Tell]</td>
<td></td>
</tr>
<tr>
<td>[Job Equipment]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References

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Ambitions and challenges for person-centered health monitoring in India: how will the digital transition serve key populations?

A focus on the impact of digital transition on key population seeking care under the National AIDS Control Program.

Research in Progress

Tauro Carolyn1
1Department of Informatics, University of Oslo, Oslo, Norway
carolykt@uio.no

Abstract
Digital transition has given rise to a non-linear proliferation producing and offering services access for people. Although a keystone of health reforms, it does not come without challenges. India’s National Digital Health Mission (NDHM) comes with enormous ambitions of a platform ecosystem envisioned for person-centered monitoring amongst other roles. Challenges for these include existing digital and non-digital reporting processes and the siloed approach of vertical national health programs. This research in progress paper presents the research plan to study existing information processes under the National AIDS Control Program (NACP) and the impact of this digital transition on those seeking care, with a focus on key population. Expected contributions of study include building new knowledge around the challenges and opportunities of person-centered based monitoring of HIV patients representing key vulnerable population groups and the role of digital health to this. The aim is to contribute to the fast emerging field of digital health in global contexts, with a focus on India.

Keywords
information processes • digital transition • key population • data governance • HIV care
Introduction

This paper presents a research in progress. I am a doctoral research fellow currently collating ideas and concepts to develop my PhD proposal. My medical and public health background and work experience with humanitarian organisations in HIV clinics with key population, co-infected with Tuberculosis (TB) and Hepatitis C, also battling with mental health disorders, led me to this study area. Also, working with patient monitoring and the District Health Information Systems (DHIS2) has made known to me several challenges of transition with technology and its interactions. This drew me closer to the research question I am considering and will present below.

My research will address two sets of debates around digital transition within the public health sector of a low and middle income country. One relates to the larger architecture in Information, Communications and Technology (ICT) and how this digital transition from an aggregate, mostly manual, health information system (HIS) to a patient-centered digital system comes with myriads of opportunities and challenges. Patient centered systems enable better clinical management over time ensuring continuity of care between health facilities, with opportunities to provide information, support and social networks for patients and providers. Challenges include lack of engagement with legacy data systems, limitation in architecture to facilitate use through interoperability and inclusivity of stakeholders, and systems of misuse, weak governance and lack of policies on data management, sharing and data governance. Another related, and broader debate towards ICT for development (ICT4D), aims to address the question on the approach and strategies in these more individualised HIS to include people who have been historically excluded. What are the challenges of person-centered monitoring in health and what would these specifically mean for marginalised people? My contributions to these debates will take the form of analyzing different information practices and issues of scale of digital transitions, their different facets underlying transitions, including achievements, challenges and approaches.

Background

**Digital transition and evolution:** Digital transition has given rise to a non-linear, non-hierarchal blooming of web platforms with benefits and challenges in the health sector. While HIS enables collection, storage and data sharing, it has shifted from capturing limited use aggregate data to more complex individualised data. Research on the use and misuse of individualised data has largely been ignored. The movement of manual systems to digital ones is also associated with changes in practices, decision making processes and social-political-cultural consequences with public health systems particularly influenced in negative and positive ways. Evolution in digital technology brings forth issues of accessibility, usability, inter-operability, inclusivity and health data protection.

Plans to integrate all at once become complex delaying implementation timelines, increasing resource demands and frustrations. Integrated platforms and information system infrastructure development come with tensions leading to change and instability. India’s National Health Policy, in 2017, expressed the vision of one such complex digital health technology eco-system aimed at developing an integrated HIS. The National Digital Health Mission (NDHM) including a national Health ID, consent manager, health registries linking clinical management, health claims, analytics, supply chain and telemedicine, all with the vision and ambition of patient-centric care, was launched.
**Person-centered monitoring in national health programs:** Ambitions of patient-centric care exist amidst current reporting systems within national health programs in India - centralised with little feedback to state governments, built in silos lacking interoperability and use of proprietary platforms incurring high costs and difficulties in systems sustainability. Furthermore, most health programs are vertical in nature, particularly those of infectious diseases affecting key population. The National AIDS Control Program (NACP), Revised National Tuberculosis Program (RNTCP) and National Viral Hepatitis Control Program (NVHCP), work independently although it is common for a person living with HIV to contract TB and / or Hepatitis, with accompanying mental health disorders managed under the National Mental Health Program (NMHP). Vertical programs mean separate strategies and separate reporting systems - Strategic Information Management System (SIMS) for HIV, web-based TB surveillance system (Nikshay), Viral Hepatitis Information Management System (VHIMS), and Mental Health Information System (MHIS). Known system challenges include lack of strategic planning in the transitional implementation process, gaps in reporting content, no formal training for end-users, non-availability of competent staff and limited scope for software improvement.

**Data governance:** Benefits of systems with individualised data also bring concerns of privacy and data protection with hacks into HIS not uncommon. Health data particularly that of key population, needs protection due to sensitivity and implications, if leaked. Lack of digital data principles in digital solutions could lead to surveillance harms. Government role in protecting its population’s health can do more harm than good, if powers are wrongfully exercised in the absence of regulation or national legal frameworks based on international guidelines. These are essential for the adoption of more just, responsible and sustainable data governance models, serving to increase the confidence of individuals and society in the use of personal data.

**Stigma and socio-technical challenges:** Challenges are not limited to technology for the marginalised. Along with the disease complexities, key population - injecting drug users (IDUs), sex workers (SWs), transgender (TG) and prisoners - experience stigma, are refused medical care and are likely to avoid health care due to the negative experiences. IDUs are less likely to utilize harm reduction or drug detoxification services from the lack of awareness about the service or their HIV status. Police presence around health centers and possible arrests keep IDUs further away. TG and SWs feel discriminated against at health facilities, have been shamed and stigmatised for taking preventive exposure prophylaxis against HIV. Although they prefer safe spaces like drop-in centers to access healthcare information and support through drop-in centers that act as safe spaces, barriers that surround service availability, accessibility and affordability come in play. Service access is limited due to lack of knowledge of clinic locations or working timings, illiteracy, unemployment and not owning a smartphone. Dependencies on populations that interact with technology include the need to be literate or “smart”, in capacity of owning a suitable device and willing to be active participants in the system. Does being excluded from the digital domain have implications on the health status of key population and their ability to access services?

To address the debates of the architecture of digital transition and its impact on the marginalised population, I will focus on the digital transition planned under the NACP and related programs. Ambitions of NDHM include having all information systems within the Integrated Health Information Portal (IHIP). This implies enormous change of existing, mostly non-digital, information processes to a highly digitalised one. Little research has been done on the
processes and challenges experienced in this digital transition in India and on what this means for the clinical and public health management of HIV, TB, Hepatitis and mental health in key population.

The central research question will be: How does the digital transition of national health programs enable person-centered health monitoring and serve key populations seeking health care? To answer the research question, my study will have objectives surrounding information practices and person-centered monitoring, digital transitional evolution, data governance and the impact of the transition on key population. I have discussed these in the Findings and discussion section.

Methodology

Since the project is in its initial stage, much of the research design is under construction and will need ongoing modification. Qualitative methods will be essentially used. Review of literature available as physical and online blueprints, meeting notes, public consultations, demonstrations, plans and policies for the current HIS in the NACP, RNTCP, NVHP and NMHP, will be done. Key informant interviews with current and past officials of national and state programs will begin a historical documentation of milestones in the journey of this transition. I will be a participant in key meetings, workshops and round table discussions with key informants. Observations of key population interactions with staff at health facilities and focussed group discussions will aim to unfold information practices and its evolution. During this time, if a case(s) stands out as exemplary to help demonstrate information practices, I will consider including this. Transcripts of interviews and meetings notes will be translated to English (if required) and transcribed, to be then analysed with manually or using appropriate software.

Empirical sites in India have not yet been confirmed and I am aware that the COVID-19 pandemic may restrict field travel. Attempts will be made to connect with informants online so that interviews via online audio-video conferencing platforms can be held. Face to face discussions will follow infection control measures, making sure to keep to local requirements of self-isolation, quarantine and safe distancing.

The study will involve observing data flow, processes, interactions and technology specifics. Information practices and barriers for key population will include close consenting conversations possibly including exchange of personal and sensitive information which will be collected, stored and analysed with assured confidentiality and anonymity. Process permissions and local ethical requirements will be undertaken in addition to the fulfilment of requirements by the Norwegian center for Research data.

Findings and discussion

At the time of writing this paper, I have not begun data collection and have, as such, no primary findings to present. Instead, I will present each objective expanding them to demonstrate how they will attempt to answer the main research question.

To understand current information practices and processes in national health programs and assess the status of person-centered monitoring for key population in the HIS used: The objective will aim to address what person-centered monitoring means, in particular for key population. Close engagement with key population will help understand catalysts and barriers during staff and systems interaction in information pathways. Observations of,
and interviews with personnel who clinically manage, monitor data and make decisions around person-centered care will help unveil current information practices along with plans, if any, of changes during the digital transition.

To explore how the HIS has evolved during this digital transition: This objective will aim to study the ecosystem of HIS and ambitions of NDHM with regards to the transition of health programs to the IHIP. Strengths and gaps in these ambitions will be compared with reality on the ground. The pathway to transitioning four vertical HIS onto one integrated portal implies various possible tensions in both de-stabilising the current and stabilising a future chain of processes.

To outline and investigate data governance aspects of digital transition: The objective will involve an in-depth study of the current data governance structure and processes, hierarchy of governance and autonomy across administrative levels dealing with HIS; the extent of individualised data collected and storage processes, including access rights. Mapping of measures considered in the new system to minimize digital harm through patient identification, health data leakage, and data sharing across players will be done. This will include an insight into the latest Data Management Policy drafted and how it compares with internationally advised governance measures for health data.

To study the impact of digital transition on marginalised key population seeking care under national health programs: This objective will investigate how the digital transition has kept in mind needs of key population seeking care under the NACP and related health programs: its plans for socio-technical challenges including illiteracy, incapacity with technical interaction, issues of affordability and stigma. How the transition improves care for key population seeking this under the NACP – whether accessibility, clinical management or policies due to improved monitoring. Will the digital transition bridge the gaps of social and healthcare ostracisation or will there be a further digital ostracisation?

Conclusion

My research findings aim to contribute towards:

1. ICT4D with new knowledge to inform processes and policies in HIS that strengthen inclusion of marginalised population.
2. New knowledge to inform public health policies on how digital technologies can lead to better person-centered monitoring and care through improved utilization of health care services by key population and addressing socio-technical challenges.
3. New knowledge on how the design of HIS can include the marginalised in the monitoring process, with robust data governance contributing to improved person-centered care.
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15. Digital data principles https://digitalprinciples.org


Exploring Algorithmic Literacy in Society: A Research Agenda

Miria Grisot¹ and Elena Parmiggiani²

¹ Department of Informatics, University of Oslo, Ole Johan Dahls Hus Gaustadalléen 23 D, 0373 Oslo, Norway
² Department of Computer Science, Norwegian University of Science and Technology, Sælands vei 9, 7491 Trondheim, Norway
miriag@ifi.uio.no, parmiggi@ntnu.no

Abstract. Learning algorithms are deeply interwoven with our society. They transform and are transformed by epistemic practices and in doing so are increasingly becoming part of our modes of knowing and engaging in society. However, their opaque nature poses challenges to how we, as citizens, can engage in the societal governance of learning algorithms. This is particularly relevant in the case of public services, where learning algorithms can determine what services can be delivered to whom, often in an opaque way. Academic and policy sources agree that there is an urgent need to develop more actionable knowledge on and contribute to a good digital society. With this short paper, we propose a research agenda to address one approach to this problem, that is the development of algorithmic literacy in society. We stress the need for IS to (1) develop in-depth knowledge on how algorithms fundamentally shape and are shaped by epistemic practices, (2) promote citizens’ ability to account for and participate in the shaping of algorithmic arrangements, and (3) inform public governance. We outline six recommendations for future research and corresponding research questions that IS researchers might ask to supplement existing accounts of learning algorithms in the public sphere on the empirical, participatory, and policy level.

Keywords: Learning algorithms, Algorithmic Literacy, Citizen Engagement.

1 Introduction

Currently, data-driven algorithms reasoning based on Artificial Intelligence (AI) or Machine Learning (ML)—often referred to as learning algorithms—is introduced in many different settings aiming to increase decisions efficiency and outcome quality. Learning algorithms are increasingly becoming part of our modes of knowing and engaging in society. They provide solutions for simple and complex problems: they are for instance inside our cars, hospitals, and welfare organizations; they are scheduling transportation, curating media feeds, and providing music recommendations; they are mediating and regulating social interactions as “active, opinionated participants in algorithmic decisions” [1] (p.130). Learning algorithms are thus gradually emerging as epistemic objects [2, 3]: inherently underdetermined, they alter orderings in society and transform
epistemic practices while also being materially defined by epistemic conditions [4–6]. However, these transformative processes are not sufficiently understood. As a recent report of the AI4PeopleEU initiative shows, our interest in building a “good AI society” for “digital well-being” requires in-depth understanding [7, 8]. This is important because, while algorithm-based digital transformation is certainly promising, it is also reinforcing known issues of inequality as well as triggering completely new subtle and less subtle changes in social relations in everyday interaction and adoption and resistance to algorithms [9, 10]. The public debate is indeed highly engaged with the topic, raising concerns related to bias, black-boxing, lack of transparency, privacy, and accountability of intelligent algorithms. For instance, critiques are raised against the automation of clinical judgements, important ethical questions are raised in the use of predictive analytics in the public sector, such as predictive profiling [11] and predictive policing [12] and reports warn against the potential to encode discrimination in automated decisions in predictive governance [13].

The omnipresence of learning algorithms in everyday life requires thus further research. This is particularly critical as these algorithms are becoming increasingly part of public services, and determine how services are delivered and to whom [14–16]. This concern ignites the call for understanding how to have “society-in-the-loop” and embed the “general will” into an “algorithmic social contract” towards the establishment of a societal governance of algorithms [17]. This short paper raises one fundamental aspect of this process, namely the need for understanding how to engage citizens in the societal governance of learning algorithms. This is important to secure and enhance equity, inclusiveness, and democratic processes of deliberation. The Information Systems (IS) field and in particular in the IFIP 8.2 community are well positioned to pay closer attention to the profoundly performative nature of algorithmic arrangements and their implications for society [18]. Already in the 1990s Monteiro and Hanseth [19] observed that we must go beyond the enable/constrain characterization of digital technologies and focus on how they mutually shape life and organizing. Today, IS should take this invitation seriously again and pay attention to the new types of configurations between humans and learning algorithms that have hardly been seen before [20] and reflect on how society can engage with them. We frame this problem in terms of algorithmic literacy [21, 22], to stress the need for IS to contribute fostering citizens’ ability to account for and participate in the shaping of algorithmic arrangements. Algorithmic literacy is not about developing advanced computational skills. Rather, we define it as the ability to engage with learning algorithms through forms of expression, ideas, and behaviors being aware of their role, inquiring about how they were created, how they are fed, and what are their capabilities and limitations.

In the next section we propose a conceptual underpinning for our argument and conclude this short paper by presenting a research agenda for the IS study of algorithmic literacy in society.
Learning Algorithms as Epistemic Cultures

An algorithm is per definition a form of ordering. Technically, it is defined by mathematicians and computer scientists as a sequence of encoded instructions to transform input data into an output [23]. Both IS research and related fields (Science and Technology Studies above all) demonstrated that we cannot conceive of algorithms as decoupled from the material and discursive practices of their creation and use [24, 25]. These works have pointed to the risks associated with forms of technocratic governance which assume that complex societal problems can be treated as technical problems and addressed by technical solutions [26, 27]. This is particularly the case when we consider learning algorithms, which we define as "emergent family of technologies that build on machine learning, computation, and statistical techniques, as well as rely on large data sets to generate responses, classifications, or dynamic predictions that resemble those of a knowledge worker" [28] (p. 6).

Learning algorithms have, as a result, characteristics that differentiate them from the traditional digital artifacts studied in IS. As Schuetz and Venkatesh [29] point out, learning algorithms are unique because they are active agents that act based on an agenda and an understanding of the world that they develop adaptively, that is, they acquire new functionality through training with new data. They are also characterized by functional transparency, because they can learn from and combine many contextual factors without the full awareness of the users and, sometimes, the developers [see also 30]. Users are often not even fully aware of whether they are interacting with a human or an algorithmic agent (see for example the case of chatbots [31]).

While extant research into learning algorithms has primarily focused on their impact for work and in social media [2, 12, 32], we want to shed light on their significance for society at large. In other words, we need to develop and establish a critical perspective on algorithms, aimed at unpacking the adoption, use, and implications of algorithms in society [18, 25, 33, 34], and examining issues such as the causes and consequences of bias in learning algorithms, or their circulation in different organizational settings, domains of practice and market contexts [35–37]. A starting point is to understand algorithms as socio-technical assemblages that are enacted through practice in relation to other computational forms, such as data structures [38] and the work of preparing and interpreting the data [39]. In this view, learning algorithms are not neutral calculative devices taken ‘in use’ but they are performative because they shape epistemic practices through the new practices they enforce: they filter what can be seen, perceived and acted upon, and they create novel categories and thus determine what we can see [2, 40].

Specifically, we take inspiration from the notion of epistemic culture, defined as culture of knowledge production [41], composed of practices that are both discursive and materially mediated [42]. Epistemic cultures refers to “those sets of practices, arrangements and mechanisms bound together by necessity, affinity and historical coincidence which, in a given area of professional expertise, make up how we know what we know” [41] (p. 363). We thus aim to understand the emergence of epistemic cultures with algorithms as a fundamental shift in our society and as “the enfolding of human thought, conduct, organization and expression into the logic of big data and large-scale
computation” [43] (p. 396). Approaching algorithms as part of epistemic cultures allows us to research how algorithms partake in the construction of the machineries of knowledge production and to enhance our understanding of the different ways algorithms are introduced in the public sphere and how this trend challenges our understanding of the nature of society [cf. 20]. More importantly, it allows us to problematize literacy, i.e. what it takes to engage with learning algorithms, who takes part in these processes and how, and who is excluded. An epistemic culture does not ‘just develop’ but it is shaped by the very material and discursive practices it is constituted by. As Zuboff [37] reminds us, if we do not promote citizen engagement with algorithms, only those with the right knowledge and access to financial resources can make decisions.

The initial work in critical algorithm scholarship shows the multifaceted complexities of adopting algorithms in society. The IFIP 8.2 community has taken up the challenge of researching digitalization in different domains, yet it has addressed algorithms as epistemic phenomena in society only to a limited extent. In the IS field, the practices that underlie the establishment and appropriation of algorithms in the public sphere have remained understudied. Here, we introduce a research agenda to address this limit by focusing on algorithmic literacy.

3 Algorithmic Literacy in Society: A Research Agenda

The theme of algorithmic literacy in society has not received much attention in IS yet. Some scholars have called for looking into algorithmic transparency (also referred to as algorithmic accountability); that is, organizations being more public and open about how they use algorithms [44, see also 45]. These contributions have so far focused primarily on organizations and workplace technologies [20]. However, as algorithms are altering and reconfiguring practices of ordering, they change established epistemic practices, reconfiguring imaginaries, valuations, and publics on a much broader scale than single organizations. We believe that IS should take a step forward and embrace a societal perspective that goes beyond communicating to citizens how a given algorithm works but tackles the emergence of epistemic cultures with algorithms in society in practice. The aim of such research should be to enhance citizen engagement with algorithmic forms of knowing in the public sphere by contributing to building algorithmic literacy in society toward more democratic development.

To achieve this goal, we propose an initial research agenda that can be used by IS researchers to expand the knowledge base on the knowledge needs and prerequisites for enhancing algorithmic literacy in society. This knowledge base will supplement existing accounts of algorithms in the public sphere on the empirical, participatory, and policy level by (1) expanding our empirical understanding of how algorithms shape and challenge societal development, (2) generating new ways for citizens as well as researchers to engage with algorithmic cultures, and (3) informing public governance of algorithms.

Our proposed research agenda can be summarized by the following two overarching research questions:
How can we better understand the diversity of adoption, use, and implications of learning algorithms in society? How can citizens engage with epistemic cultures with learning algorithms in ways that foster democratic processes of deliberation?

These research questions are then split into the following recommendations for future research presented in Table 1.

Table 1. Proposed recommendations for future research and corresponding research questions, on the empirical, participatory, and policy level

<table>
<thead>
<tr>
<th>#</th>
<th>Aim</th>
<th>Research questions</th>
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<tbody>
<tr>
<td></td>
<td><strong>Empirical understanding of algorithmic cultures</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>To generate novel research-based knowledge about how algorithmic cultures become part of and can be shaped by society</td>
<td>How can we theorize the emergence of algorithmic cultures?</td>
</tr>
<tr>
<td>2</td>
<td>To develop an interdisciplinary methodology to study the emergence of algorithmic cultures</td>
<td>How can we address algorithmic cultures methodologically?</td>
</tr>
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<td></td>
<td><strong>Elicit citizen participation</strong></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>To generate novel research-based knowledge about algorithmic literacy for citizens’ engagement</td>
<td>How to enhance algorithmic literacy to foster citizens’ ability to engage with algorithmic cultures?</td>
</tr>
<tr>
<td>4</td>
<td>To develop novel approaches to foster algorithmic literacy for democratic societal development</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Inform public governance</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>To generate novel research-based knowledge about the cultural prerequisites for the societal governance of learning algorithms</td>
<td>What approaches can be conducive to citizen engagement in the societal governance of learning algorithms?</td>
</tr>
<tr>
<td>6</td>
<td>To develop awareness and facilitate critical debate to (re)negotiate the use and shaping of learning algorithms</td>
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References


T5

ICT4D and Digital Work
Where ICT4D Meets Data Justice: A study of COVID-19 Tracking in India

Silvia Masiero, University of Oslo
silvima@ifi.uio.no

Soumyo Das, EmLyon Business School
das@em-lyon.com

Abstract. Discourse on data justice during the COVID-19 pandemic has problematised the techno-solutionism resulting in the largely indiscriminate repurposing of technology towards disease surveillance. While studies of smartphone-based COVID-19 trackers are being conducted from a data justice perspective, these are yet to be put into explicit relation with issues, such as conditions of poverty and dependency affecting vulnerable groups, that fall in the traditional remit of ICT4D. In this paper, we study the smartphone-based COVID-19 tracker enforced by the Indian government, Aarogya Setu, from a data justice perspective integrated with a design-reality gaps analysis from the ICT4D field. By doing so, we illuminate three gaps (information, technology, and objectives-values) between the design of Aarogya Setu and the reality lived by economically disadvantaged residents of India, which in turn result into three forms of data injustice towards them. Our empirics illuminate the need for a conjoined study of ICT4D and data justice, contingently highlighting the relations between the two lenses in framing technology in a post-pandemic scenario.

Keywords: ICT4D; data justice; COVID-19; surveillance; socio-economic development; India

1 Introduction

Since the World Health Organisation declared COVID-19 a pandemic on 11 March 2020, strategies aimed at testing, tracing and isolating cases to contain the diffusion of the disease have characterised national responses. With the sudden, pressing need to minimise contagion, responses inspired by partnerships of national governments with large technology companies have entered the scene, with an unprecedented partnership between Apple and Google announced on 10 April 2020 towards the Exposure Notification system (The Guardian, 2020). In a scenario in which a large majority of COVID-19 apps are “de facto public-private partnerships between a government, Apple, and Google”, issues of data justice – conceptualised with Taylor (2017) as “fairness in the way in which people are made visible, represented and treated as a result of their production of data” have inevitably emerged, leading to studies of COVID-19 tracking apps from a data justice perspective. Paradigmatically, a recent book by Taylor et al (2020) collects experiences from 33 countries, narrating intersections between disease tracking and data injustices ranging from privacy violations to utter abuse of state power (cf. Bogacs, 2020; Johns, 2020; Mwesigwa, 2020; Oduro-Marfo, 2020).
Against this backdrop, development studies research has highlighted the burdens caused by COVID-19 in the Global South, illuminating the exacerbation of economic, social and redistributional effects of the pandemic amidst health infrastructure crises (Drèze, 2020; Khera & Somanchi, 2020; Oldekop et al., 2020). In particular, researchers of information and communication technologies for development (ICT4D) have interrogated the opportunities and constraints of technology usage in the pandemic, highlighting its affordances in strengthening healthcare systems (cf. Nicholson, 2020) and constraints lived by vulnerable actors such as gig workers (Krishna, 2020). As a post-pandemic scenario is being delineated at the supranational level, what is lacking is an intersection of the data justice perspective – highlighting injustices associated to technology usage – with issues of poverty, vulnerability and skewed redistribution traditionally studied in ICT4D research.

This work contributes the view that it is crucial to combine these two perspectives, to contextualise data injustices in forms of pre-existing inequality and weakness such as those observed in the Global South. To achieve such a combination, we carry out a study of Aarogya Setu, the COVID-19 tracking app enforced by the Indian government, from an ICT4D lens corroborated with a data justice perspective. The starting point of our analysis is the empirically elicited view, gathered by the India-based first author during the country’s lockdown, of general mistrust and suspicion towards the app from the general public. We draw on a dataset on 68 secondary sources, including press releases, government statements and blog posts, to ask: how does Aarogya Setu meet the needs of economically vulnerable communities during COVID-19 in India?

2 Analysis: From Design-Reality Gaps to Data Injustices

Our data collection revealed multiple discrepancies between conditions of existence of poor people during COVID-19 and the design prerogatives of the Aarogya Setu app. As a result, we found the conceptual lens of design-reality gaps (Heeks, 2002) to be appropriate to answer our question. Heeks’ conceptual instrument, summarised through the ITPOSMO (information, technology, process, objectives and values, staff and skills; management systems and structures, other) acronym, allows us to identify three gaps between the design of Aarogya Setu and the needs of economically disadvantaged groups in India, namely:

1) **Information** – at the heart of the Aarogya Setu app is the performative value associated to what a low-risk, high-risk, positive, or negative status implies. With the app shifting from voluntary to mandatory in most Indian states in May 2020, movement for vulnerable groups – especially the large groups of migrant workers stranded by lockdown on 23 March 2020 – has been subjected to downloading the app, running it and displaying a status that allows travel. The burden of such a requirement shows especially on stranded migrant workers, whose mobility is now subordinated to information provision and technology ownership (see point below). In the scenery devised by Aarogya Setu, the same piece of information has different performative values across the economic and societal spectrum, putting a
stranded migrant worker who owns no smartphone into dire conditions than the smartphone-owning, economically well-off person they work for.

2) Technology – according to research on COVID-19 tracking in Europe, smartphone-based COVID-19 tracking apps require activation from about 80% of the smartphone-owning population as a precondition for effectiveness (Edwards, 2020). However, the very concept of a “smartphone-owning” population being used as representative is problematic in India, where statistics assess the smartphone-owning population at 36.7% and this is concentrated in the urban areas (ITU, 2020). With the inherent all-population character of the pandemic, assuming smartphone ownership as a precondition for tracking erases a huge share of the Indian population, neglecting the structural conditions of economic vulnerability that determine (lack of) smartphone ownership.

3) Objectives-values – technology embodies precise intentionalities (Lyytinen, 1988) and COVID-19 trackers are no exception, with the inbuilt purpose of protecting people from diffusion of the disease. When such technologies are plugged into extant conditions of vulnerability, they enter situations in which workers living off a daily wage are put in peril by the lockdown-induced halt of their activities, or forced to work under unsafe conditions due to the precarious nature of their work (Krishna, 2020). The equalising purpose of Aarogya Setu sees all individuals as “having to download the app”, erasing the difficulties lived by daily-wage workers as compared to upper class households. A third gap emerges, as a result, between the assumption of equality implicit in Aarogya Setu and the material inequality of those for whom inability to prove COVID-19 negative status means inability to gain basic livelihoods.

Summarised according to Heeks’ ITPOSMO tool, three gaps around information, technology and objectives & values emerge here between Aarogya Setu and the lives of economically vulnerable groups in India. We argue, at this point, that a data justice perspective (Taylor, 2017; Heeks and Renken, 2018) is crucial to illustrating what these gaps mean in terms of how people are visualised and treated based on the data they produce. Specifically, we argue that each design-reality gap illuminated here corresponds to a different form of data injustice for India’s economically poor:

1) The fact that information (in this case, proof of a negative status) is crucial for those for whom mobility means ability to gain livelihoods (e.g. India’s internal migrants) means that inability to prove such a status means a severely enhanced form of vulnerability, which non-neutrally hits groups at risk. This leads to a first, information-generated form of data injustice;

2) A technology designed on the assumption that 80% of the population will download it erases the context of a population whose rate of smartphone ownership is a lot lower, hence factually deleting India (and many countries in the Global South) from the picture;
3) A technology designed with the objective of “equalising” erases pre-existing inequalities, which make the consequences of not having the app a lot direr for India’s poor, migrant and informal workers. The assumption of equality deletes their vulnerability, resulting in a third form of data injustice.

<table>
<thead>
<tr>
<th>ITPOSMO Dimension</th>
<th>Design-Reality Gap</th>
<th>Data Injustice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information</strong></td>
<td>Design – based on equality of all Indian residents downloading app; reality – much direr consequences of a positive or at-risk status for economically vulnerable people (esp. migrants)</td>
<td>Vulnerable groups subjected to a type of tracking that impairs their ability to generate livelihoods in a situation of crisis</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>Design – based on the assumption that “everyone” can download the app; reality – the majority of the Indian population does not own a smartphone</td>
<td>Vulnerable groups erased by an app that does not account for the consequences of their vulnerability (i.e. not owning the device needed to download the app)</td>
</tr>
<tr>
<td><strong>Objectives-Values</strong></td>
<td>Design – based on the intentionality to minimise contagion for “everyone”; reality – poor, migrant and informal workers at greater risk of consequences in case of suspicious outcomes or for not downloading the app (if they own a device at all)</td>
<td>An equalising objective that does not take into account the pre-existing, inequal economy that the app has entered</td>
</tr>
</tbody>
</table>

Table 1: Aarogya Setu – design-reality gaps and data injustices

Table 1 summarises the design-reality gaps found in Aarogya Setu, paralleling them with forms of data injustice that each gap is related to. As a result, we illuminate the
conjoining of an ICT4D perspective with the data injustice underlying the systematic issues that ICT4D points at.

3 Contribution: Why ICT4D Should Meet Data Justice

By tracing three gaps between the design of Aarogya Setu and the reality lived by vulnerable communities in India, this work illuminates the need for a conjoined study of ICT4D and data justice, where issues captured from an ICT4D lens (such as that of design-reality gaps) are immersed in a data justice context. In the case studies here, an app with “equalising” principles fails to account for extant vulnerabilities in the Indian context, systematically erasing the poor and vulnerable from a picture assuming universal ownership of smartphones and consequences of information sharing. The first contribution of our paper is therefore that of bringing to light the need of such an analysis, where ICT4D issues can be traced to data injustices and back.

Secondly, we suggest that our conjoined perspective will be of practical help understanding technology development in the post-pandemic scenario. With its 33 country cases of technology-based COVID-19 response, the book edited by Taylor et al. (2020) illuminates multiple issues of data injustice to be cautioned for, contemplating Global South cases in which such issues are heightened (cf. Duarte, 2020; Oduro-Marfo, 2020). As we propose an ICT4D-cum-data-justice perspective on such issues, we believe our framework may shed light on the blind spots of intersectional repercussions such as those suffered by vulnerable groups in the Global South, explicitly illuminating the relation between failure to meet local realities and the active perpetration of injustice on them.

References


ICT for Development: Comparison between Developing and Developed Countries

Shubha Krishnamurthy\textsuperscript{1} and Rahul De'\textsuperscript{2}

\textsuperscript{1}Indian Institute of Management Bangalore, Bangalore, India
\textsuperscript{2} Information Systems Area, Indian Institute of Management Bangalore, Bangalore, India
shubha19@iimb.ac.in

Abstract. ICT4D implementations in developed countries are understudied in prior research, limiting our understanding of the factors influencing ICT4D implementations in developed countries and how they differ from developing countries. A comparison of the ICT4D implementations in these countries can help improve the success rate of these projects. We use bibliographic analysis to examine four ICT4D, and mainstream IS journals during 2009-2019 to capture the extent of ICT4D studies in the developed countries. We find that less than 10\% of articles focus on ICT4D implementations in the developed countries, with mostly quantitative and positivist studies. ICT4D studies in a developed country were conducted by only researchers from these countries, while many studies in developing countries did not have researchers from a developing country. Next, the paper identifies and compares the factors influencing ICT implementations in developed and developing countries along social and institutional, technological, and management dimensions.

Keywords: ICT for Development. Developing country. Developed country. Implementation. Comparison.

1 Introduction

Information and Communication Technology (ICT) is beneficial across public and private sectors, urban and rural areas, and across different domains like healthcare, education [19]. Success rates of ICT applications in these different sectors and areas have been dismal [3], necessitating ICT implementation studies. ICT for Development (ICT4D) research has mostly focused on developing countries to improve social and economic well-being using technology [2]. Marginalized populations in the developed countries share many similar characteristics like low income, limited access to education, technology, healthcare with developing countries [2,8,19]. ICT4D implementations in the developed countries for marginalized populations are understudied in the prior research, limiting our understanding of what factors influence such projects in the developed countries. A comparison of the ICT4D implementations in developing countries and developed countries can provide a view of similarities and differences along social, technical, and managerial aspects. Insights from the compar-
ison can facilitate ICT4D implementors to be conscious of the enablers and inhibitors of implementation, improving the success rates of ICT4D implementations in the developed and the developing countries. This may help us understand and improve the success rate of ICT4D implementations in developing countries, which is rather dismal [2]. The paper addresses the questions:

To what extent have prior studies examined ICT4D implementations in developed countries?

What factors inhibit or facilitate ICT4D projects in developing and developed countries?

We examine four journals to capture the extent of ICT4D studies in developed countries – (1) Information Technology for Development (ITfD), (2) Information Technology and International Development (ITID), (3) MIS Quarterly (MISQ), and (4) Information Systems Research (ISR) for the recent period 2009 - 2019. ITID and ITfD, top-ranked ICT4D journals [11], are chosen since they provide adequate coverage of ICT4D articles on many ICT4D topics [6]. We chose MISQ and ISR, top-ranked mainstream IS journals since they focus on studies in developed countries. We use the GDP per capita measure to classify countries into developed and developing countries.

2 Methodology

We adopt a bibliographic analysis to examine and classify ICT4D articles in the journals listed above from 2009 – 2019 using an approach from prior studies [21, 6]. We included empirical research articles and excluded editorials, book reviews, opinions, non-empirical articles for the classification. ITfD and ITID publish ICT4D research [11]. We screened the title, abstract, keywords of the articles to find the country where the research was done and classified it into a developed or developing country. The full text of the article was read if the country could not be determined from these sections. We added MISQ and ISR since they publish research in developed countries. We classified papers as ICT4D articles in MISQ and ISR by reading the article's abstract, title, and keywords to find if they address ICT4D topics like healthcare, e-health, e-government, open-source software (OSS), digital divide, and studies of marginalized sections. The country of research was found following a similar approach as ITfD and ITID articles.

E-government and ICT in healthcare implementations constitute a significant part of ICT4D research. An in-depth review is conducted for selected ICT4D articles in e-government and ICT in healthcare to determine the factors that influence ICT4D implementations in the developed and developing countries and compare these factors.
3 Preliminary Findings

3.1 Journal Review Summary.

Less than 10% of the articles surveyed researched ICT4D topics in developed countries. A total of 1780 articles were scanned from the journals mentioned above, out of which 138 articles were ICT4D studies in developed countries (see Table 1), providing support to our claim that there are limited ICT4D studies in the developed countries and for their marginalized sections. The shortage of such studies limits our understanding of the factors that influence ICT4D implementations in developed countries.

Many ICT4D studies in developed countries used a positivist approach, and limited studies adopted interpretivist and critical approaches. The studies lacked the explanation of the factors that influenced the ICT implementation in the developed countries. Qualitative, interpretive research is preferred to positivist studies to explore the indigenous subjects and build IS-relevant research frameworks for them [14]. ITD and ITfD had relatively more non-positivist ICT4D studies than MISQ and ISR.

By examining the authors and their university affiliations for the ICT4D articles in these journals, we find that the research in developed nations was conducted by researchers from developed nations; in contrast, research in developing nations was not driven by researchers from a developing country. Theories and the research findings can be consciously or unconsciously influenced by the researcher’s culture and background [5].

The next sections provide an overview of ICT4D articles in each of the journals.

<table>
<thead>
<tr>
<th>Journal</th>
<th>Total articles reviewed during 2009-2019</th>
<th>ICT4D articles in developed countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITID</td>
<td>267</td>
<td>9</td>
</tr>
<tr>
<td>ITfD</td>
<td>317</td>
<td>14</td>
</tr>
<tr>
<td>MISQ</td>
<td>595</td>
<td>66</td>
</tr>
<tr>
<td>ISR</td>
<td>601</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1780</strong></td>
<td><strong>138</strong></td>
</tr>
</tbody>
</table>

Information Technologies and International Development (ITID).
Nine out of 267 research articles in the ITID addressed ICT4D topics in developed countries between 2009 and 2019, as listed in Table 2. These articles covered differ-
ent ICT4D topics like e-Government, employability and ICT skills, ICT in agriculture, mobile phone adoption by the marginalized communities in developed countries such as the U.K., Norway, Australia, the U.S., Singapore, E.U. countries.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Country of Study</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feith et al.</td>
<td>2018</td>
<td>Maintenance Affordances and Structural Inequalities: Mobile Phone Use by Low-income Women in the United Kingdom.</td>
<td>UK</td>
<td>Mobile phone adoption</td>
</tr>
<tr>
<td>Mustaq et al.</td>
<td>2017</td>
<td>Can Digital Discussion Support Tools Provide Cost-effective Options for Agricultural Extension Services?</td>
<td>Australia</td>
<td>ICT for Agriculture</td>
</tr>
<tr>
<td>Chib et al.</td>
<td>2013</td>
<td>International Migrant Workers’ Use of Mobile Phones to Seek Social Support in Singapore</td>
<td>Singapore</td>
<td>Mobile phones</td>
</tr>
<tr>
<td>McLeffan et al.</td>
<td>2011</td>
<td>Knowledge Discovery Empowering Australian Indigenous Communities.</td>
<td>Australia</td>
<td>ICT for culture enhancement</td>
</tr>
<tr>
<td>Kluzer et al.</td>
<td>2009</td>
<td>E-Inclusion Policies and Initiatives In Support of Employability of Migrants and Ethnic Minorities in Europe</td>
<td>EU</td>
<td>E-Government</td>
</tr>
</tbody>
</table>

**Information Technology for Development (ITfD).**

Fourteen out of 317 articles in the ITfD addressed ICT4D topics between 2009 and 2019, listed in Table 3. Eleven out of fourteen articles were comparative studies between developing and developed countries on economic and ICT parameters. Three articles studied the factors influencing ICT4D implementations in developed countries for e-government and ICT for disabled implementations.
Table 3. Studies in the developed countries in ITfD between 2008 and 2018

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Country</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee, S. O. et al.</td>
<td>2017</td>
<td>ICT diffusion as a determinant of human progress</td>
<td>Developed &amp; Developing countries</td>
<td>Human progress</td>
</tr>
<tr>
<td>Yang, Z. et al.</td>
<td>2017</td>
<td>Employees' collaborative use of green information systems for corporate sustainability: motivation, effort and performance</td>
<td>US and China</td>
<td>Green IS</td>
</tr>
<tr>
<td>Hameyerd, A. et al.</td>
<td>2017</td>
<td>Can the internet promote democracy? A cross-country study based on dynamic panel data models.</td>
<td>Developed &amp; Developing countries</td>
<td>ICT for democracy</td>
</tr>
<tr>
<td>Alderene M.</td>
<td>2017</td>
<td>Examining the ICT access effect on socioeconomic development: the moderating role of ICT use and skills.</td>
<td>Developed &amp; Developing countries</td>
<td>ICT for development</td>
</tr>
<tr>
<td>Reichek, M. et al.</td>
<td>2017</td>
<td>The impact of ICT on labor productivity in the EU.</td>
<td>Developed &amp; transition economies</td>
<td>ICT and Productivity</td>
</tr>
<tr>
<td>Enorie, A. et al.</td>
<td>2017</td>
<td>Governing nonprofit platform ecosystems – an information platform for refugees.</td>
<td>EU</td>
<td>E-Governance</td>
</tr>
<tr>
<td>Garcia-Murillo M</td>
<td>2013</td>
<td>Does a government web presence reduce perceptions of corruption?</td>
<td>Developed &amp; Developing countries</td>
<td>E-Government</td>
</tr>
<tr>
<td>Ratcliffe K et al.</td>
<td>2012</td>
<td>Navigating the currents of change: technology, inclusion, and access for people with disabilities in the Pacific.</td>
<td>US</td>
<td>ICT for disabled</td>
</tr>
<tr>
<td>Negash S</td>
<td>2010</td>
<td>Learning assessment of a videoconference-based training: lessons from medical training between USA and Ethiopia.</td>
<td>Low income, high income countries</td>
<td>Healthcare, education</td>
</tr>
</tbody>
</table>

MIS Quarterly (MISQ).

66 ICT4D articles were found among the 595 research articles published in the MISQ from 2009 – 2019, listed in Appendix 1. ICT for healthcare and e-government related articles constituted about 50% of these 67 articles. The remaining articles addressed ICT4D topics related to banking, open-source software, cybercrime, sustainability. The country of research in these ICT4D articles included developed countries such as the USA, the UK, Sweden, Singapore.

Information Systems Research (ISR).

49 ICT4D articles were found in ISR out of a total of 601 research articles that were published in 2009 – 2019, listed in Appendix 2. More than 50% of these forty-nine ICT4D articles discussed ICT for healthcare and e-government topics. Digital divide, digital access, technology use, open-source software were the other topics studied in these ICT4D articles.
3.2 Factors Influencing ICT implementations in Developed and Developing Countries

An in-depth review of selected articles on e-government and ICT for healthcare implementations is done to identify and compare the factors that influence developed and developed countries’ implementations.

Social and Institutional Factors.

User resistance.
User resistance is a common factor in ICT implementations in both developed and developing countries [15]. Reasons for user resistance are lack of ICT awareness and the benefits of ICT initiatives, perceived loss of power, and control in e-government implementations [9]. Certain sections of the population, like senior citizens, resist ICT initiatives in developed countries since they are concerned about the higher cost for broadband connections to access government portals, partly addressed by the well-built technology infrastructure like public kiosks in the developed countries.

Language barrier.
English not being the native language of developing countries, ICT systems with no local language support are significant barriers for ICT4D implementations. ICT4D implementation in the developing countries, mostly funded by the West [2, 20], have systems built-in English [13]. Lack of funds limits local language support in the ICT4D implementation in developing countries. The developed nations do not face the language barrier as much.

ICT Literacy.
Developed countries have a higher ICT literacy rate than developing countries that aid ICT implementations. Some sections in developed countries, like migrants, elderly citizens, may have lower ICT-literacy levels, which are addressed via ICT-literacy and awareness programs. In contrast, ICT-literacy in developing countries is less, which impacts the ICT4D implementations. For example, Sri Lanka has 10% ICT literacy [22].

Fit to social and cultural context.
Institutions like the World Bank, IMF that are influenced by Western countries are principal sponsors of many ICT implementations in developing countries. These sponsors have a limited view of the social, cultural, and institutional contexts of developing countries. Lack of fit to the context inhibits ICT implementation in developing countries

Institutional support.
Developed countries provide an impetus by offering incentives for ICT initiatives like e-health, telemedicine systems [1]. The Health Information Technology for Economic and Clinical Health (HITECH) in the U.S. promotes e-health initiatives by giving
providers monetary incentives [18]. Developing countries lack such institutional support for better ICT implementations.

### Table 4. Social, political, and institutional factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social, Political and Institutional Factors</td>
<td>Elderly population resist changes, addressed via ICT awareness program; Higher costs for broadband connections alleviated via public kiosks, telecenters</td>
<td>User resist fearing loss of power and control, related to low ICT literacy</td>
</tr>
<tr>
<td>Language Barriers</td>
<td>Less of a barrier, ICT applications use English as primary language which most developed countries are aware; Enough funds to apply localization changes in case English is not the main language in the country</td>
<td>English is the primary language for most ICT applications which people are unaware; Funds for localization to the native language usually not available</td>
</tr>
<tr>
<td>ICT Literacy levels</td>
<td>ICT Literacy levels are higher which leads to more use and adoption of ICT systems; A small percent of the population may have lower ICT literacy levels, addressed via awareness programs</td>
<td>They have lower ICT literacy rates leading to less use and adoption of ICT systems; Need large funds and resources to increase the ICT literacy levels</td>
</tr>
<tr>
<td>Fit to Social and cultural context</td>
<td>ICT applications are usually designed in the developed countries and fit the local social and culture context</td>
<td>ICT applications are designed for the developed countries, and lack fit with the social, cultural and institutional context; Planning and design of ICT initiatives need to consider the fit before implementation</td>
</tr>
</tbody>
</table>

### Technological Factors.

**Technical infrastructure.**

The developed countries have well-established technological infrastructures like Telecom network, Internet, telecenters, and public terminals for free Internet access. ICT implementations build on the existing well-functioning infrastructure [22]. In contrast, most developing countries have poor technical infrastructure. ICT implementations that rely on this infrastructure suffer due to non-functioning networks, impacting access to rural areas and marginalized communities.

**Data privacy and security concerns.**

Concerns for technology vulnerabilities like data privacy and abuse are higher in developed countries than developing countries, hindering ICT4D implementation [22]. Concerns are attributed to higher ICT literacy rates in developed countries. The developed countries support more robust data protection and privacy laws to protect users’ data from unintended use [18].
Management Factors.

**Funding for ICT implementation.**
Many ICT4D initiatives in developing countries rely on external sponsors' funding, mostly from developed countries [2,20]. Misalignment of the interests of the sponsors and the developing countries can inhibit ICT implementation. In comparison, most ICT implementations in developed countries are self-funded [22], which can positively influence the ICT4D implementations.

**Strategy and leadership support.**
Lack of coordination between the different departments in the government inhibits the implementation of e-government projects in the developing countries, leading to a longer time for the completion of the ICT implementations. Developed countries have a more explicit strategy and well laid out plan for the timely execution of e-government projects [22].

Tables 4 and 5 provide a summary of the factors influencing ICT4D implementations in developed and developing countries.

### Table 5. Technological and Management factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technological factors</strong></td>
<td><strong>Technical infrastructure</strong></td>
<td><strong>Data privacy and security concerns</strong></td>
</tr>
<tr>
<td></td>
<td>➢ Well functional IT and network infrastructure available on which ICT applications are built</td>
<td>➢ One of the major concerns for ICT adoption and use</td>
</tr>
<tr>
<td></td>
<td>➢ Well functional public terminals for Internet access</td>
<td>➢ Not much of a concern for ICT adoption and use</td>
</tr>
<tr>
<td><strong>Management Issues</strong></td>
<td><strong>Funding of ICT initiatives</strong></td>
<td><strong>Strategy and guidance from leadership</strong></td>
</tr>
<tr>
<td></td>
<td>➢ Funded by the self usually, not dependent on external sponsors</td>
<td>➢ Well laid strategy and planning to complete the implementations and address issues if any</td>
</tr>
<tr>
<td></td>
<td>➢ Funded usually by external sponsor such as WB, IMF etc</td>
<td>➢ Lacks strategy and planning, mainly due to less ICT awareness and resistance</td>
</tr>
<tr>
<td></td>
<td>➢ Takes much longer time for implementation and adoption</td>
<td>➢ Takes much longer time for implementation and adoption</td>
</tr>
</tbody>
</table>

### 3.3 Summary of the Preliminary Findings

A review of articles from the four journals finds that less than 10% of studies focus on ICT4D in developed countries. These studies were mostly positivist and quantitative, with a limited explanation of factors influencing the implementations. Another key finding was the limited presence of researchers from developing country background in the ICT4D studies in developing countries. An in-depth review of articles in the e-government and ICT for healthcare implementations in the developed and developing countries enabled us to find and compare the implementations along the dimensions of social and institutional factors, technological factors, and management factors.

The study has several limitations. The researcher’s background is derived from the university affiliation of the author. The author might have moved from one country to another, which is not considered. The study can include articles from other ICT4D
topics like digital-divide, education for in-depth analysis to gain additional insights. Future work can extend the research to theories used in ICT4D studies and examine what theories suitably analyze ICT4D implementations in the developed and developing countries.

4 Appendix 1


5 Appendix 2


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Differentiators of Decent Work in the Gig Economy: Evidence from South Africa

Richard Heeks1, Mark Graham2, Kelle Howson2, Paul Mungai3 & Jean-Paul Van Belle3

1 Centre for Digital Development, University of Manchester, UK
2 Oxford Internet Institute, University of Oxford, UK
3 Centre for IT and National Development in Africa, University of Cape Town, South Africa

1 Introduction

Among its various targets, Sustainable Development Goal 8 requires countries by 2030 to achieve “decent work for all” alongside “technological upgrading and innovation”. At the intersection of these two targets, a key issue has been whether or not technological innovations are helping or hampering the creation of decent work.

This issue is particularly being investigated in relation to platform-based gig work: short-term tasks mediated by digital platforms such as Uber or Upwork. Evidence to date is a contradictory mix; some shows gig work meeting certain decent work standards; some shows it falling well short of such standards.

In this paper, our intention is to investigate what differentiates gig work’s adherence to vs. shortfall from decent work standards. In order to provide a consistent context, we study this in one country – South Africa – and look at three proposed dimensions of differentiation: sector, ownership, and institutional logics of platforms. Findings are based on two years’-worth of field data gathered from all of South Africa’s leading gig economy platforms.

2 Literature Review

SDG8 requires the creation of more and better jobs across the world, yet simultaneously advocates for the technological innovations that – as part of the “future of work” debate – are seen to threaten both quantity and quality of employment (ILO 2019, World Bank 2019). There have been particular concerns around growth of the digital platform-based gig economy; estimated to employ at least 50 million people worldwide with predictions for growth rates to accelerate in response to the Covid pandemic and its aftermath (Lawrence 2020, Scarfe 2020).

The evidence base on gig work has been expanding in recent years. As a generalisation, gig work tends to fall short of decent work standards because almost all gig workers are not recognised as employees, and thus fall outside legislative protections accorded to employees in most jurisdictions. However, within this general picture there is variation (Graham et al 2017, Heeks 2017, Prassl 2018, ILO 2020). Workers are
sometimes reported to have reasonable incomes and working conditions with clear contracts and lines of management communication. Conversely, workers are sometimes reported to earn less than minimum wage, work very long hours at significant personal risk and with opaque management.

Here, we put forward three propositions that might explain differences in the “decency” of gig work:

- Decency of gig work is differentiated by platform sector; for example with evidence comparing taxi driving with delivery driving, that pay rates are lower and accident rates higher in the latter (ILO 2020).
- Decency of gig work is differentiated by platform ownership; for example with some evidence of particular decent work issues in relation to foreign-owned multinational enterprises (ILO 2015a, ILO 2015b).
- Decency of gig work is differentiated by platform logic; for example with evidence that organisational culture is a differentiator of decent work outcomes (Haiming & Yan 2020) and that platform culture may be understood in terms of institutional logics (Frenken et al 2020).

In order to enable a systematic comparison, we used a structured decent work framework for the gig economy; the five principles of the Fairwork programme – fair pay, conditions, contracts, management and representation.

3 Methods

Using the consistent context of a single country – South Africa – we undertook interviews and other data-gathering covering 17 platforms across a two-year period involving 144 worker interviews and interviews with platform managers. These were based around the Fairwork framework. Key parameters of the context include recency of gig economy growth; high levels of inequality; and significant organisation of gig work along lines of gender, race and migration.

4 Findings

- Differentiation by sector: professional-sector platforms (covering both digital professionals (web designers, programmers, etc) and domestic professionals (plumbers, electricians, etc)) in general deliver higher decent work standards than other sectors (ride-hailing, delivery services, domestic cleaners). This likely derives from the differing labour market conditions including supply-demand balance within these sectors.
- Differentiation by ownership: there were no clear differences in decency of gig work comparing multinational- and local-owned platforms. However, the evidence base was limited with only four foreign-owned multinationals of the 17 platforms, and with three of those having local subsidiaries, thus reducing potential foreign vs. local differences.
- Differentiation by logics: within three of the sectors there are instances of differentiation in which one or two platforms provide work that is significantly more
decent than competitors. While there may be other factors involved, there is evidence of a differentiation of institutional logics. All platforms demonstrate commercial logic but higher-scoring platforms also demonstrate a degree of welfare logic in their organisational culture and practices. We caveat a potential for circularity of argument here, however, since a key indicator of welfare logic is provision of decent work conditions for workers.

5 Discussion and Conclusions

Within an incremental addition of new evidence in general about decent work and the gig economy, we here provide a systematic means for identifying and presenting evidence of variation in decent work. This shows significant variation: from platforms with no evidence of meeting any decent work standards to platforms that met many (though not all) of the decent work standards of the Fairwork framework. Alongside this, the main contribution here is a first attempt to understand this exposed variation in decent work across the gig economy, with sectoral (labour market conditions) and organisational (organisational logics / culture) factors shown to play a role.

This variation, particularly between sectors, may reinforce inequalities given professional sector workers enjoy more-decent work, while migrant- and women-dominated sectors in general enjoy less-decent work. Practical implications would include finding ways via ethical consumption or regulatory support to reward platforms delivering higher standards and to encourage change in those platforms performing poorly. This may also suggest a role for any regulatory intervention to be differentiated by sector.

Future research can apply this approach to include additional sectors (e.g. cloud-work) and other countries; and look for other differentiators that may emerge from a wider dataset.

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In/Formalisation of Employment and the Gig Economy in the Global South

Richard Heeks1, Kelle Howson2, Paul Mungai3, Mounika Neerukonda1, Pradyumna Taduri4, Funda Ustek-Spilda2, Mark Graham2, Srujana Katta2, Balaji Parthasarathy4, Janaki Srinivasan4 & Jean-Paul Van Belle3

1 Centre for Digital Development, University of Manchester, UK
2 Oxford Internet Institute, University of Oxford, UK
3 Centre for IT and National Development in Africa, University of Cape Town, South Africa
4 International Institute of Information Technology Bangalore, India

1 Introduction

There are widespread concerns that growth of the gig economy is leading to an informalisation of employment; an informalisation that erodes the hard-won gains of formalisation during the 19th and 20th centuries, and which will serve to exacerbate social inequality. Notwithstanding the interest in this topic, there has been relatively little direct research; particularly in the global South and particularly using a systematic framework for analysis. It is the intent of this paper to fill this knowledge gap, addressing two research questions:
- RQ1: Does gig work fit more with the profile of formal or informal employment?
- RQ2: Is growth of gig work in the global South leading to formalisation or informalisation of employment for workers?

2 Literature Review

From the Industrial Revolution onwards and throughout much of the twentieth century, the typical response to poor pay and conditions of workers has been a formalisation – particularly regulation – of employment, leading to demonstrable improvements that, for example, have served to reduce social inequalities. There are now significant concerns that growth of the gig economy may be putting this process into reverse, with the gig economy informalising work and thereby engendering poor pay and conditions for workers (Aloisi 2015, De Stefano 2015). This, in turn, may increase social inequalities and reverse the progress of history to the extent that some speak of a neo-feudal age (Kotkin 2020, Krzywdzinski & Gerber 2020).

Such concerns and general discourse have particularly related to the global North where, albeit problematically, formal employment is seen as the appropriate comparator. Views from the global South have been less-prevalent. They have sometimes identified the gig economy with some level of formalisation of employment; particu-
larly given that informal employment is the dominant mode of work (D’Cruz & Noronha 2016, Ford & Honan 2017). Even here, though, the dangers of gig-related informalisation are seen to remain (Randolph et al 2019).

Despite the widespread interest in this topic and the valuable contributions of work to date, we identify some lacunae in the current research base. Direct evidence on the topic has been somewhat limited, particularly from the global South. There appears to have been little systematic consideration of the topic, such as framework-based analysis. And the trajectories of individual workers are missing; something needed if we are to move beyond static categorisations to a dynamic understanding of trends. Hence, the aim and research questions of the current research reported here.

2.1 Conceptual Framework

The analytical framework used here derives from five “Fairwork” principles: core principles of decent work developed specifically to analyse gig work (Graham et al 2020). For each of these five principles, a continuum is developed from formal to informal employment, which can then be used to calibrate gig work:

<table>
<thead>
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<th>Formal . . .</th>
<th>. . . Principle . . .</th>
<th>. . . Informal</th>
</tr>
</thead>
<tbody>
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<td>Regular salary, reasonable pay level</td>
<td>Pay</td>
<td>Irregular, low paid</td>
</tr>
<tr>
<td>Formal training and protection</td>
<td>Conditions (health &amp; safety)</td>
<td>No training or protection</td>
</tr>
<tr>
<td>Formal and employee status</td>
<td>Contracts</td>
<td>None</td>
</tr>
<tr>
<td>Formal processes</td>
<td>Management</td>
<td>No formal processes</td>
</tr>
<tr>
<td>Unionised</td>
<td>Representation</td>
<td>None</td>
</tr>
</tbody>
</table>

3 Methods

The evidence base for the findings presented here comes from data gathered over a two-year period with the 31 main gig economy platforms operating in India and South Africa. Interviews were undertaken with c.200 workers and with a number of platform managers.

4 Findings: RQ1

- **Pay**: pay levels are generally above minimum wage after costs but there is an uncertainty and volatility of pay not seen in formal employment. Differentiation can be seen; for example with pay being higher for professional-sector platforms and generally much worse for delivery platforms.
- **Conditions**: there is a very mixed picture with some platforms (particularly those operating in professional sectors) providing training and protections for workers but many providing nothing.
- **Contracts**: no formal employment contracts were found in any of the platforms and, for the majority of platforms, even the terms and conditions offered to workers were not understood or accessible.

- **Management**: within a very mixed picture, the modal pattern is a reasonable level of communications between supervisory staff and workers but a failure to take action to address issues such as discrimination and inequality. While professional-sector platforms tend to be more formalised in their approach, a number of platforms especially in delivery and ride-hailing sectors do not have documented, transparent management processes.

- **Representation**: there is an almost-universal lack of formal recognition of unions. A few platforms – particularly in the professional sector – provide some channel for collective voice of workers but the greatest number of platforms do not even provide that.

5 Findings: RQ2

Tracing the livelihood trajectories of gig workers presents challenges. However, their prior employment falls into three main categories: formal employment; self-employment; similar employment (i.e. with another platform). There is thus little evidence that platforms are associated with a formalisation of work for individuals; i.e. with a progression from informal employment to slightly-more-formal platform employment. If anything, the trajectory is the reverse with at least some workers swapping more-formal for less-formal employment in moving into the gig economy.

Workers seem willing to sacrifice formal employment protections for what they perceive to be higher income and greater flexibility/autonomy. For many, though, even this promise is not fully realised: incomes reduce over time as platforms seek to recoup costs and generate profits, as worker supply increases, or as costs of work increase. Behind the façade of autonomy, worker schedules are driven by the demands of platforms, their algorithms and their customers.

Relatively few gig workers were previously unemployed, so the dominant pattern is a shift in the profile of employment rather than direct entry of new workers into the gig economy. Pattern analysis must also try to account for platforms’ creating new jobs as opposed to just substituting for equivalent non-platform employment. Job creation is likely for deliveries; less so for domestic, professional and ride-hailing sectors (though these will experience some job creation through induced demand).

6 Discussion and Conclusions

There is significant variation in the level of informality of gig work; for example with variation by sector, which could be explained by issues of worker power, role and dependence. However, this first systematic analysis of employment in/formality in the global South evidences a modal picture of gig work adhering more to norms of informal rather than formal employment.
The so-called “independent contractor” status of gig workers both reflects and reinforces this picture. Platforms claim that their approach respects, and is necessary given, the preferred contractual status of workers and the flexibility and autonomy this offers. Such claims, though, are hard to sustain. Not merely that workers lack flexibility and autonomy in practice but also that a few platforms – while still following independent contractor status – are found to deliver pay and conditions more akin to formal employment (something a broader range of platforms have chosen to do in response to Covid).

There is little support for the argument that relative informality of gig work in the global South matters less owing to the great predominance of informal employment. While, again, there is variation in trajectory of workers into gig work, the majority are seeing their employment informalised more than formalised.

Recommendations from this include support for government intervention to increase the formal regulation of gig work and protection of gig workers; and for more market-oriented interventions to support platforms adhering more closely to formal employment norms and to encourage change among those adhering more closely to informal employment norms.

References


Incorporating a human rights perspective into Health Information Systems development in Low and Middle Income Countries

Submitted to IDRC, Canada, 31 July, 2019

Sundeep Sahay$^{1,2}$, Niveen ME Abu-Rmeileh$^3$, Yousef S. Khader$^4$, Alexandrine Pirot de Corbion$^5$, Mohammad S. Alyahya$^6$, Maysaa Nemer$^3$, Tamara Awwad$^3$

$^1$ Department of Informatics, University of Oslo, Norway

$^2$ HISP (Society for Health Information Systems Programmes), New Delhi, India

$^3$ Institute of Community and Public Health, Birzeit University, Birzeit, West Bank, Palestine

$^4$ Department of Public Health and Community Medicine, Faculty of Medicine, Jordan University of Science & Technology, Irbid 22110, Jordan

$^5$ Privacy International Organization, London, UK

$^6$ Department of Health Management and Policy, Faculty of Medicine, Jordan University of Science & Technology, Irbid 22110, Jordan
Abstract

Many low and middle income countries, including those in the Middle East and North African region, are engaging in digital initiatives based on personal data to strengthen Reproductive Maternal, Neonatal and Child Health services, while these initiatives provide the potential of improving urgently required care services, they also come with the risk of leading to violations of human rights and gender discrimination. These risks are heightened in fragile states like Jordan and Palestine, the empirical basis of our ongoing research, where there are ongoing challenges such as of refugees. Effective data governance models are required to ensure that the potential of these digital initiatives are duly leveraged upon while mitigating the risks of violations. With this aim, the paper argues for the need to build data governance frameworks which have human rights and gender rights as key underlying guiding principles.

Keywords:
Digital personal data; mother and child health; data governance; fragile context; gender equality
1 Introduction

Governments in many low- and middle-income countries (LMICs) are rapidly moving towards implementation of digital systems for the planning and provisioning of health care services. A key focus of many of these initiatives is to generate, store and use digital personal data (DPD), such as by health workers using a mobile phone to track an individual pregnant mother over the cycle of pregnancy, or a child over his/her cycle of immunization. Spread of reform initiatives such as for Universal Health Coverage (UHC) and disease elimination are accelerating country efforts to deploy such DPD based initiatives. While health systems have significant experience of working with aggregate systems, knowledge of DPD based systems, particularly how they can be effectively governed within ethically defined frameworks that protect human rights, are far more limited.

Data governance refers to the overall management of the availability, usability, integrity, and security of the data employed in an enterprise. While earlier, manual data remained within the confines of the health facility, the changing context implies that digital data becomes accessible to an array of actors, and circulates across time and space and can be potentially combined with other sources of digital data to generate new form of information and intelligence. This novel information can be leveraged on to strengthen health care services, but if used unlawfully or unethically, it can expose individuals to threats and risks, which infringe upon issues of human rights, such as privacy and use of data without prior consent. These developments mean that effectively regulating governing data is more important than ever, requiring a clear definition of the obligations and responsibilities of those governing and processing personal data.

We are particularly concerned about such data governance issues in fragile contexts. As ICTs for Development (ICT4D) research has emphasized, “context matters,” and “fragile” contexts are characterized by weak governance and policy environments, making engagement in them a long-term challenge. Fragility is relevant because it needs to consider a high percentage of population living in these settings who are women and children, making them vulnerable to challenges related to unwanted pregnancies, sexual violence, and unmet contraception needs. Fragility become important in both shaping the content of heath
care challenges and in the choice of digital initiatives relevant in this context. Our key research question concerns:

“What are the challenges of data governance relating to digital personal data to help in ensuring the protection of human rights while ensuring more effective access to health care services?”

2 Building an analytical lens around data governance informed by a human rights perspective

_Digital personal data and human rights_ refers to privacy, security, personal expression and appropriate use of data as defined by national and international legal and regulatory frameworks. This requires data governance structures to protect against the risks in various aspects of digitization by considering the power structures in place, i.e. dominant/hegemonic structures of power, such as in making digital technology choices, or in accessing care and use and misuse of information to identify vulnerable groups. _DPD and data governance_ concerns measures and processes required to effectively regulate the collection, storage, management and use of data, by considering risks and threats to be considered and the issues they raise for the protection of individuals and their data. A data governance system informed by a human rights perspective can help to build ethically robust frameworks for studying and applying ICT4D, with a focus on fragile public health contexts.

Fragile states are characterized by weak policy and governance environments that threaten efforts to end poverty, improve health outcomes and other interventions. It is estimated by 2030, nearly half of the extremely poor people will be living in fragile settings. So, the problem of fragility threatens to be of a long-term nature. The Organization for Economic Co-operation and Development (OECD) has proposed a “Fragility Framework” which describes fragility as a multi-dimensional concept with economic, environmental, political, security and societal dimensions [1]. Each of these dimensions includes a set of risks which, if left unmitigated, can result in crises and negative development outcomes.
Health services are directly adversely affected by conditions of fragility. It has been reported that nearly 75% of the global population affected by humanitarian crises are women and children; nearly 500 women die each day in childbirth in humanitarian and fragile settings; 60% of preventable maternal deaths globally take place in fragile settings; 20% of women in fragile settings have experienced sexual violence; and less than 20% of facilities in fragile settings have the capacity to provide services to meet the large unmet needs for family planning [2]. Armed conflict is a significant determinant of fragility, which adversely influence health services through direct exposure to violence, as well as through indirect effects of social and economic disruption, such as reduced access to quality health services, food shortages, and lack of shelter, safe water and sanitary facilities [3]. Further, the health system is affected by diversion of healthcare personnel and the disruption of supply chains, which limits access to and quality of health services. Conflicts lead often to migration and a refugee crisis, as is seen in the influx of Syrian refugees in Jordan.

International organizations since long have been engaged in understanding and enabling the role of ICTs in fragile settings and for post-conflict reconstruction. The World Development Report, 2011, emphasized that development cannot be achieved in a context of instability, and reconstruction work must be broad-based, and where ICTs have a crucial role to play. There are some documented examples of the role ICTs have played in reconstruction efforts in Afghanistan, Timor Leste, and Rwanda [4]. Since conditions of fragility vary across and within countries, it is important to understand the particularities of individual fragility, rather than making generalized assumptions about them. Kelly and Souter (2014) have identified some crucial roles that ICTs can play in fragile settings, such as in the stabilization of systems, enabling infrastructure, promoting reconciliation efforts, and enabling public engagement on issues of importance [5].

How to define data governance within a human rights framework? There is no question that ICTs can help governments to ensure the effective access and delivery of health services, but safeguards and due process guarantees are needed from the onset in order to identify and mitigate risks to which beneficiaries might be exposed, and consider the roles and obligations of the different stakeholders. The use of ICTs and
data raise some key concerns in relation to the protection, respect and promotion of the right to privacy as provided for under Article 17 of the International Covenant on Civil and Political Rights and Article 12 of the Universal Declaration of Human Rights. Particularly, the systems need to meet the three overarching principles of legality, necessity and proportionality, all of which have implications for non-discrimination and equality [6].

Various initiatives on health care and data protection are emerging from an array of policy-making spaces. For example, the World Health Organization (WHO) presented a draft Global Strategy on Digital Health 2020 – 2024 which came in response to the resolution of the 71st World Health Assembly which requested the Director-General of WHO to develop a global strategy on digital health in consultation with Member States and other stakeholders [7]. In 2019, the Council of Europe also issued a set of guidelines to Member States urging them to ensure, in law and practice, that the processing of health-related data is done in full respect of human rights, notably the right to privacy and data protection [8]. Various development and humanitarian organizations in the health sector are also starting to regulate more formally their data processing activities through the adoption and implementation of internal data protection policies.

Health care data is widely recognized in data protection terms as ‘sensitive personal data’ or ‘a special category of data’ which, when collected, processed, and shared requires additional levels of protection against discrimination addressed in human rights instruments and constitutional protections [9]. This category of data attracts higher safeguards, including limitations on the permitted grounds for processing it in the first place, and preventing further processing for other purposes than the original provided for by the data controller. What has changed over the last decade is the advancement in technology and data processing and exploitation capabilities which are providing ever increasing powers to collect, process and gather intelligence, enhancing with it possibilities of misuse of data, violating human rights.

Digital solutions are often reliant on the private sector for their design, implementation and maintenance, potentially making them intermediaries to the providers and consumers of services and data. The provision of various health services is becoming dependent on the digital infrastructure and external business models.
over which health care providers have no control. Within fragile settings, designing and using DPD based systems come with potentially larger challenges of human rights, gender and governance. For example, biometric based identification systems may provide refugee populations with a sense of identity that could conflict with their home-country identity, impinging on their human rights [10]. Sharing of individual data between the multiple organizations engaged in providing relief services, always runs the danger of who gets the data for what purpose, requiring robust processes of data governance that respect concerns of human rights.

In this section, we have tried to identify the different parameters, which go into the development of an analytical framework around data governance of digital personal data in health services delivery that can be informed by a human rights perspective. The first parameter concerns how we define data governance, which we define as managing decision rights to ensure the protection of human rights of individuals while supporting more effective health services. The second concerns the context of fragility, and how these influence the vulnerability of the citizens, what conditions of human rights that need to be sensitively considered and protected, and on choice of digital technologies appropriate to the context. The third concerns the nature and implications of a human rights perspective, which primarily in our context focuses on data protection, based on criteria of legality, necessity and proportionality.

We next come to the question how our research is seeking to develop this analytical framework? We next turn to describe the research team and the empirical approach adopted.

3 Empirical approach to build this framework

We are approaching this analytical challenge in the following ways: i) developing a multi-disciplinary research team, spanning domains of public health, informatics, human rights, and researchers from two fragile settings where the field work is being conducted; ii) the two settings where empirical research is being conducted are Jordan and Palestine, with a key focus on refugee populations, which are naturally fragile; iii) to give focus to the empirical work, we have selected the domain of Reproductive Maternal and
Child Health Services (RMNCH), which are sites of major digital initiatives for the collection and use of DPD. We are currently in the end of the first year of a 3-year research project.

The methodology involves a multi-level and longitudinal approach. The levels of analysis include: i) the international and regional level where a desk review will be performed to build a macro-level understanding of the relevant issues in the MENA (Middle East and North African) region countries, with a particular focus on Jordan and Palestine; and, ii) country level, where a detailed situation assessment in Jordan and Palestine will be conducted to identify different DPD ongoing initiatives and to select 2-3 relevant efforts for conducting detailed empirical study. The research design involves a comparative case design where DPD initiatives will be compared within the two countries, and also across them. The methods used will include a policy document analysis, technology mapping surveys, systematic literature review of ICT initiatives, semi-structured interviews and focus group discussions; direct participant observations; and, secondary data analysis of relevant documents.

The research seeks to develop both theoretical and practical outputs around the issue of data governance around DPD initiatives in fragile settings.
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    http://www.refworld.org/docid/4a60961f2.html

Towards an Investigation of the Factors Mitigating Against Enrolment into Digital Identity Systems in a Developing Nation: A Case of Six States in Nigeria’s Geo-Political Zones

Onawola, H.J, Sandip, R., Narasimha, V & Longe, O.B
School of IT & Computing
American University of Nigeria
Yola, Nigeria
E-mails: Hassan.onawola@aun.edu.ng; Sandip.rakshit@aun.edu.ng; narasimha.vajjhala@aun.edu.ng; Olumide.longe@aun.edu.ng

Abstract

Approximately 1.5 billion citizens in developing countries are yet to have formal identifications. For example, in Nigeria, over 100 million persons do not have a national identity document, and out of over 200 million population only 36.6 million (18.3%) have been captured and obtained the National Identification Number (NIDN) [5; 19; 27; 28]. This paper presents a research plan and framework for investigating the factors mitigating against enrollment into digital identity systems in a developing nation. Our thrust in this paper is to harvest further inputs that can be leveraged to research focus in literature, methodology, design, and inferences. We intend to investigate the challenges facing enrollment into Nigeria's digital identity system to provide a framework for achieving the digitalization of identity for registration into NIDN for sustainable development goals (SDG). We will employ the nationalism and modernization theories as our theoretical framework and positivism as a philosophical standpoint. The research will gather data from six states representing each geo-political zone in Nigeria, adopt quantitative methods, and then use the Structural Equation Model (SEM) to analyze and validate the field results. The study's outcome is expected to address some challenges encountered by the citizens and contribute to mitigating the rising security challenges in developing nations. Also, the study's results will assist Nigeria as a nation in meeting item #16.9 sustainable development goals (SDG).

Keywords: Digital identity, National Identification Number, Nigerian Identity Management Commission (NIMC), SDGs, SEM

1. Introduction

Digital identity is a procedure of identifying individuals living in an area, society, community, or nation. This process enables governance to decide on available resource allocation, right, and restriction of individuals residing in the society. Many residents have no national identity, which describes their self-perception [8]. Digital identity is the primary means for data capturing and verification of individuals which uses the biometrics system [20]. Emerging technology for global systems allows business transactions to be carried out in an online platform via the Internet of Things (IoT), Artificial Intelligence (AI), Expert Systems (ES), mobile systems, and social media. These systems have brought transparency, economic growth, good service delivery, and other financial benefits. Biometric data capturing can be linked to identity management systems as a means of authentication, identification, and both for security usage. [13] stated that identity's nonexistence is an ingredient that makes development more difficult and less comprehensive. Digital market data capture has become a subject to reconcile with, as no nation can be sustained without taking their citizens' identity very important. Studies have shown that emerging technology has enhanced sustainable development in developing countries [23].

Developed countries now give special attention to identity before services can be rendered for any citizen [5; 10; 13; 19]. In Nigeria, many agencies recognized NIDN as a gateway for given services to individuals or groups. This is because formal identity is seen as a requisite to a modern world. Many developing nations operate on multiple identities (Nigeria, Tanzania, Mexico); others depend on local identity controlled in their local community [10; 17]. [19] stated that the lack of digital identity would have negative impact on citizens living in rural communities, especially in education, health, employment opportunity, and other social wares. Lack of proper control of the influx of foreigners can aggravate the country's demographics discrepancy [22]. Commercial activities are done online across borders; trust in an online environment can pose a security challenge. [3;4] explained that a lack of regulation and management has made productivity ineffective in-service delivery, especially in ministries, departments, and agencies (MDA’s). Having an identity is vital, because it is the road map to
many opportunities, such as banking, education, and other related institutions, health, social welfare opportunities, and electoral voting[9].

1.1 Attainment of the Sustainable Development Goals (SDG’s)
One of the reasons for NIDN is to enhance economic development in developing nations. For the goals of SDG #16.9 to be attained, all legal citizens are required to be provided with identity by the year 2030. Therefore, to meet the 2030 United Nations SDG target, the private sector should be given the opportunity to participate in citizens' enrollment. Table 1 shows the total enrolment in the database of NIMC between the years 2015-2019.

<table>
<thead>
<tr>
<th>S/No</th>
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<td>2</td>
<td>2016</td>
<td>14,000,000</td>
<td>2017</td>
<td>[25]</td>
</tr>
<tr>
<td>3</td>
<td>2017</td>
<td>23,300,000</td>
<td>20/10/2017</td>
<td>[27]</td>
</tr>
<tr>
<td>4</td>
<td>2018</td>
<td>33,000,000</td>
<td>26/10/2018</td>
<td>[28]</td>
</tr>
<tr>
<td>5</td>
<td>2019</td>
<td>36,000,000</td>
<td>29/04/2019</td>
<td>[26]</td>
</tr>
</tbody>
</table>

Source: Authors’ Fieldworks

Regarding the chart in Fig.1 above, if NIMC can only capture 36.6 million Nigerians within five years, it will take over two decades to capture over 200 million Nigerians.

1.2 Problem Statement
Developing countries have been making attempts to implement enrolment of citizens into digital identity systems. Still, due to poor administration of the nation’s resources and poor understanding of what development represents in developing countries, this objective has not been achieved. In many developing nations, modernization theory has been a tool used for NIDN project, which has yielded a good result. Modernization theory is a process that brings development and economic growth [7]. Therefore, governments’ inability to develop scalable identity systems and capture citizens’ data has continued to mitigate against effective governance, resource distribution, and other governmental activities, thereby creating an avenue for high crime rates and insecurity in most developing nations.
1.3 Research Questions

The research questions that emanate from the foregoing are:
1. What are the factors militating against digital data identity in Nigeria?
2. How can the process be enhanced for better service delivery in the ecosystem?
3. What are the interventions that can be deployed at the front-end and back-end that can engender sustainability in the system?

1.4 Research Aim

The aim of the research is to develop a model that can minify the challenges facing the enrolment of citizens into digital identity systems in a developing nation.

1.5 Research Objectives

The specific objectives to be addressed by the research are:
1. Investigate the low turn-out for the digital identity data system capturing in Nigeria
2. Develop a use-case model for digital data capturing system from front-end to back-end
3. Explore the digital Identity ecosystem in all three tiers of governmental operations in Nigeria.

1.6 Theoretical Underpinning

1.6.1 Nationalism Theory

Nationalism theory explains that nationalism is a thought which tends to promote one’s identity alongside others and can be ascribed to modernization [14; 18]. For this context, the society, community, and the nation, in general, are frequently used as “coterminous” and identity are attached in “national space” [11]. Identity can be ascribed to appearance, religion, language, history and origin, principles, nationality, and geographical location by birth [18]. Nationalism is an essential prerequisite to all nation’s industrialization in that it offers citizenry with dominant lots of enthusiasm to make a change in society [24].

1.6.2 Modernization Theory

Modernization theory is a theory of development that brings about economic growth, industrialization, urbanization, bureaucracy, and democracy [7]. The level of modernization is a parametric factor for determining nation's development [23]. This research will draw from modernization theory to explain how digital ID can carry out multi-purpose functions in nation’s development, especially in transmitting information virtually.

2. REVIEWED WORK

Table 2: Summary of Literature highlighting the authors, Focus, Findings and Gaps

<table>
<thead>
<tr>
<th>S/No</th>
<th>Author</th>
<th>Focus</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[21]</td>
<td>Institutional enabler &amp; constraint of national biometric identification Implementation in Developing Country.</td>
<td>Regulative enabled implementation have positive effects on policy and practice.</td>
</tr>
</tbody>
</table>


7. [19] Prioritizing Digital Identity Goals—The Case Study of Aadhaar in India. To identify and embrace the goals of Aadhaar in India.


10. [15] Information security in an identity management lifecycle: mitigating identity crimes. The Use of identity in an offline or online channels and lengthening the initial framework lifecycle from a 3 phase 4.


2.1 Gaps in Literature
The existing research identified that quantitative method and other Information systems paradigms that supported testing for hypothesis, generalization be adopted to further test for the validity and viability of this type of study. However, the researchers believe that assigning a unique individual numbers to each citizen, not to be shared with any one, will encourage business and global transactions across the nation’s borders and served as one of the mitigating factors to some of the challenges of global identity and other security challenges.

In all of these related works, non-have investigated the factors that mitigated against the low record in enrolment into digital identity in a developing country (Nigeria), and this is what the research seeks to address.

3. PROPOSED METHODOLOGY
To address issues mitigating against enrolment into digital identification in each of the regions, we propose a research agenda. For our research, data collection will be done via a primary and secondary source. Each region has its peculiarity. A structured questionnaire with closed-ended and open-ended questions will be used. Data for six states, each representing geo-political zones in Nigeria, will be considered for the study. This method's choice was considered suitable in this context and appropriate for this study because the researcher will not be biased or manipulate any of the variables being measured and to testing for reliability and viability of fieldwork. A quantitative method would be adopted in analyzing the data obtained from each of the six states represented. The data will be gathered in NIMC’s database and will be based on demographics on biometrics. Tools and methods adopted for data analysis, interpretation, and inference will include Structural Equation Modelling (SEM) coupled with the Statistical Package for the Social Sciences (SPSS) and Analysis of a Moment Structure (AMOS).
4. EXPECTED CONTRIBUTIONS TO KNOWLEDGE

The research outcome will provide a framework for enrollment into digital identity systems in a developing country. The research will contribute to Nigeria as a nation in meeting the United Nations Sustainable Development Goals (SDG) #16.9 on providing legal identity for all by the year 2030.

5. CONCLUDING REMARKS

The study sought to investigate the challenges facing enrolment in the digital identity system. The research will develop a framework geared toward evaluating digital identity systems’ impacts in a developing nation. However, the research study is in the conception stage, and research is still ongoing to further develop the idea to a logical conclusion.
Towards an Investigation of the Factors Mitigating Against Enrolment into Digital Identity Systems in a Developing Nation
A Case of Six States in Nigeria’s Geo-Political Zones

References
T6

Organization, Management and Institutionalizations
The Relationship between Digital Options and Organizational Agility – The Moderating Role of Organizational Dynamism

Janek Richter1[0000-0003-3189-9357] and Karl Werder1[0000-0001-8481-1596]
1 University of Cologne, 50679 Cologne, Germany
{janek.richter, werder}@wiso.uni-koeln.de

Abstract. Organizational agility is the ability to sense and respond to changes. While prior research has focused on environmental dynamism, the organizational dynamism has been largely neglected. However, we suggest that managing organizational dynamism is important for the success of organizations on their journey toward increasing agility. Organizational dynamism occurs with regard to organizational members, routines, and structures. We suggest a mixed research strategy combining publicly available secondary and survey-based primary data in order to investigate the effect of organizational dynamism within the relationship between digital options and organizational agility. We expect three contributions: i) a more nuanced perspective between digital options and organizational agility, ii) advances in theorizing about organizational dynamism, and iii) novel measurements of digital options.

Keywords: Digital Options, Organizational Agility, Organizational Dynamism.

Introduction

Exogenous shocks, such as COVID-19, and continuous digital transformation of organizations increase organizational dynamism characterized by speed, unpredictability, and complexity of endogenous changes. New ways of working, digital nomads, and full time working from home [1] are only few examples for how organizational dynamism affect corporate lives. While traditionally, organizational change has been understood as an organizational process that can be managed by planning and implementing change, nowadays, contemporary organizational work environments represent complex, nonlinear, open systems whose effects to manipulation are difficult to predict. Rather, unanticipated endogenous changes confront the organization with unpredictability and dynamism. For example, tenure and permeability across organizations has become ever more dynamic through democratization of work and workers’ technological empowerment [2]. Crowd working and on-demand work via digital platforms empower workers to easily change their employer and employment status. Hence, unanticipated endogenous change provides new challenges to organizations fighting for survival.

In order to cope with dynamism and unpredictability, organizational agility—an organizations ability to sense and respond to changes—has been proposed and investigated. In order to achieve agility, prior scholars have suggested IT capability [3],
IT competences [4], IT ambidexterity [5] and digital options [6]. Thus far, empirical research on the IT-agility relationship has been limited to exogenous dynamism and uncertainty such as environmental dynamism (e.g., Chakravarty et al., 2013), environmental volatility (e.g., Tallon & Pinsonneault, 2011), environmental velocity (e.g., Park et al., 2017), and environmental complexity (e.g., Chen et al., 2014). However, we suggest that organizational dynamism plays an important role in the way digital options form agility. Furthermore, conceptual research provides evidence that endogenous change is an important factor, which organizations have to consider when sensing and responding to change [11].

We propose that equally important as environmental dynamism, organizational dynamism influences organizational agility for two reasons. First, organizational dynamism or the lack thereof influences the context in which organizational agility is developed [12]. Second, organizational dynamism influences how organizational agility is instantiated by its members [13]. Thus, organizational dynamism impacts the degree and form of capabilities that an organization requires to succeed. Neglecting this important organizational phenomenon under conditions of contemporary digitally-enabled economies results in mismatching levels of organizational agility and ultimately threatens the organization’s survival. Hence, we formulate the following research question:

*What is the effect of organizational dynamism within the relationship between digital options and organizational agility?*

The study provides three central contributions. First, we add a more nuanced perspective to the relationship between digital options and organizational agility. We investigate the path between digital options reach and richness toward organizational agility (operational adjustment agility and market capitalizing agility). This comprehensive empirical investigation advances our understanding of the relationship between digital options and organization agility. Second, we add the perspective of organizational dynamism to theorizing about the relationship between digital options and organizational agility. While prior work has often focused on dynamism of exogenous change, we shed light onto the dynamism of endogenous change of an organization. Organizational dynamism increases significantly through digital transformation and can be actively manipulated by organizations to a larger degree than environmental dynamism. Third, drawing on the literature from strategic management, we provide novel ways of measuring IS concepts such as digital options. This allows scholars to benefit from secondary data sources when measuring the strategic impact of digital technology and related organizational abilities.

**Background**

**Digital Options**

Digital options are “a set of IT-enabled capabilities in the form of digitized enterprise work processes and knowledge systems” (Sambamurthy et al., 2003, p.247). Given the unique characteristics of digital technologies, i.e.: reprogrammability, homogenization
of data, and self-reference [14], they start shaping work processes and knowledge systems within organizations. Prior empirical research on digital options suggests its mediating role within the IT-agility relationship [6, 15]. IT is conceptualized either as IT capability (e.g., Queiroz et al., 2018) or IT competencies (e.g., Chakravarty et al., 2013). Digital options help generating more value from existing IT capability [6]. More specifically, a distinction between reach and richness of digitized processes and digitized knowledge has been suggested [17]. Digitized process reach helps organizations to deploy IT-enabled processes in order to increase the flow within the value chain. Digitized processes richness related to the quality of information that are available about events within the value chain. Digitized knowledge reach helps an organization to increase access and comprehensiveness of their explicit knowledge about the organization and its network, whereas digitized knowledge richness relates to the tacit knowledge about the organization, its members and their processes. We focus on the distinction of digital options reach and richness, since the boundaries between process and knowledge-oriented systems are increasingly blurry.

Organizational Agility

Organizational agility has been generally associated with the organizational capability that enables organizations to sense and respond to environmental changes in a timely and effective manner and hence, helps them to stay competitive in uncertain times [18]. Researchers distinguish between market capitalizing agility and operational adjustment agility [3]. While the former emphasizes identifying appropriate things to act upon, continuously monitoring, and quickly improving offerings, the latter is primarily directed at operational activities and is reactive in nature. We suggest that these dualistic conceptualizations of agility can be conceptualized using systems theory that distinguishes between the endogenous system (i.e., its inner workings) and the exogenous system (i.e., everything outside to the endogenous system). As such, we distinguish between agility that is associated with the endogenous system (i.e., operational adjustment agility) and agility that is associated with the exogenous system (i.e., market capitalizing agility). Operations adjustment agility represents the ability of the organization to swiftly respond to identified changes internally and transform its structure, resources, and capabilities to meet new requirements from the outside environment (e.g., Chakravarty et al., 2013). Market capitalizing agility focuses on the ability of the organization to sense external events concerning markets, partners, and customers as well as to derive competitive or strategic actions (e.g., Lu & Ramamurthy, 2011).

Organizational Dynamism

The central role of change for businesses has been long recognized in administrative as well as management research [19, 20]. Following a systems perspective [21], scholars distinguish between an endogenous and exogenous environment [22]. Research on organizational agility tends to focus on the organization’s exogenous environmental changes (often characterized by dynamism and deep uncertainty; e.g., Teece et al., 2016). When changes stem from an organization’s endogenous environment, scholars often refer to organizational change. Organizational change can be represented by the
implementation of a new performance management system, the restructuring of internal IT systems and their support, and the internal strategy that supports actively approaching mergers and acquisitions [11].

Organizational change is perpetual and persistent, and concerns organizational members, routines, and structures [22]. Traditionally, organizational change has been understood as an organizational process that can be managed by planning and implementing change [19]. However, organizational change has also been recognized as a source of uncertainty [23]. Particularly, contemporary organizational work environments represent complex, nonlinear, open systems whose effects to manipulation are difficult to predict and confront the organization with uncertainty and dynamism and hence, require new approaches to investigating organizational change [20].

Organizational change in the form of restructuring and reconfiguration have been recently identified to have an impact on organizational performance [24]. We argue that particularly change in organizational members can be directly leveraged by modern organizations. This form of organizational change has been associated with organizational performance, for example, in the form of employee downsizing [25]. Developments such as a mobile and permalancing global workforce shape the composition of human resources for organizations [26] and their turnover rates of organizational members [27]. Tenures and permeability across organizations have become more dynamic and unpredictable due democratization of work and workers’ technological empowerment [2]. Organizations have created hyperdynamic contexts such as crowd sourcing and on-demand work via digital platforms where these developments have become particularly evident.

Hypotheses Development

Drawing on systems theory [21], we suggest that organizational dynamism influences the relationship between digital options and organizational agility. Organizational agility is an organizational capability that is enabled by digital technology. As such, agility benefits from increasing digital options [6, 28]. When investigating digital options, we distinguish between digital options reach and richness.

Digital options reach has been suggested to improve agility [6]. We suggest that this relationship is moderated by organizational dynamism. Organizational dynamism refers to the unpredictability of fluctuation and change within an organization. Such fluctuation and change occur when organizational members either change their role within the organization, or organizational members leave the organization and are replaced with new members from outside the organization. In either case, the members starting a new role need to learn the existing processes, rules and standards that are in place. Such additional efforts prevent them from sensing and responding to changes.

We acknowledge that turnover can lead to positive results for the organization (such as new perspectives by new hires and lay-off of not required personnel), digital options
reach is designed with path dependencies of prior employee structure within the organization. For example, explicit knowledge is codified in knowledge repositories that reflect a historic state and is optimized for its members in their previous roles. Knowledge, processes, rules, and standards need to be updated by and for the new workforce. While we do not suggest that digital options reach is irrelevant for organizations with high degrees of organizational dynamism, those with low degree will benefit more. Consequently, we formulate:

**H1:** The effect of digital options reach toward organizational agility is smaller for organizations with high dynamism, whereas the effect is larger for organizations with low dynamism.

Digital options richness has been suggested to improve agility [6]. We suggest that this relationship is stronger for organizations with much organizational dynamism. The increasing fluctuation and change within the organization results in newly assigned roles to members. Either due to an internal reassignment, or due to a new hire from outside the organization. In either case, the organization benefits stronger from information with high quality about processes, providing increased transparency and details to people receiving a new role. Furthermore, organizational members that come into a new role often see processes with a different perspective and are more willing to change them, especially when they see a clear benefit. New perspectives and willingness to change of staff facilitates the reengineering of existing processes, allowing organizations to better sense and respond to changes impacting their business. Members that are new to their role benefit more from video conferencing and collaboration tools than members that remain in their role. While the onboarding process takes time and the members need to spend resources on acquiring tacit knowledge, this process has many synergies leading to an improvement of the sensing activities of the organization. Furthermore, members that are new to a role are more willing to and can easily respond to changes as part of their onboarding process. While we do not suggest that digital options richness is irrelevant for organizations with low degrees of organizational dynamism, those with high degree profit more. Consequently, we suggest:

**H2:** The effect of digital options richness toward organizational agility is larger for organizations with high dynamism, whereas the effect is smaller for organizations with low dynamism.
Method

We rely on a mixed strategy on integrating secondary publicly available and survey-based collected primary data. We use system-captured and publicly available data wherever possible to increase transparency of our approach and objectivity of data quality. We complement the secondary data with primary data in order to account for common method and key informant bias. We take our sample from the EURO STOXX 600, listing companies from the Eurozone. We track companies from 2010. These companies are active in different industries and are likely to receive appropriate media coverage due to their size. The 10-year timeframe allows us to thoroughly analyze long-term impact of digital options. We collect secondary data for digital options, IT investment, organizational dynamism, environmental dynamism, organizational performance, size, and age (see Table 1). We intend to use ordinarily least square regression analysis in order to estimate and test our proposed model.

Table 1. Overview of Variables and their Measurements.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measurement</th>
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<tbody>
<tr>
<td>Digital Options:</td>
<td>Following prior literature, we distinguish digital options by digital options reach and richness. Following prior practices [24], we count events of IT investments associated with digital options reach and richness in annual reports, SEC 10Ks, and press announcements from databases, such as Lexis-Nexis. Relying on prior conceptual work about digital options [6], we operationalize as follows:</td>
</tr>
<tr>
<td>1. Digital options reach</td>
<td>1. Digital options reach: IT investments in technologies such as enterprise resource planning, supply chain management, customer relationship management, product data management, intranets, databases, and knowledge repositories.</td>
</tr>
<tr>
<td>2. Digital options richness</td>
<td>2. Digital options richness:</td>
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Figure 1. Research Model
2. Digital options richness: IT investments in technologies such as: decision support, analytic, and tracking systems, advanced knowledge technologies, virtual video-conferencing systems, collaborative, and tools for knowledge sharing.

<table>
<thead>
<tr>
<th>Organizational Dynamism</th>
<th>We adapt previously used measured from strategic management for restructuring and reconfiguration [24] as well as downsizing [29].</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Agility</td>
<td>Organizational agility consists of operational adjustment agility and market capitalizing agility. We will adopt existing measures for operational adjustment agility as an organization’s ability to adjust its operations in a reactive manner and market capitalizing agility as an organization’s ability to strategically embark on opportunities related to markets and customers [3, 7, 9].</td>
</tr>
</tbody>
</table>

Outlook

Our next steps are to develop a more fine-granular coding scheme for the data extraction and coding of secondary sources. As such, both authors will start to code a case company. The results will be discussed in order to identify coding rules for future cases and discuss problematic code segments. As a result, we expect a clear code book with clearly identify sources that provide a reliable form of measuring our intended variables.

References


Towards new leadership mechanisms in digital work:
Leadership adjustments in response to Covid-19

Louise Harder Fischer and Frederikke Grunnet,
IT-university of Copenhagen, Denmark

1. Introduction

In the near future organizational leadership will routinely take place through electronic channels [1]. However, the move to virtual settings for leaders at work has been much slower than predicted, and electronic channels, have in many instances been used only as complements to traditional leadership, at the more co-located workplaces. How digital leadership will change the traditional role of the manager has been researched by other scholars [2], yet we need to fully understand how managers change their practices when moving fully online. During the recent COVID-19 pandemic lockdown, employees in knowledge work-settings were instantly forced to work from home. The rapid shift to digital work settings shared by a majority of organizations, serve as a suitable event to examine the impact on leadership and how managers altered their leadership practices. Recent studies have found that the pandemic has changed work- and leadership practices and that it is expected to impact future leadership styles [3]. The purpose of this abstract is thus, to bring attention to how the Covid-19 pandemic and its coupled scaling of organizations’ digital collaboration practices, provoke changes in leadership mechanisms. Thus, we have performed a preliminary qualitative empirical study in a large financial institution in Denmark that demonstrates how practices changed through the activation of mechanisms of individualization, institutionalization, and socialization.

The preliminary study prompts for more research into new leadership mechanisms that can define the shift in the midst of the pandemic, as well as its perceived impact on the future of leadership practices. Exploring both traditional, digital, and crisis leadership paradigms, provides an interesting alley of research. Combining existing research with an expanded empirical study gives rise to the development of new theory on the temporary and permanent leadership changes caused by the Covid-19 pandemic. The remainder of the abstract presents first, the research setting, second the theoretical framing, thirdly we present the challenges of leadership as experienced by managers, and our theorizing thereof. Lastly, we reflect on future empirical research to corroborate the findings.

2. The research setting

In early 2020, the Covid-19 pandemic forced most organizations into new and unforeseen realities. In Denmark, the society went through a lockdown period and required all employees in knowledge work settings, to work from home. As such, organizations were instantly pushed into scaling their digital transformation, and as such, adding to their already exponential use of communication technologies [1]. As suspected, the restrictions enforced by the government in response to the pandemic, rapidly changed work- and leadership practices [3]. As such, learnings from this time period can be
utilized for the continuous increase of online work in organizations as well as for equipping leaders for handling future crises. The shared situation in all organizations allows for comparison across organizations and for lessons to be transferred across organizational contexts.

3. Theoretical gap

Leadership as a field of research has a line of extensive history and body of knowledge. Traditional leadership theory often relies on face-to-face interactions, which prevent it from being directly transferred to digital interactions [2]. As digital technologies have been around for years, there are variants of research paradigms on technology-mediated leadership, including e-leadership, distance-, virtual-, digital- or tele-leadership [4]. Yet, neither of these paradigms can be directly translated to the context of the Covid19 pandemic, which adds an element of commanded change on top [5], as a response to an instant crisis. Furthermore, if considering crisis-related leadership theories, these are usually focusing on man-made organizational threats, and not a global and unexpected one [3]. As such, little research is yet conducted considering all of these factors; suddenly being a digital leader in a global pandemic forcing employees to transfer their workplace to their homes overnight.

4. Framing of research

The objective of this research is to explore the aforementioned theoretical gap by investigating leadership adjustments in response to the Covid-19 pandemic. More specifically, the research employs a critical realist perspective to explain the generative mechanisms and structures that influence the social phenomenon of leadership during the event of the covid-19 pandemic [6]. With the phenomenon being new and still relatively unexplored, this paper seeks to develop theory from empirical insights and established theory within the leadership and change paradigm [7].

5. Findings from the preliminary research

The preliminary study found that leadership was adjusted and that these adjustments activated a set of generative mechanisms of individualization, institutionalization and socialization in new ways. As theorized by [7], the mechanism of individualization is usually triggered by employees making adjustments to work-practices, enabled by mobile and malleable digital technology. Often it comes as a response to increasing institutionalization of work-processes, standardized through the implementation of enterprise-platforms and social norms of being physical-present at the workplace. Leaders often respond to individualization at the workplace, with an increased emphasis on triggering institutionalization and socialization. In the preliminary findings, we saw a different pattern.
5.1 Ad. Individualization

Firstly, leaders took the individual employee’s reactions, well-being and private circumstances into account and allowed for a substantial part of work to be carried out much more individualized. More specifically, employees were handed more autonomy and flexibility, and were required to lead themselves in the process of separating work and private life, as the new circumstances blurred the lines between them. Furthermore, leaders asked and listened more to discover how to give the needed extra support and compensate for ordinary physical observation of non-verbal cues and spontaneous wellbeing talks. Checking in on each and ensuring that team members were doing well in the new and uncertain circumstances, was given higher priority. Leadership enforced individualization as a mechanism to cope with the lost shared space at the office. The increased individualization of work, influenced the need for institutionalizing certain elements.

5.2 Ad. Institutionalization

Secondly, work processes were adjusted and institutionalized rapidly. More specifically, check-ins and social gatherings were formalized and in an increasing number scheduled to create a space for connecting in the lack of the usual, spontaneous encounters. Ultimately, the compulsory remote work forced leaders to face and adjust to the advantages and disadvantages of the new work structures, and fit their response to the employees’ various reactions to the change. While leaders were required to maintain their usual tasks of meeting goals and performance indicators, their work processes were expanded to prioritize their employees’ emotional stability. Usually, the institutionalization of processes is followed by socialization i.e. the establishing a set of social norms and shared values around work and behavior.

5.3 Ad. Socialization

Lastly, socialization as providing shared spaces, was strengthened to accommodate for the lack of physical presence and connectivity. With communication being facilitated by digital technologies, everything needs to be verbalized to reduce complexity. As such, with powerful facial mimics and gesticulations lost in the technological facilitation, leaders were challenged in communicating enthusiasm, creating a viable presence as well as sensing the atmosphere and the comprehension. While relying on the physically established trust and empowerment, leaders increased their empathy and transparency of communication towards the teams. In meetings, the shared crisis and the homely environment revealed by video, also served as entrances to discuss more personal matters. Additionally, the leaders also increased transparency and put extra attention to, to communicate and be very honest and truthful about what is the situation now and how is the department is impacted.
6. Discussion

Our findings suggest new dynamics in digital leadership mechanisms. We suspect that catering to the individual and thus - the individualization of work-practices - will become even more important in the future, to establish not only productivity but also well-being. This align well with the studies focused on new mechanisms in a virtual workplace [7]. The role of the leader will be to enforce and encourage individualization - and to a large degree - self-management, while also seeking to institutionalize certain work-processes and socialize employees with the workplace through frequent, transparent and truthful communication. Increasing empathy and attention to personal well-being seem of higher importance, which aligns with the growing focus on emotional intelligence in leadership literature [3]. While individualization is seen as providing autonomy to work, and thus, to enforce self-management, which is an important element in establishing dynamic capabilities - it also bears the risk of being turned into egoistic behavior and also isolation. Individualization is a double-sided sword that needs digital leadership practices that are tuned into how mechanisms of individualization, institutionalization and socialization impact, enable or halt each-other at the digital workplace.

7. Reflections on data saturation of preliminary study

The preliminary study already conducted, explored a single case of three leaders from a large financial institution in Denmark. The research is still in progress and the next step is data saturation. The research will be expanded from a single case to a multi-case study by interviewing in total twelve department- and team leaders from four large Danish companies. All companies have relatively distributed work, and are, as such, somewhat used to collaborate online. Nevertheless, their digital practices were scaled by the Covid-19 lockdown. While the organizational context of the interviewees is different, their situational context has been alike with the lockdown of Covid-19. As such, parallels and patterns will be drawn across the cases to examine the objective from a universal meta-perspective. Expanding the empirical research will allow us to confirm and develop the preliminary findings and the interpretation of generative mechanisms activated in said settings. A qualitative research process will help examine the impact of the covid-19 pandemic on leadership and collaboration through the perspectives of the interviewees.

References


All Along The Watchtower: Tracking India’s Citizens Through Registers And Numbers

Arijit Sen

Doctoral Researcher, Peace Research Institute Oslo and Department of Informatics, University of Oslo

Abstract:

This paper attempts to understand the interaction between the “all-seeing-all-knowing-State” and its efforts at collecting data of citizens for India’s National Population Register (NPR) and National Register of Citizens (NRC) both of which are part of the ecosystem that defines India’s new set of citizenship rules that includes the Citizenship Amendment Act (CAA). The NPR that will be linked to India’s mandatory biometric identification project Aadhaar remains ‘the mother database for creating the National Register of Indian Citizens by verifying the citizenship status of each and every citizen’. Does it give rise to the possibility of surveillance and erode the other Constitutional rights of citizens? The possibility of being excluded from a list of citizens weaponizes the concept of citizenship, and the right to citizen’s rights. It also gives rise to potential statelessness. Is targeted digital surveillance then the flipside of e-governance? Is it a durable digital disorder and how does the State see this? This paper will seek to empirically investigate the answers. By doing so this paper attempts to lay the ground for future research work on citizenship and surveillance with special emphasis on India.

Keywords: biometrics, citizenship, surveillance, statelessness
I Introduction: Panopticon for Citizenship Surveillance?

As a Doctoral Researcher, at the Peace Research Institute Oslo and the Department of Informatics, University of Oslo, at an initial stage of formulating my research quest there are some key questions whose answers I am attempting to empirically investigate.

In 2018-19, during a research project on detention centres in Assam in India’s northeast, I noticed that paranoia about illegal cross-border migration had reached fever pitch. Individuals suspected to be ‘illegal migrants’ and declared as foreigners by quasi-judicial bodies were sent to these detention centres—overcrowded spaces situated inside prisons where rights violations were rampant. There was no segregation between undertrials, convicts and the detainees. In August 2019, the Assam authorities published the updated and final National Register of Citizens (NRC). Close to two million applicants were left out of it and made potentially stateless.

By interviewing people who have taken part in the NRC process, and by marking how personal data on the population of India can be put to use in the monitoring and surveillance of any individual resident of India, this paper will help build a better understanding of citizenship surveillance. Has the citizenship-surveillance ecosystem put up watchtowers to see everyone clearly and then sit on judgment about their citizenship?

I will attempt to understand the interplay of various social-cultural and institutional factors and their implications on surveillance. What are the collaborations and methods used to carry out e-governance and surveillance, and how do they impact the lives of subjects, users or targets of intervention, as well as those under the uncharitable gaze of the security establishment? Is targeted digital surveillance the inevitable flipside of e-governance? What are the safeguards against such surveillance?

There is a certain darkness and cunning ascribed to citizen surveillance—a citizen’s nightmare opposed to a digital dream. It talks about security and often arrests, kills, disappears people, silences activists and yet no one is able to point a finger to what it is that is brewing around in different countries across the globe, often with popular support. The compliance of the citizen is often tied to—if not development, then to rights and duties associated with the citizen-state relationship i.e., the social contract, in which the citizen rarely has the opportunity to opt out, once the system is in place. This is regarded by some as a perversion of the idea of citizenship and also the promise of technologies such as IoT. In many instances, it has also given rise to a trade-off between privacy and welfare benefits.

The building blocks of such a surveillance and e-governance framework are unique identification numbers, the census and other large-N data of citizens, as well as technology to process such large-scale data using computation and machine learning. Does this give rise to a mechanism that rewards some citizens while those who dissent are subject to punitive measures? How does this impact the life of the citizen and the non-citizen?
As the Science and Technology studies (STS) stream of research has emphatically demonstrated, Information and Communication Technology (ICT) has both liberating and constraining consequences, shaped by the social-political and institutional contexts in which they are designed and used.

Is unbridled surveillance, corruption and misuse of the law an unavoidable consequence of e-governance? According to one report (*The Panopticon Is Here*, The Atlantic, September 2020) Chinese President Xi Jinping’s grand vision of using AI technology for e-governance and surveillance draws on a model of direct citizen control in which the ‘cutting edge of surveillance’ is supposed to create ‘an all-seeing digital system of social control, patrolled by precog algorithms that identify potential dissenters in real time.’ China is exporting surveillance tools across the world, the report claims. But such moves are not unique to a nation, polity, or type of government. Is there a pattern of collaboration? To draw from Amartya Sen’s *Lecture on Human Rights and Asian Values* (1997), authoritarianism is not just restricted to Asia, ‘there are many skeletons in many cupboards across the world’, the West included. Aspects of China’s oft-criticised vision of digitalization can also be found in European, American and Indian contexts.

The theoretical framework lies at the intersection of human security, Information and Communication Technology for Development (ICT4D) and political science. The theoretical fulcrum of the work will be Michel Foucault’s ideas of ‘disciplining’, ‘governamental’, ‘bio-power’ and his interpretation of the Panopticon (1977-1978). It will also look at the concept of ‘necropolitics’—a term introduced by Achille Mbembe (2003) and how both Foucault and Mbembe’s ideas play out in a situation that includes the use of digital technology for governance, and relations between the citizen and the State.

II Analysis: Registers or all-knowing digital shackles?

The paper attempts to understand how the interaction between the “all-seeing-all-knowing-state” and its citizens is mediated in an Information and Communications Technology (ICT)-driven societal vision, and how digital technologies affect such mediation, and its everyday consequences for people who use such technology. One strand of that interaction explores the promise of empowerment that digital technologies carry with them beyond the concepts of utopia and dystopia. For example, in India, the internet opens up a world beyond the rigid confines of a defined life within a certain domain—a village or a small town. However, at the opposite end of the spectrum of such liberation lies the other attempt at collecting data of citizens for India’s National Population Register (NPR) and National Register of Citizens (NRC) both of which are part of the ecosystem that defines India’s new set of citizenship rules that includes the Citizenship Amendment Act (CAA). The NPR that will be linked to India’s mandatory biometric identification project Aadhaar remains ‘the mother database for creating the National Register of Indian Citizens by verifying the citizenship status of each and every citizen’. It gives rise to the possibility of a space where the rights of citizens and other Constitutional guarantees are eroded. The possibility of being excluded from a list of citizens weaponises the concept of citizenship, and the right to citizen’s rights.
The main methodological basis for my empirical enquiry will be anthropological, in which I will observe and interview a range of stakeholders in the surveillance agency and related corporate sector, as well as people subjected to such surveillance. My research will include qualitative data collection and proceed along an interpretive paradigm. The primary domains of contribution remain ICT4D and human security.

Over the last few decades, scholars have substantially added to the literature on technologies of surveillance and their interaction with e-governance. While my research will draw from such insights, it will also explore the relatively unknown terrain of government policies and collaboration with tech corporations to govern the lives of citizens. Is the law adapting to these new technologies and their consequences, ensuring conditions for better governance? The framework of the Panopticon—a term coined by Jeremy Bentham to describe a maximum surveillance prison and used by Foucault in Discipline and Punish (1975), will be used to understand how a citizen is observed. Does the Panopticon exist in new technologies today? A design of never-ending, ‘ceaseless surveillance’ that extends across the world, invisible, and yet ever-present? As surveillance scholar Shoshana Zuboff (page 11, The Age Of Surveillance Capitalism, 2019) writes, ‘Our dependency (on the internet) is at the heart of the commercial surveillance project, in which our felt needs for effective life vie against the inclination to resist its bold incursions. This conflict produces a psychic numbing that inures us to the realities of being tracked, parsed, mined and modified.’

In exploring such mediations across the globe, my research proposes to study these processes in India, analysing in detail the evolving relationship between the Indian government and its citizens within the time frame from 2002 to 2020. The starting point of the study, the year 2002, is the landmark year after the Kargil War between India and Pakistan that put the idea of a national identity card and security at the centre of Indian governance and policymaking (Kodali, 2019). Over the following two decades, India has witnessed the arrival of initiatives to transfer subsidies electronically and prevent leakages. At the same time, while digital technology has transformed society radically has it also given rise to a surveillance mechanism?

For the people who were left out of the NRC list in Assam, the state always fears that they might perform the act of vanishing. To preempt such disappearances, detention centers, the border police and border push-backs are standard methods that are used to mark, capture those individuals who are marked as ‘illegals’ and force them out of the country. Their biometric details have also been stored to track individuals.

Before that, in October 2012, the state government in Assam in India’s northeast in a ‘White Paper on Foreigners Issue’ made it clear that individuals declared as illegal foreigners should be sent to detention centres to restrict their movement and to ensure that they do not perform the ‘act of vanishing.’ In Assam where citizenship has been a contested issue for more than a century, the question of who belongs and who doesn’t, who is a citizen and who is not, resurfaced with renewed vigour. This divide has also spread to other parts of India with new proposals for detention centres for illegal citizens.

Between 1979-1985, Assam witnessed a violent anti-foreigner agitation, immediately after Bangladesh liberation war of 1971 that led to an influx of refugees from just across the border to the state. The demands of the agitators were
to detect and expel, ‘illegal migrants’. They wanted a National Register of Citizens (NRC) 1951 list to be updated; walls to be built along border areas with Bangladesh, watchtowers with spotlights to be installed and whoever wanted to scale such walls to be shot at. The Assam Accord was signed in 1985 with the Indian government and gave rise to a special set of citizenship rules. It was only in 2014, the Supreme Court instructed the NRC to be updated. In the entire exercise, the biometric and legacy data (with family details) of all applicants were collected in Internet Seva Kendra (Internet Service Centres). The process polarised communities and turned amicable spaces of cohabitation into environments of suspicion. There was stigmatization of minorities and the citizenship of a person without documents suddenly came under watch, public humiliation and even attack.

During the process of data collection, for one of the largest citizenship drive in the world, the standard operating procedure (SOP) stated that biometric enrolment of applicants will be carried out by the Assam government with the Unique Identification Authority of India. It also stated that once the final list of legal citizens was published, all those included will be given Aadhar number. This paper will try and unravel the NRC-NPR-Aadhar and India’s new Citizenship Amendment Act link. Are they all connected? And if so, how? How does it help citizens? Or is there a fear of human rights violation?

As tech-ethnographer and sociologist Tricia Wang (2020) writes, ‘the violation of personhood is not a new experience [but it is] now happening in unfamiliar ways […] the entire process is invisible, automated and designed to obfuscate.’ How are such violations happening? Wong (ibid.) points out how removal of personhood can come in the form of ‘abuse, surveillance, racism, genocide, homophobia, slavery, trafficking, colonialism, torture and human rights violation’, be it Uighurs detained in China, or Bengali citizens marked as ‘illegals’ and sent to detention centres in Assam, or Kashmiri mobile phone users constantly being monitored, while the same digital technology is used to track and arrest them. This paper attempts to unravel issues that arise when a private data operator like Wipro in Bangalore, India stores the legacy data of Indian citizens, a set of issues that has also been raised by groups like Our Data Bodies—based within marginalized communities in the USA—working on the collection and sharing of digital information for e-services by government agencies and corporations.

At the intersection of human security and informatics research, my query puts the spotlight on a rapidly transforming State-technology-citizen-ecosystem across the globe. At a practical level, this work captures an Indian transformation which promises to be an essential address for future scholars, journalists and those involved in informatics and human rights. At the theoretical level, it will look at technology, the transformation of human experience, the participation of citizens and the role of the State through a legal and anthropological lens. It promises to specifically contribute to the field of ICT for Development and ICT for Human Security.
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The Centre For Internet and Society, A Survey of Covid-19 Apps Launched by State Governments in India


Understanding formal and informal practices of Antibiotics prescription and consumption in India
Yogita Thakral¹², Sundeep Sahay¹, Arunima Sehgal Mukherjee¹²

¹ Department of Informatics, Universitetet i Oslo
² HISP India

Abstract: Antimicrobial resistance is a global threat attributed to the irrational use of antibiotics. This paper reports ongoing research to assess the patterns and practices of antibiotics prescription among physicians, patterns of antibiotics dispensing among pharmacists in both human and veterinary domains, and the patterns of self-medication in humans using a semi structured qualitative survey in a district with both urban and rural facilities in both human and veterinary domains. Initial thematic analysis with the responses has been done and 4 major themes have emerged around antibiotics consumption and use. The initial results show a varied pattern of understanding of antibiotics among the stakeholders in the rural and urban areas. The interviews are being conducted and identified for additional themes.

Keywords: Antimicrobial Resistance (AMR), Antibiotics, Antimicrobial stewardship program (ASP), Antibiotics consumption, Antibiotics use, Information, and communication technologies (ICT), Information system (IS)

Introduction

Antimicrobial Resistance is a threat to the future of treatment of basic infections and the outcome of routine medical procedures in both humans and animals from slow responses to antimicrobial treatment, prolonged stays at hospitals, and increased mortality. The prevalence of antimicrobial resistance is strongly correlated with the level of antimicrobial use [1]. Irrational use of antibiotics in both the Human and veterinary domains has resulted in the emergence of resistant bacteria [2]. WHO has been repetitively warning about the world entering a “post-antibiotic era” which would make it impossible for the antibiotics to work for minor infections and injuries previously treatable with antibiotics [3]. WHO Global report, 2016.

The irrational use of antibiotics is particularly striking in India and a well-known driver for Antimicrobial Resistance. India is one of the top consumers of antibiotics for both human and veterinary health [4],[5]. The knowledge of antibiotics and antimicrobial resistance is limited in the country which is also a major contributor to the increasing Antimicrobial resistance. Additionally, most private pharmacies dispense antibiotics without prescription and operated by unqualified persons which have resulted in the dispensing of medicines which are generally not allowed to be sold over the counter without prescriptions. Despite the presence of policies and reforms like the Drugs & Cosmetics Act and Rules which is meant to regulate over the counter (OTC) use of antibiotics in India and provide a mandate to identify unlicensed pharmacies, many pharmacies are selling over-the-counter drugs. The government of India legalized Schedule H1 for certain drugs which increase dispensing restrictions nationwide for several antibiotic classes, but the effects of this policy remain unknown.[6]. To address these issues and build a framework to initiate antimicrobial stewardship practices, an understanding of patterns of formal and informal practices of antimicrobial prescription and consumption is essential.

This study aims to identify awareness of AMR, knowledge, formal and informal practices around antibiotics prescription, consumption, and use in both Human and veterinary domains. population. Limited studies are identifying the knowledge gaps and formal and informal practices of antibiotic consumption in India working on both Human and veterinary sciences.
2. Conceptual framework

An assessment and knowledge of the formal and informal practices of antibiotics prescriptions are essential to make effective and informed policy decisions. Patients or the general population is also a key determinant in India as they can make treatment decisions for themselves and procure antibiotics from pharmacies without a prescription. This study explores the awareness of AMR, knowledge of antibiotics, and the patterns of prescribing and dispensing across human and veterinary domains to provide a baseline assessment of awareness of the stakeholders involved and to inform interventions.

The objectives of the study include:

a. To assess how antimicrobial resistance is understood in both Human and veterinary settings in India.

b. To identify the knowledge, attitudes, formal and informal practices of antibiotics prescription among physicians, dispensing among physicians, and self-medication practices in the human and veterinary domain.

c. To identify the drivers of antibiotics prescription and usage.

To assess the knowledge and perception of antimicrobial resistance and irrational use of antibiotics, informed by a one-health approach, semi-structured interviews are being conducted and study participants are selected based on local contacts in a geographic area with health care facilities serving both humans and animals in urban and rural settings. Given the difference in the usage of both terms the working definitions for Antibiotic consumption and use specific to my study have been defined based on their applicability in the study, **Antibiotic consumption** is the composite of the antibiotics procured by a facility, transferred to different departments in within the facility or the total antibiotics utilized at a facility in ICUs, departments, wards, etc. or sold by the hospital pharmacy in a given time. **Antibiotic use** is an approximate assessment of the data that can be disaggregated at a patient-level such as antibiotics prescribed by physicians at a facility, antibiotics dispensed by the pharmacists, antibiotics, and the patterns associated with utilization of antibiotics by the patients, antibiotics administered to patients admitted in the hospitals, etc.

3. Design/methodology/approach:

Most people in India have direct access to antibiotics through various health facilities such as hospitals, general practitioners/private clinics, and pharmacy shops. All these types of facilities have been included in the study to target different groups for subsequent interventions. The study has been done in both rural and urban areas and facilities in both areas were selected based on convenience and feasibility in district Hisar located in the northern part of Haryana. A qualitative study of the social determinants of antibiotic prescription among the physicians, dispensing among pharmacists, and antibiotics use among community members in Haryana, India, to investigate how knowledge and access impact the practices. Open-ended questionnaires were prepared to assess the demographic details, knowledge, and patterns of antibiotics prescription and use and to get additional information for the e-prescription system.

Data is collected based on participants regarding participants’ demographics, health, literacy, antibiotic knowledge, and typical antibiotic use. The strict sample size has not been set before data collection due to and will be determined when the saturation point will be reached.

In-depth face-to-face interviews are the primary method of data collection with medical professionals and pharmacists from both the human and veterinary domain, pharmacists dispensing drugs for both domains,
and people from the general population, and animal owners/dairy workers for medication practices. The questions are asked in sequence followed by other questions that come up based on the answers given by the participants. Interviews are recorded with consent and transcribed to facilitate thematic content analysis.

**Case study narratives**

The open-ended questionnaire for physicians included 14 open-ended questions divided into 6 categories which covered the topics mentioned in Table 1. The questions included the professional profile of the physicians and pharmacists and the educational qualification, their knowledge about Antibiotics and AMR, knowledge about the local AMR profile, current practices followed by physicians and pharmacists to reduce AMR, Patterns, and basis of prescribing the types of antibiotics for specific diseases, usage of broad or narrow-spectrum antibiotics if laboratory results are referred while prescription of antibiotics. Additional questions are asked based on the answers received for more relevant information. Additions questions relevant to the study are being added to the questionnaire.

<table>
<thead>
<tr>
<th>1. Professional Profile</th>
<th>Educational Qualification, Specialization, Position, Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Knowledge of Antibiotics</td>
<td>Types, combinations, Source of knowledge/Guidance</td>
</tr>
<tr>
<td>4. Awareness on AMR</td>
<td>Understanding of AMR, Role of diagnostics in AMR, Causes/Drivers of AMR, Importance of rational use of Antibiotics</td>
</tr>
<tr>
<td>5. Prescribing/Dispensing patterns</td>
<td>Role of Diagnostic tests results in a prescription, Difference between training and practice</td>
</tr>
<tr>
<td>6. Initiatives to combat AMR/Suggestions</td>
<td>Current practices or initiatives undertaken by the Physician or Pharmacist to combat AMR, Suggestions for future interventions, Resources to update knowledge on Antibiotics.</td>
</tr>
</tbody>
</table>

Table 1: Summary of interview questions for physicians and pharmacists

The self-medication questionnaire has 18 questions divided into the categories mentioned in Table 2. Demographic details of the people, their knowledge on AMR, history, frequency, and patterns of taking antibiotics are recorded. The pattern of storing, using antibiotics, and sharing of the antibiotics with friends and family showing the same symptoms is recorded. Patterns of giving antibiotics to pets if any is recorded.

| 1. Demographic profile | Educational qualification, Age, Marital Status, Children. |
2. Disease history/Comorbidity

| History of any acute disease, Suffering from a chronic disease |

3. Antibiotics usage

| Frequency of antibiotics use, types of antibiotics taken. |

4. Antibiotics use/Self-medication pattern

| Antibiotics are taken after physician consultation/self-education, Dose, frequency, and duration of antibiotics usage ask doctors to prescribe antibiotics, take doctor’s advice on antibiotics usage. |

5. Sourcing and storage of Antibiotics

| Antibiotics bought with or without prescription, use old prescription to buy antibiotics, keep antibiotics for future usage |

6. Knowledge of AMR

| Understanding of AMR, how it affects health. |

7. Antibiotics sharing

| The practice of sharing antibiotics with friends and family showing similar symptoms |

8. Livestock

| Patterns of giving antibiotics to pets etc. If any |

Table 2: Summary of interview questions for self-medication in humans and patterns of giving antibiotics to animals by owners.

Discussion

This is ongoing research where data collection and in-depth interviews are on-going to understand the local knowledge, attitudes, and patterns specific to antibiotics is being done which is the first step in designing a framework for rational usage of antibiotics and effective antibiotic stewardship. This framework is essential in planning interventions for antibiotic resistance throughout India. From the initial analysis, these major themes have emerged, by comparing the answers given by participants, their experience, educational qualification, and the area of practice/residence (Urban/rural): i) Attitude of physicians and pharmacists towards the prescription of antibiotics. Pharmacists dispense antibiotics without prescription and consider themselves authorized based on the responses.

“98% of patients come without prescription to the pharmacy and 2% come with a prescription. Around 500 patients are coming to the pharmacy every day. With my experience of more than 40 years, I know what antibiotics to give to the patients. Most patients come and tell me their symptoms. Even if they have to go to a physician, they ask me first if it is required for me to the physician”

ii) General population’s knowledge of antibiotics among the formal and informal prescribers and the general population in India. Most people responded they shared the antibiotics with their friends and family and have no to little understanding of Antimicrobial resistance. iii) Physician’s and pharmacists’ knowledge about the antibiotics. Despite the responses showing the irrational prescription practices, some physicians understand the issues associated with it.

“Overuse and unnecessary usage can be avoided, and it should not be given for patient satisfaction and should not be given for cases where patients can be treated without antibiotics. Sometimes we do not
understand the diagnosis and see if the patient is cured by giving a dose of antibiotics which should not be given. And patients should be guided to not take self-medication.”

iv) Factors driving informal practices of antibiotics consumption and use,

The main patterns identified based on the initial data analysis posing a challenge to the digitization of antimicrobial consumption and usage data in India including pharmacists prescribing and dispensing antibiotics without prescription, pharmacists consider their experience in dispensing antibiotics as a basis of prescribing and dispensing antibiotics, self-medication practices by general population like storing of antibiotics at home, using old prescriptions to buy antibiotics from pharmacies, sharing antibiotics among friends and family, etc.

This is an ongoing study and is an essential first step towards analyzing the practices and patterns of antibiotics consumption to identify if and how the digitization of the antibiotics consumption data can be done in a country like India with diverse practices to combat Antimicrobial resistance. The next steps would include i) identification of additional themes and how do they differ in the human and veterinary domains. ii) an analysis to see if these patterns are reflected in an information system. iii) Identification of the implications for the design of a surveillance system for Antimicrobial consumption.

References

Tracing over time the Institutional dynamics around the implementation of DHIS2 for HMIS strengthening in Mozambique

Nilza Collinson 1,2 [0000-0002-6907-4054], Sundeep Sahay 2 [0000-0002-4374-9551] and Emilio Mosse 1 [0000-0003-1087-9365]

1 University Eduardo Mondlane, Av. Julius Nyerere, nr. 3453, Maputo City, Mozambique
2 University of Oslo, Ole-Johan Dahls Hus, Gaustadalléen 23 B, 0373, Oslo, Norway

nilzac@ifi.uio.no

Abstract. The implementation of Health Management Information System (HMIS) is susceptible to influences of several institutional dynamics, either raised by the technological artefacts themselves or the political and cultural conditions in place. These dynamics, not being always obvious and easily acknowledgeable, sometimes appear intrinsically merged or hidden within the context, being only perceptible through patterns visible along a certain period in time through particular lenses. In those cases, history can be a valuable tool to understand and pursue explanations around why and how a technology gets adopted and institutionalized or not in context. This understanding is valuable in planning future implementation efforts. We attempt such an analysis around the efforts to adopt the DHIS2 software by the Ministry of Health in Mozambique since 2000. As this study intends to conduct a research based in a longitudinal case study over the last twenty years, the history is reconstructed in terms of three main phases: initiation of DHIS into Mozambique phase (2000-2007), disruption of the Ministry of Health with DHIS phase (2008-2012), adoption and scaling up nationwide phase (2013-2019). For the purposes of this paper, we collected data from oral and written sources, through interviews, documentary reviews and observation. Within this excerpt of history, we identify a set of institutional pressures playing determinant roles within the implementation process. Those raising either from the artefact being transferred as a development based in another context by a foreign team with a different language, from donors financing the health sector with determinant voice in the process, or the setting itself with unfavourable technological conditions and limited resources constraining support and maintenance on site.

Key words: Historical reconstruction, institutional dynamic, adoption, cultural factors, political roles, technical constrains.

1 Background

Information Systems (IS), either computer based or not, are seen as powerful instruments to support the ongoing operations of organizations. Braa et al. [2] refers to the increasing recognition that “improved health information systems (HISs) can significantly contribute to help address health service delivery problems”. But the overall process involved in implementing such an IS, that delivers what it promises, is not an easy task and comes with multi-dimensional challenges spanning institutional, technical, social, economic and political domains. These challenges have contributed to large-scale failure of HIS in developing countries [5], and Spiegel et al. [12] have questioned the persistent controversy on whether the worldwide expenditure in information system (IS) applications is worth and achieves something meaningful. Even though, taking into account the importance of its central object ‘information’ and the potential of the ICTs, the efforts and investments to build or transfer technological artefacts globally is a continuous tendency, which is exponentially increasing in contemporary times given the growing prevalence of digital technologies even in developing countries. “Almost all governments in developing countries have ongoing information systems projects aiming at efficiency of administration and improvement of public sector services [1].”

The implementation of Health Management Information System (HMIS) is susceptible to influences of several institutional dynamics, either raised by the technological artefacts themselves or the political and cultural conditions in place. These dynamics, not being always obvious and easily acknowledgeable, sometimes appear intrinsically merged or hidden within the context, being only perceptible through patterns visible along a certain period in time through particular lenses. In those cases, history can be a valuable tool to understand and pursue explanations around why and how a technology gets adopted and institutionalized or not in context. Arguably, according to Immergut [6] some “contingent developments” over time “stand beyond logic and can only be grasped through historical analysis”, which can in turn “allow one to look to the past as a source of alternatives for the future” and also “provide answers to institutionalists questions”
Therefore, a historical analysis of this implementation process can indeed provide answers to this question, while also guide future efforts to effectively institutionalize this system in the HIS of the country, and utilize its potential to help address the pressing health challenges the country is facing today.

We take into account the importance of historical studies in IS, which according to Bryant et al. [3] helps to build awareness and identity of both the technology and the context of study. Even though they have not extensively used in IS studies, perhaps possibly due to the complexity of carrying out such an analysis, they have the potential to provide rich and comprehensive insights into the implementation of ICT projects. Heeks [5] has also argued for such analysis, writing that the analysis of “…technology transfer… between different contexts… across place and time allows a clearer differentiation between the initial context… and the ongoing contextual changes” and therefore, “IS cases from developing countries provide… fertile ground for helping understand the complex interplay of action and context that underlies all organizational change.” Therefore, we oversee an initial contribution laying in the reconstruction of DHIS2 piece of history, building awareness of the evolution of this technological artefact, but we believe also that a greater contribution stands for the broad domain of ICT4D.

This study is part of an ongoing project that intends to conduct a research based in a longitudinal case study of the reconstruction of the institutional history of a technological artefact – DHIS2 (District Health Information Software) based in the implementation in Mozambique, over the last twenty years. This, as a means to support the analysis of the interplay between technical, institutional and human factors involved in the process, and its evolution over time. We attempt such an analysis around the efforts to adopt the DHIS2 software by the Ministry of Health in Mozambique since 2000.

2 Method

The history is being reconstructed in terms of three main phases: initiation of DHIS into Mozambique phase (2000-2007), disruption of the Ministry of Health with DHIS phase (2008-2012), adoption and scaling up nationwide phase (2013-2019). For the purposes of this paper, we collected data from oral and written sources, through interviews, documental reviews and observation.

The data collection process initiated with a documental review from PhD research work done by some Mozambican PhD students involved in the pilot implementation project in collaboration with the UiO supervisors that were also part of the developing team. A set of interviews were conducted, involving the PhD students from Mozambique, as part of a major interviews plan, including key stakeholders involved in the process being studied. At some point along this paper we bring out some extracts from their work to give them voice and transport the reader to the time and space in reference.

A field work trip was conducted in 2019 covering five provinces of Mozambique, being three of them the sites where the pilot ran, namely Inhambane, Gaza and Niassa. The others included Maputo City, the country capital, where Ministry of Health (MoH) is settled, and Maputo Province, being the closest to the provincial capital for comparison purposes. The researchers participated in this activities as members of the team, alongside with University of Oslo (UiO) staff and students, University Eduardo Mondlane (UEM) staff, MoH and provincial officials. During this period different sources of information were consulted, at different levels of the national health information system, namely National, Provincial, District and Facility levels. The data collection methods included also observation, a survey, informal interviews and documentation reviews.

As for the analysis phase, we adopted institutional lenses. We used a framework of Institutionalism, to identify and explore some of the institution pressures that emerged along the process, combined with a multi-level approach, considering for the micro level the piloted provinces and at the macro level the provincial capital of the country where the Ministry of Health is headquartered. Thus, in order to pursue a better understanding of how the institutional pressures enabled or constrained the changes that occurred over the time.

3 Findings and Discussion

Despite the duration of this implementation, we found along the process different successes and setbacks. While the pilot, in three provinces, did not result to an early adoption DHIS by the Mozambican HIS in phase 1, aims were partially successfully achieved with the institutionalization of the Masters Programs at UEM during phase 2 and with a late adoption of DHIS2 (second version) countrywide in phase 3. Both Master Programs are still being run until today, strengthening the capacity of both Informatics and Health
domain, providing training to MoH staff or other sectors within the Health Sector, and from other institutions from different domains. A note, worth mention, is regarding the involvement of the authors of this papers in the Master Programs, two participating as lecturers and the third as former student and currently a lecturer.

From this excerpt of the history, we were able to identify some institutional pressures playing a determinant role in the implementation of the technological artefacts, in relation with cultural aspects of the society, political strategies and technical constrains. In this section we discuss some of them an attempt an analysis on the implication of their combination, trying to pursue a better understanding of the institutional dynamics that had a determinant role to such undesirable outcome of this first efforts to implement DHIS2 in Mozambique.

We look at the fact that the artefact was being transferred as a development based in another context by a foreign team with a different language, the unfavourable technological conditions associated with the limited resources to support maintenance on site, while also the pressures from the donors financing the health sector having a determinant voice in the process and the lack of ownership by the local authorities, contributing as setbacks of this implementation, during phase 1. This implementation of DHIS is discussed as a transfer of technology [9] between two developing countries that, despite being neighbors, their settings differ in several aspects, such as languages and social structures, historical background and political regimes, social and economic development, for instance. Despite that, attempts were made to translate the artefact to adapt it to the actual context, but later other challenges emerged in relation of technical support. Locally it was limited to the implementation team and when they could not provide appropriate assistance things had to be handed out to the external developers in South Africa.

Worth of mention, is the fact that at the time the software being used to support the SIS was not supportive to the majority of the health programs. This lead to the non-desirable emergence of new and parallel systems financed by different donor and developed by different teams, which turn the scenario more complex to handle. As, Nhampossa [9] refers, “This multiplicity imposes pressure on the field level health workers to support parallel and not integrated channels of information flows through data collection and reporting [9].”

As being a country economically dependent of external aid, the political and economic interventions involved different donors in HIS strengthening efforts, and that led to different interactions between institutional, technological and human factors, which contributed to varying outcomes at different points of time relating to HIS development and implementation [6]. Indeed, the institutional pressures in the LMICs Health sector can be emphasized because the “Healthcare services… are usually provided in collaboration between national authorities, foreign aid agencies and non-government organizations” [4]. In Mozambique, as a LMIC the situation is not different. It’s “National Health System can be seen as a complex organizational structure involving many actors, from the international agencies to the Ministry” of Health “at the central level to the district and sub-districts at community level” [4]. In which, a “multiplicity of information systems… at the national level” [4] exists, and at the lower levels with “primarily paper-based” that are “required to satisfy the reporting needs of the health administrative hierarchy”... with the flow “shaped by the geographical location of the health facilities [8].”

One of the pressures that we identified in this process was related with MoH decision to adopt and assume this implementation as a priority and therefore assume ownership. As often seen, whenever an organization is pursuing to establish their initiatives, many other challenges can emerge posing as threats to its success, depending on the conditions in place and the influence of several actors. Wendt [13] suggests ‘conflict’ as one relevant concept that comes into play in this process, in the sense that “institutional environments are ‘conflicted’ and that institutional struggle is always part of institutionalization… processes”.

Looking through the perspective of conflicts, other issues may arise in the context of LMICs namely the ownership of systems, data and the information produced of that. According to Sahay [10] this can be a significant concern “for a variety of reasons given the multiplicity of actors involved”, the location of the data, “how data is used and reused, and the ambiguity of jurisdiction... these asymmetries play out at individual, organizational, and national levels, especially from the perspective of LMICs”. Taking into account that some Ministries of Health “are bound by regulations that health data should not leave their national boundaries” there might emerge conflicts between them and the donors, who assume to have ‘earned’ the ‘right’ to use it through their investments in the systems. While, on the other hand, the lack of expertise in the ministries to “deal with the technical and institutional issues…” might lead to reliance on external dependencies or abandoning the system [10].

According to Sahay [10] institutional pressures, such as values and meanings underpinning an IT innovation, can influence its adoption and implementation contributing to occurrence or not of
organizational changes. In turn, Sheikh [11] discusses the challenges related with institutionalization, “a concept from institutional theory... referring to a process” where the IS introduced blends into the organization and is presence and use become taken-for-granted. She suggests that, as similar to what happens to any other innovation, it requires “efforts and resources”, which in turn, “are either source or are results of the use of power” [11]. In this sense, we can see another type of pressure being exercised by the use of power, as Mosse & Byrne [7] explain: “Power is something people use and create rather than possess” and “...is expressed through the chosen discourse, through which we make meaning of and construct our world.”

Aside from the several contextual factors that affected directly or indirectly the process of implementation of DHIS risen within those studies, in the initial stages we observe the positioning of the MoH not being the motor but a partner in the process. In this case, this positioning was not supportive enough to achieve all the intents of the project, because even though permissions to go to the ground were in place, there was no formal notification to the pilot sites encouraging them and providing formal directions. According to Nhampossa [9] “…the use of the DHIS by the district authorities was very weak, because a formal sanction was not given by Maputo.” This, at some extent, could have been a major contributor to demotivate the health workers and, at the end, not to embrace the adoption of the technological artefact during phase 1. In turn, during phase 3, the MoH positioning was perceived as being different, while deciding to adopt DHIS2 and scaling it up for the entire country.

4 Contribution

While an initial contribution lies in the reconstruction of DHIS2 piece of history that will build awareness of the evolution of this technological artefact, a greater contribution stands for the broad domain of ICT4D. From this excerpt of the history, we were able to identify at least three types of institutional pressures playing determinant roles in the implementation of technological artefacts related with cultural aspects of the society, political strategies and technical constrains. A deeper analysis on the implication of their combination can be used to provide a better understanding of the institutional dynamics and provide insights to future implementation process of technological artefacts in within the context of developing countries.

5 References

T7

Innovative Ways for Digital Work
Information Flow Pathways for Rohingya Refugees: Challenges, Resilience and Innovations

Abdullah Hasan Safir¹ Faheem Hussain² P.J. Wall³

¹Brac Institute of Governance and Development (BIGD), Brac University, Dhaka, Bangladesh
²Arizona State University, USA
³ADAPT Center, Trinity College Dublin, Ireland

abdullah.safir@bracu.ac.bd
faheem.hussain@gmail.com
wallp2@tcd.ie

Abstract. This research seeks to sketch out a robust and dynamic information flow pathway in a Rohingya refugee camp in Bangladesh. This information flow pathway is based on the refugees’ usage of traditional and non-traditional means of communication and exchange information both inside and outside the camps. Challenges to this information flow include poor Internet connectivity, inadequate ICT infrastructure, and legal restrictions around the use of ICT by the refugees themselves. In order to map the existing information ecosystem for the Rohingyas, we identify and evaluate some of the most important innovations as well as the bottlenecks related to information access, usage, and dissemination within the refugee camps.

Keywords: Rohingya, ICT4D, digital innovation, Information Ecosystem, Bangladesh, refugees

1 Introduction

Bangladesh has seen the arrival of 750,000 forcibly displaced Rohingyas from Myanmar since 2017 [1]. Even before this most recent influx began, about 400,000 Rohingya refugees were already living in Bangladesh [2]. For decades, Rohingyas have been consistently persecuted and discriminated against by the army-led administrations in Myanmar with this systematic campaign ultimately resulting in ongoing and violent ethnic cleansing against the Rohingyas over the past few years [3]. The host communities within Bangladesh initially welcomed the Rohingyas, with makeshift refugee camps providing haven from the threats of violence, death, rape, and starvation experienced in Myanmar. The situation is now beginning to shift from one of welcome and emergency provision to a more structured emergency program designed to deal with a significant humanitarian development problem inside the camps in Bangladesh [4]. One of the most important parts of this evolving response is providing access to ICT and Internet connectivity for the refugees. This has proven to be challenging for several reasons including legal restrictions, high bandwidth costs, and the unavailability of telecommunications networks [5]. Rohingyas in this situation had been legally cut off
from the rest of the world by a ban on accessing the Internet and various other technology-related services until recent time. However, in practice on the ground in the various refugee camps illegal Internet connections were common, and many of the refugees have access to smartphones. This type of digital accessibility is important and widely recognized as a right, as opposed to a privilege, for refugees [6].

2 Fieldwork and Methodology

In December 2018, we conducted rigorous fieldwork in three separate Rohingya refugee camps - Balukhali, Ukhiya, Cox’s Bazar - in Bangladesh. Data was collected by a variety of methods including semi-structured interviews, focus group discussions, observation, informal conversation, and other engagement with the refugees themselves. We focused on a variety of age friendly spaces and women friendly spaces, mosques, markets, shops, pharmacies, as well as various streets and houses inside the camps. We also paid visits to different stakeholders’ offices, including UN organisations WFP, UNHCR, IOM, and various other NGOs such as BRAC, in an attempt to understand their individual perspectives. We talked to over 200 people during our field research. This included over 100 semi-structured interview respondents and 6 focus group discussions, consisting of a variety of different refugee age and gender groups, as well as various NGO employees and volunteers. Two of the focus groups discussions were with the young and adult males and another with young and elderly females. The focus of the discussions concerned Internet usage and access to various other digital tools in an attempt to understand participants’ perception about technology and connectivity to the outside world. The fourth focus group was with Rohingya Imams to understand the thoughts of religious leaders and their influence on women. The final two focus group discussions were with young and adult male Rohingyas and concentrated on access to information both inside and outside the camps. In addition, we conducted various in-place semi-structured interviews with various buyers and sellers connected with shops within the refugee camps that sell and repair mobile phones and memory cards with digital contents. This multi-sourcing of information allowed us to enrich our understanding beyond the respondents' biases by cross-checking and triangulation of data.

3 Findings and Discussion

From the data collected we began construction of an information flow pathway within the Rohingya refugee camps in Bangladesh. We first divided the information ecosystem into three domains: information providers, information intermediators, and information receivers. Inside these separate domains we examine the real-life applications, penetrations, appropriations, and impacts of digital platforms and online services, with specific focus on mobile telephony, social networks, and voice messaging apps from user demography perspective. It is important to note that refugees need to provide official identification documents as well as biometric information to purchase a SIM card in Bangladesh. This level of information is also required to go online and access any mobile network. Rohingyas officially do not possess such documents, and hence are
unable to use or buy Bangladeshi SIM cards legally. As an alternative, the government has offered all refugees access to free telephone booths within the refugee camps, but hardly anyone uses them [7]. Instead, illegal mobile phone service is the most popular mode of communication with many Rohingyas having procured Bangladeshi SIM cards through the black market at a significantly increased cost over what legal users are required to pay. Rohingya women are also struggling substantially while accessing digital services and information. Many lack the literacy and social connections to obtain and operate illegal SIM cards, leaving them heavily dependent on their limited social circle for such services. In addition, within the camps Rohingya women are often reluctant to avail of available services. This is in part from fear of repercussions from their social groups and by the religious authorities. These significant barriers are even higher when it comes to these women accessing the Internet. Amid this widespread scarcity of proper education and any information dissemination infrastructure within the camps, there has been a significant growth of makeshift mobile phone repair shops that fill this void by providing customized and on-demand digital content for the Rohingyas. These shops have proven to be popular destinations for young Rohingya men in particular, with the shops being heavily segregated against women. Although the shops provide a valuable service, we found that the digital content provided is often rife with fake news and misinformation.

Our research thus highlights two key gatekeepers in the information flow nexus who control both access to, and the content of, digital services and information within the refugee camps. These are: i) Rohingya religious leaders/Imams; and ii) the mobile phone repair and charging shops. To analyse their respective roles, we take guidance from the existing literature on the topic of ‘technological gatekeepers’ [8]. These key people are important in any information ecosystem as they mediate between the internal and external sphere and connect these spheres [9]. In the context of this paper, we posit that these two gatekeepers control digital content dissemination within the camps. They actively dictate who specifically can access such content, and they also set the price of all digital services and technology in this particular context. This is despite widespread recognition of the significant importance of such information and technology in this context. Our research framework and methodology provide a lens through which we can more clearly understand the asymmetry of information flow in this particular case. Such information flow and asymmetry within the Rohingya camps has emerged as an important and significant challenge, as sustainability and reliability of data and information flow is seen as a key component of education, business & innovation, and the provision of a stable governance within the camps. Robust, reliable and symmetric information infrastructure mechanisms will facilitate the Rohingyas in their transition from being passive recipients of data and information to active earners and learners inside the camps.

References

Algorithmic Management in the Gig Economy

Laura Schulze¹, Manuel Trenz¹, Chee-Wee Tan², and Zhao Cai³

¹ University of Goettingen, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany
² Copenhagen Business School, Howitzvej 60, 2000 Frederiksberg, Denmark
³ University of Nottingham Ningbo China, 199 Taikang East Road, Ningbo, 315100, China

Abstract. In the gig economy, jobs are decomposed into granular tasks and performed by independent workers on a temporary basis in exchange for payment. Digital platforms control and coordinate value co-creation between workers and clients in the gig economy by means of algorithmic management. To this end, this study aims to offer an in-depth appreciation of the ways by which gig economy platforms algorithmically manage the value co-creation process between workers and clients. We classify gigs and gig economy platforms based on characteristics pertinent to the latter’s choice of algorithmic management practices. In the next step, we will conduct focus groups with workers from multiple platforms representing different types of gig work and elicit algorithmic management practices being enacted. We expect to contribute to a more nuanced understanding of algorithmic management practices in the gig economy, thereby providing the basis for further research. Likewise, gig economy platforms could benefit from our identification of algorithmic management practices for mediating the type(s) of gig work being offered.

Keywords: Gig Economy, Algorithmic Management, Digital Platform.

1 Introduction

The shift of the conventional economic system to one in which workers are hired by clients on a temporary, payment-by-service basis via digital platforms to engage in value co-creation has attracted considerable interest among academics and practitioners. Termed as the ‘gig economy’, workers are increasingly turning to these platforms as a means of supplementing their existing income or a source of primary income. In the gig economy, labor markets are disintermediated to such an extent that predominant ways of creating value through purposeful work within traditional organizations is challenged. Whereas related tasks in organizations are often bundled into jobs and then assigned to workers, who are employed permanently with the requisite skillsets to perform these jobs [1, 2], the logic is reversed in the gig economy.

¹ Other terminologies in the likes of crowdsourcing, crowdwork, and the sharing economy have been employed to describe identical or similar phenomena. However, for this research-in-progress, we concentrate on the meaning of the gig economy as presented in the text and refrain from a more detailed distinction among the abovementioned concepts.
and jobs are decomposed into granular tasks or gigs [3]. Workers can access these gigs via digital platforms and earn money by applying their expertise to complete gigs of their choice. Consequently, gig economy platforms eliminate transaction costs [4, 5] by simplifying the match between suppliers of services (workers) and requesters of services (clients), removing overheads associated with work sourcing in organizations. While task-based work has existed in pre-industrial societies and also occurs in the form of non-standard work today [6, 7], digital platforms, by acting as a mediator between workers and clients, have redefined organizational structures to the extent to which new forms of organizing have emerged [8]. Particularly, gig economy platforms have reshaped worker-client relationships whereby both workers and clients enjoy substantial autonomy in selecting the exact party to transact with.

To manage the large number of independent workers and clients involved in a growing number of service transactions (gigs), gig economy “platforms exercise control through their design features and algorithms, which are a set of rules and routines that are coded and programmed with a set of instructions on how to perform the tasks” [4, p.5]. These practices, which are enacted by gig economy platforms to manage work, have been labelled algorithmic management (AM) [10]. The automation of work control and coordination at scale on gig economy platforms differs from centralized command-and-control governance structures in traditional organizations [3, 11]. Compared to traditional organizations, the optimization of service transactions is paramount for gig economy platforms such that AM practices are enacted exclusively to ensure the effective completion of gig work and manage individual workers. AM practices therefore differ significantly from other forms of coordination and control, such as scientific management [13] as well as bureaucratic and technical control [14].

Recent studies have primarily investigated AM in the gig economy from two directions. On the one hand, past studies have elucidated AM as a novel form of control and coordination as opposed to human management by presenting evidence of exemplary practices of AM on gig economy platforms and within organizations (e.g., [14, 15]). On the other hand, scholars have also conducted an in-depth analysis of selected platforms (e.g., [10, 16–18]) to uncover specific AM practices enacted by these platforms. Yet, despite the emphasis in previous scholarly discourse on prominent examples, such as Amazon Mechanical Turk or Uber, it is undeniable that the types of work available on gig economy platforms are much broader than those depicted in prior research [19–22]. As the type of work differs, the manner by which gig economy platforms can mediate the value creation process between workers and clients differs as well. For instance, Farshchian and Thomassen [23] discovered that the management of dementia healthcare service platforms is distinct from the way standardized services (e.g., Uber driving) – where communication is not pivotal, which do not require substantial training, and where long-term evaluations are unnecessary—are managed. Indeed, while prior research has sought to distinguish among multiple gig economy platforms, the focus mostly lies in the management of gig workers (e.g., [24, 25]) rather than the nature of the work accomplished on the platforms. Additionally, the distinction tends to be descriptive rather than prescriptive (e.g., [26]). Consistent with the emphasis on the transaction itself in transaction cost economics [4, 5] and Eisenhardt and Ouchi [27, 28] who alleged that the choice of organizational versus market control strategies depends on task characteristics (e.g., ability to measure outputs), we contend that
different types of gig work lend themselves to certain kinds of AM practices more than others. Because the entire service transaction revolves around the gig work being completed, its characteristics will inevitably dictate how it is managed. To this end, this study attempts to provide an answer to the following research question: *How does the nature of gig work influence the algorithmic management practices enacted by gig economy platforms?*

In addressing this question, we endeavor to offer a:

1. classification of gig archetypes that differentiates gigs according to the nature of their value creation, and;

2. deeper understanding of how AM practices are enacted for different gig archetypes and how these practices are perceived by workers.

In this research-in-progress paper, we present our classification of gig archetypes and outline our methodology for identifying corresponding AM practices.

## 2 Theoretical Perspective

We seek to contribute to the discourse on AM in the gig economy by illuminating the AM practices enacted by gig economy platforms to manage their gig offerings. Particularly, we espouse *Service-Dominant Logic* (SDL) [29–31] as the conceptual lens through which we scrutinize AM in the gig economy. Service-dominant logic states that resources are integrated in a way whereby value is co-created among actors through participation in service ecosystems which are, in turn, governed via institutional arrangements [29–31]. Extrapolated to the gig economy, this implies that value is co-created by three focal parties: the worker, the client, and the platform. Whereas workers apply their expertise to offer value-added services (i.e., gigs) for clients, clients participate in the value creation by describing requirements, specifying expectations, and supplying intermediate feedback whenever necessary. In turn, gig economy platforms shape the value creation process by delivering content and service functionalities to facilitate value co-creation between workers and clients [11]. Arguably, AM practices resemble institutional arrangements governing the value co-creation process. Insofar as gigs can be regarded as services from the lens of SDL, we can classify gig work based on their service attributes. Besides, SDL takes into account the entire value creation process of gigs, thereby embracing a broader view of AM which implies that platforms do not only manage the workers, but also the clients and the interactions between the workers, the clients, and the platform itself.

Although we examine the entire value co-creation process on gig economy platforms, this is accomplished from the standpoint of workers, because AM practices can be regarded as mandated work practices that are encoded in algorithms and must be adhered to by workers. As a consequence, it is conceivable that among the various stakeholders, workers are the ones who constitute the primary subjects of AM practices such that their ensuing behaviors in their work environments are governed by these practices. Subscribing to the workers’ viewpoint also aligns with extant literature on platform governance which delineates between attempted and realized control [32] as
well as the Human Resource Management (HRM) triad, which differentiates among intended, actual, and perceived HRM practices [33–35].

3 Classification of Gigs and Platforms

The basis of our study is the differential nature of gigs. We adhere to guidelines on taxonomy development [36] to arrive at a classification scheme for distinguishing gigs. Based on the distinction among different gig archetypes, we are then able to classify gig economy platforms accordingly. Our focus lies in gig characteristics that are pertinent to the algorithmic management of the gigs (meta-characteristic). Multiple coders iteratively went through the conceptual-to-empirical approach, and the empirical-to-conceptual approach, until consensus was attained. We assembled a sample of gigs for the classification scheme in three steps: First, we compiled a list of digital platforms mentioned in both academic (e.g., [20, 37]) and non-academic (e.g., [38, 39]) sources and deleted those which do not conform to our definition of gig economy platforms. Second, we extracted the gig offerings from these platforms and grouped them based on similarity. Third, we sampled specific gigs for each group and conducted an initial round of conceptual-to-empirical coding that is grounded in service and task characteristics advocated within extant literature on service [40] and control [27, 28] respectively. Through four subsequent rounds of coding by five raters, the classification was progressively altered and refined. The eventual classification scheme was then presented to three additional independent raters who reached an absolute agreement of 91%-93% on the four dimensions for a sample of 67 gigs.

Our eventual gig classification scheme distinguishes gigs along four dimensions and nine characteristics (see Table 1): namely location (location dependent vs. location independent), activity (predominantly physiological activities vs. predominantly cognitive activities vs. no dominance), feedback (intermediate feedback required vs. intermediate feedback not required), and credence (credence vs. non-credence). We submit that the characteristics identified in our classification scheme bear important implications for how gig economy platforms algorithmically manage the value creation process between workers and clients. For example, the management of remote work processes (e.g., content creation on Paypercontent) will likely differ from their location dependent counterparts (e.g., driving on Uber). In this sense, the classification scheme allows us to differentiate among 24 gig archetypes. On the basis of these gig archetypes, gig economy platforms can be further distinguished based on the combination of gigs being offered. If there is only one archetype of gigs being offered on a gig economy platform, we refer to it as a specialized platform. Conversely, if there are multiple archetypes of gigs being offered on the gig economy platform, it will be treated as a general platform. Of the 144 digital platforms conforming to our definition of gig economy platforms, 108 (75%) are specialized and 36 (25%) are general platforms.
Table 1. Classification of gigs and exemplary specialized platforms.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Characteristic</th>
<th>Exemplary platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: Extent to which performing the gig has to take place at a predetermined location</td>
<td>Location dependent</td>
<td>Uber</td>
</tr>
<tr>
<td></td>
<td>Location independent</td>
<td>Paypercontent</td>
</tr>
<tr>
<td>Activity: Extent to which performing the gig involves predominantly physiological activities, predominantly cognitive activities, or an equal mix of the two</td>
<td>Predominantly physiological activities</td>
<td>Soothe</td>
</tr>
<tr>
<td></td>
<td>Predominantly cognitive activities</td>
<td>Catalant</td>
</tr>
<tr>
<td></td>
<td>No dominance</td>
<td>BeMyEye</td>
</tr>
<tr>
<td>Feedback: Extent to which performing the gig requires intermediate feedback from the client</td>
<td>Intermediate feedback required</td>
<td>99designs</td>
</tr>
<tr>
<td></td>
<td>Intermediate feedback not required</td>
<td>Postmates</td>
</tr>
<tr>
<td>Credence: Extent to which the client is able to assess the quality of the completed gig or if the assessment of gig quality involves important long-term criteria or other uncertainties</td>
<td>Credence</td>
<td>Wag</td>
</tr>
<tr>
<td></td>
<td>Non-credence</td>
<td>JobBoy</td>
</tr>
</tbody>
</table>

4 Methodology and Expected Contribution

In the next step, we plan to conduct focus groups to interview workers of gig economy platforms and elicit AM practices enacted by these platforms to manage the value co-creation process. By granting access to participants’ views, opinions and experiences, focus groups support collective sensemaking [41]. The rich data generated in the focus groups will deepen our understanding of the AM practices experienced by participants according to the different types of gigs they perform. We plan to cover all characteristics that constitute the 24 gig archetypes we identified, while at the same time managing the number of participants and focus groups by employing a discrete choice modeling approach for selecting participants. In the focus groups, we plan to ascertain discrepancies in AM practices by asking participants to recall practices encompassing all aspects of their work processes on the gig economy platforms. The service value chain framework [42, 43] will guide us in structuring the focus group by making sure that we have an adequate coverage of key aspects of the value creation process.

The intended outcome of the research project after data collection and analysis will be a contribution to extant literature in the form of a comprehensive classification of the nature of gigs and gig economy platforms, which in turn aids in advancing the
discourse on the gig economy. Additionally, the choice of AM practices enacted by gig economy platforms in response to the nature of gigs being offered will be made clear as well. In so doing, it opens a path for future research to scrutinize consequences of AM practices for workers. Findings from our study can also inform practitioners on the appropriate AM practices to be enacted for optimizing value co-creation on gig economy platforms.

References


Community Perspectives as an Essential Element of Resilience Thinking: Resilience from a View of Inequality

Sifiso Dlamini¹,² [0000-0002-3756-4980], Isabel Meyer³ [0000-0003-3338-754X]

¹ CSIR NGEI, Meiring Naude Rd Pretoria, South Africa,
² Department of Informatics, University of Pretoria, Pretoria 0001, South Africa
³ CSIR Smart Mobility, Meiring Naude Rd Pretoria, South Africa

Email: sdlamini@csir.co.za; imeyer@csir.co.za

Abstract. Resilience is a popular concept in development studies, particularly in research and development on how Information and Communication Technologies (ICTs) can be used to improve livelihoods. As much as the primary focus is on using ICTs to deliver services in sectors that operate in resource-constrained environments, the question of inequality remains a key consideration. One of the challenges that faces the future of the ICT-related development of communities is the perspectives and perceptions of researchers on communities, particularly in developing countries with remote rural areas. Taking a resilience view on community without addressing the question of inequality leads to biased resilience strategies in the rural communities of developing countries. This paper presents thinking from an ongoing research study that aims to develop a resilience framework and guidelines for the introduction and use of mobile technologies in South African rural schools.

Keywords: Resilience, Inequality, Rural Communities, ICTs

1 Introduction

There is a continuous contestation in development studies on what resilience is and what the nature of its strategies should be in order to deliver appropriate development outcomes. In this study, resilience frameworks and strategies refer to the approaches that are used to enhance the ability of communities to develop themselves in the face of continuous changes and challenges. They are used in the context of balancing external interventions (such as technology projects) that intend to “deliver” change, with change that is aligned with, and driven by, community objectives. This paper presents the importance of taking a community perspective when developing resilience frameworks and strategies. It presents research in progress on a study that aims to develop a resilience framework for integrating and using mobile technologies in South African public rural schools. There has been an increase in resilience thinking in academic fields such as development studies, and in research fields such as Information and Communication Technologies for Development (ICT4D), with a focus on the role of ICTs in communities. Various frameworks and models have been developed for building resilience, for example, the RABIT framework by Heeks and Ospi-
na [1], and the frameworks by Lerch [2] and the Society for Community research and Action [3].

The study that informs this paper has identified three challenges associated with resilience thinking and communities. The first challenge is the existence of varying levels of inequalities in communities, which indicates that communities should not be treated as if they are equal and their asset and resource bases are the same. The second challenge is that resilience frameworks and strategies are developed without engagement and consultation with the communities in question. The third challenge is that the definitions of resilience that are used to guide the development of strategies and frameworks have a limited community focus. The focus is often on a system that needs to be resilient, which will in turn ensure the resilience of project or the system, and not the resilience of the community. This paper advocates for a need to understand and define different types of communities, based on their access to technologies and other services, and for a need to ensure adequate engagement so that the resilience framework and strategies can speak to the needs and interests of the benefiting communities. It first gives a brief summary of the mobile education project (Section 3), followed by an overview of the use of the concepts of resilience (Section 4) and community (Section 5) in development. Section 6 summarises the focus of future work.

2 Resilience and ICT in Education

South Africa has seen a number of ICT for education initiatives, which were introduced by the education department in partnership with research institutions and other government departments. Most of these initiatives aim to deliver mobile technologies to remote rural communities, which are classified as resource-constrained environments. They involve provision of mobile technologies and other technology infrastructure to enable 21st century learning environments [4]. The scope and nature of the interventions vary. Some initiatives provide technology without focusing on teacher development, while others couple the delivery of ICT with training to ensure that the technology supplements good teaching skills. However, the challenge is that, regardless of the type and nature of the intervention (technology only, or technology and training), the failure rate is high [5]. Earlier studies that have focused on the introduction of technologies in rural schools have described this as a sustainability problem, which includes the challenge that the schools are not empowered to drive the initiatives by themselves [6-8].

The inability of schools to manage interventions is evident from the collapse of the projects when the funder and research team hand it over to the school to manage. While various academic studies have focused on how to ensure the sustainability of ICT-related initiatives[6, 9], current practice remains, with high failure rates. This study takes the view that building resilience at school and community level increases
the probability that initiatives can be introduced that can be jointly supported by the school and the community. Resilience inherently ensures inclusivity, whereby various stakeholders can jointly support the schools, thus resulting in a resilient, thriving school despite limited support from national education structures. While sustainability studies focused mainly on the project and the school, resilience focuses on the school, available ICT resources, and how the surrounding environment can support the school to thrive.

3 The Use of Resilience in the Development Context

Resilience, similar to sustainability, is a complex concept that is used to guide the equally complex environment of development interventions. Its interpretation in models and frameworks, and the subsequent application thereof, has the potential to influence development outcomes. However, the concept of resilience is ill-defined and broadly interpreted, and is used in an almost ad-hoc and inconclusive manner in literature. Definitions and interpretations vary across a broad spectrum, with some authors interpreting resilience as the ability to recover from shocks [10] and others emphasizing its evolutionary nature and continuous adaptation to changing environments [11]. Such definitions can be considered as preventing consensus by being too broad, and role players are not clear as to how they see the ‘end state’ of resilience [12]. Resilience tends to be used as a buzzword, and much is written about resilience without being clear on what resilience is [13].

Where resilience is defined, the perspectives are in some cases partial, and the complexity of the environment in which it is applied is overlooked. Even in contexts where the community is the focus, researchers spend significant time to find definitions that suit the research agenda, instead of focusing on strategies to enhance community resilience. While some authors, such as Heeks and Ospina [14], are unclear on their epistemological stance on resilience, others overlook societal complexities and use technical-reductionist frameworks that are ‘based on unchallenged assumptions of society’ [15]. The lack of clarity in terms of its definition and role influences the application of resilience in practice. The same applies to the question of what we really mean when we think and write about the resilience of communities. This lack of clarity and focus potentially results in inappropriate development spend. Importantly, the inappropriate application of concepts in development raises ethical questions on the conceptual basis upon which practitioners intervene in, or influence, communities.

The challenge associated with the complexity of resilience and how it is used is further exacerbated by the high-level view that is taken on community. Below is an indication of how the resilience frameworks that have been employed in the development context use the word community, while the term (community) is in itself a complex construct.
Table 1 Application of community focused resilience frameworks

<table>
<thead>
<tr>
<th>Reference &amp; application</th>
<th>Perspective</th>
<th>Framework</th>
<th>Use of framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashmore et al [16]</td>
<td>Social/ psychological resilience A multi-dimensional construct; process view.</td>
<td>Has multiple dimensions, with equal attention to dimensions.</td>
<td>Develop understanding of development opportunities and identify impact of policies.</td>
</tr>
<tr>
<td>Community development &amp; ICT access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heeks and Ospina [14, 17]</td>
<td>Community resilience The ability to withstand and recover from short-term shocks, and to adapt to long-term trends. Communities are adaptive systems.</td>
<td>Comprises foundational and enabling sub-properties or resilience.</td>
<td>Use framework to evaluate an ICT project pre, during, and after implementation, and as measurement and benchmarking tool.</td>
</tr>
<tr>
<td>Ospina et al. [18] Low-income urban communities</td>
<td></td>
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<tr>
<td>Martey [19] Urban Climate Change</td>
<td>Urban climate change resilience (UCCR) An approach to reduce vulnerability at the societal and household levels (Baker, 2011).</td>
<td>Uses seven entry points into the city to translate the theoretical UCCR into practice, considering seven different qualities.</td>
<td>Assess status with respect to a technology aspect and highlight areas where technology could have a greater effect.</td>
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<tr>
<td>Roberts et al. [20] ICT policy analysis</td>
<td>Community resilience The capacity of individuals and communities to proactively adapt to constant change through processes of building capacity and resources.</td>
<td>Integrates three dimensions of resilience (multi-scalar, normative assumptions, integrated and place-sensitive); resource and a process view.</td>
<td>Analyse and identify policy gaps.</td>
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</tbody>
</table>
4 A need to revisit the role of communities when building resilience

There has been various attempts in development studies to define communities. One of the widely used definitions is that of The International Federation of Red Cross and Red Crescent Societies [21], which defines a community as a group of people who may or may not live within the same area, village or neighbourhood, and share a similar culture, habits and resources. Communities are groups of people who are also exposed to the same threats and risks such as disease, political and economic considerations, and natural disasters” [21]. The first part of the definition takes a collective perspective on what constitutes a community, but still lacks a classification. When a community is used as an area of focus where resilience is to be achieved, there has to be a clear classification of the community in question.

The use of the term community in development studies and in ICT4D introduces a problem of definition when applied in developing countries. In South Africa, for instance, the word community may refer to people who live in a particular geographical area or people who share interests or identity. In developmental studies, there is often mention of the word community, which may refer to a wider geographical coverage or a small geographical location. The introduction of the term resilience, in combination with a vague term such as community, introduces a complex assumption that leaves the reader to assume what community resilience really means. Patel's [22] study considered how the term community resilience contributes to our thinking of development across disciplines. His findings indicate that community resilience remains a challenging concept that is understood and applied differently by various scholars and researchers. The study made a contribution by discovering that, although there is still no consensus about what community resilience is or should be, there are well-understood elements that are widely proposed as important for a resilient community. He therefore proposes to use elements of what constitutes a resilient community, rather than to treat it as an ill-defined concept.

Further progress has been made in the research and development on what the elements of community resilience should be. One of the progressive steps in defining the role of community in building resilience is that of the Society for Community Research and Action (SCRA) [3], which combined the sustainable livelihoods approach and community capitals framework in contributing to the community resilience literature. In this process, the SCRA [3] identified the seven capitals listed in Table 2.
Table 2 Capitals for Community Resilience (SCRA [3])

<table>
<thead>
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<th>SCRA Capitals for community resilience</th>
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<tr>
<td><strong>Capitals</strong></td>
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<td>Natural Capitals</td>
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<td>Cultural Capitals</td>
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The capitals outlined above could form a basis on which to differentiate different communities, to define their resilience, and to measure progress towards increasing resilience.

4. Conclusion

Similar to resilience, the term community resilience continues to pose challenges on what the role of the community is in building community resilience. For development outcomes in building community resilience to be achieved, there is a need to develop a consensus on what community resilience is. The most significant challenge is that the widely used definitions of communities in development studies do not speak to the classification of rural communities in developing countries, and the question of inequality is often left out. As such, the study in question aims to contribute to the body of knowledge in ICT4D specifically, and developmental studies in general, by developing a resilience framework that speaks to the core of communities in a deep rural area, resource-constrained environment. Taking such an approach will enable the design of development outcomes that speaks to marginalised communities by addressing their needs, without generalising by using either the word community or the concept of resilience as umbrella terms. The study acknowledges the fact that previous work has identified elements that are considered as essential to the development of community resilience. However, the challenge is that these do not speak to the level of inequality of communities in developing countries. This will be a key element of future work.
References


Cultivating data: Practices of coping with imperfect representations in machine learning development

Tomislav Karacic, Anastasia Sergeeva, and Marleen Huysman

1 Vrije Universiteit Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands
t.karacic@vu.nl

1. Introduction

Data work refers to practices of organizing, analyzing, judging, and decision-making concerning data [1, 2]. Research on data work emerged to emphasize that, instead of viewing data as an independently existing entity, it is important to make visible the practices through which data comes about [3, 4]. Studies on data work since then showed that such practices require much effort, involve human judgment [5], reflect political choices [6], and sometimes require intensive sensemaking involving multiple stakeholders to put the data in context [7]. One of the characteristics of data is the inability to capture the complexity of the phenomena it stands for [8, 9]. For example, Bailey et al. [9] show that in simulations, when representations of vehicles do not match their referents and there is no way to empirically validate them, engineers can...
neither analyze vehicle performance in an informative way nor find solutions to known problems. Similarly, Monteiro et al. [8, 10] find that sensors detecting sand in oil wells located at the deep-sea levels need to be continuously verified, while representations they produce require expert interpretation accounting for the context of production. Thus, representations cannot reliably stand for their referents, as they are unable to portray the full complexity of the phenomenon they represent. What has been underexplored is how practitioners deal with the issues of working with imperfect representations. So, our research question is: How do practitioners cope with the “imperfect nature” of representations and what practices do they employ to overcome challenges associated with it?

In this study, we address this question by studying a case of machine learning (ML) development for agriculture, which is an exemplar case of imperfect representations given how complex the representations of natural environments are, and a suitable case for studying data work, given how consequential data choices are for the resulting ML models. What emerged from our case is that, when facing imperfect representations, the teams engaged in practices that included an intricate interplay between the expertise of the domain on the one hand and the expertise of data science on the other. The implication of our study is that, beyond the importance of knowing the domain, ML developer teams need to consider the hybrid expertise that interlaces both domain and data science knowledge. Our study also brings in the argument from the data work studies to the discussions on ML: it highlights that it takes “work” and effort to produce datasets for ML and additionally illustrates how consequential the hybrid expertise is for this step in the process.

2. Case description and Findings

Our study follows four teams developing ML solutions for agricultural challenges, in the context of a hackathon. So far, we conducted thirteen semi-structured interviews with participants (~1 hour each), collected the datasets and codes they used, collected four introductory webinars (~30 minutes each), and observed two final hackathon events (~2.5 hours each). From this data, we gained insights into how participants collaborated and used their expertise, as well as relied on knowledge of others to develop solutions for their respective challenges. For the considerations of space, we present here our findings¹ from one of the teams: Predicting the Desert Locust Outbreak. The team had seven participants: four remote sensing specialists, one agricultural business owner, one academic agronomist, and one data journalist.

The goal of the challenge was to explore remote sensing and ML tools for creating an outbreak warning system; to prevent the threat to the livelihood of farmers in East Africa. Figure 1 illustrates the spread of outbreaks and Figure 2 presents the lo-

¹ The coping practices we describe seem to emerge in all four hackathon teams we are currently systematically analysing.
cust, illustrating its small size. Currently, it is impossible to track the movement of locusts from the ground, because a swarm can grow hundreds of square kilometers in size and travel hundreds of kilometres in a day. The team involved in the challenge aimed at using ML to analyze remote sensing images in order to produce danger heat-maps. A major obstacle was to come up with a representation of the desert locust in an ML workable way. The issue is that the locust cannot be directly observed through remote sensing. So, the team had to find a suitable proxy representation.

We found that while coping with the task of producing a representation of a highly complex natural phenomenon such as locust, an interplay between domain and data science expertise became important. In our case, we identify three ways of coping with such inherently imperfect representations: i) digging into the domain knowledge, ii) probing how representations link to reality, and iii) patching up representations.

Digging into the domain knowledge is a process of searching for knowledge about the phenomena in an effort to understand it and infer potential ways of representing it. Since natural phenomena are embedded in the complex natural world and may not be observable directly, measurement of related phenomena may be used as potential proxies.

The team first dug into knowledge about locust. While perusing academic articles, they found that one important related phenomenon was the amount of vegetation in the area, which was possible to capture via satellite. From academic articles and research, they discovered that, since the danger with the locust is precisely in it eating vast amounts of vegetation, sudden and widespread changes in vegetation were known to be linked to the locust infestation. Furthermore, they found that the desert locust numbers and movement are linked to rain since locust tends to lay eggs in moist areas. Thus, the weather also emerged as relevant for capturing locusts’ move-

![Figure 1](image1.png)  
![Figure 2](image2.png)
ment. In this example, we can see how domain knowledge is essential for exploring proxy representations by uncovering locusts’ embeddedness in the environment.

Probing how representations link to reality involves exploring how different representations can succeed or fail in capturing a phenomenon. Such exploring is done by relating the technical specifics of how representations are produced with what is known about the phenomena. So, probing the referential link inherently involves an interplay between domain expertise with data science expertise.

While considering vegetation as a proxy, they evaluated if they can use the satellite images to map vegetation changes, thus indirectly following the locust. A remote specialist from Ethiopia who was part of the group pointed out that the satellite imagery has issues of so-called “cloud cover” (clouds stand in a way of the light being reflected from Earth), and therefore creates poor representations of vegetation during rain. Relating it to how locusts react to rains, the team concluded that despite satellite imagery being a natural choice, its limitations were too severe: satellites miss essential information on vegetation. Concerning the weather, the French remote sensing specialist cautioned that including all variables would render their model too complex, so they limited their collection to the three most impactful variables (temperature, precipitation, soil moisture), a choice they made based on the literature. Thus, the team’s data choices were guided by the knowledge of both the domain, in selecting relevant representations, as well as data science expertise, in limiting the amount of data they included in their data set.

Patching up representations involves relating several representations to each other in the light of collected knowledge. It results in the production of representations that are able to capture the phenomena in more detail. Importantly, domain knowledge plays a role in the patching up of the representations, since prioritization of certain representations over others or finding correlations is guided by which features of the phenomenon the patched representation should capture. It is the domain knowledge that informs the choice of a certain patch, while data science expertise guides the determining a workable way of implementing it.

While searching for alternatives to satellite, a remote specialist from France informed the group that they could use radar images which could provide information about the vegetation without the interference of rain and clouds. Yet, radar images had their own limitations: they cannot differentiate between two objects of the same texture, thus not capturing important aspects of vegetation, e.g., plant health and transpiration rate. So, they integrated the satellite and radar representations of vegetation to improve on the deficiencies of both. By patching up the radar’s textural data with the satellite’s vegetation data, new representations were produced that did not contain cloud cover, while they captured the volume of vegetation. The team also included the weather data in their model, by calculating the correlation between weather variables with locust presence data. After computing the weights, they were applied to weather variables during model training. Thus, they combined the weather and GPS data into a representation that can be fed to the algorithm. In patching, the team drew on their knowledge of the locust to determine which representations are important to relate. Because they decided that it is important to capture information on the vegetation
during rainy periods and that climate influences locust behavior, they turned to their data science expertise to include patches that will capture that information in their representation of the locust movement.

As we illustrate with our case study, producing a workable representation of a natural phenomenon involves an intricate interplay between domain expertise and data science expertise. By relying on these three ways of coping with imperfect representations, the team managed to produce a proxy representation for the desert locust by continuously relating and evaluating the potential representations of the targeted aspects of the natural environment.

3. Conclusion

Our case shows that both domain and data science expertise play a role in coping with imperfect representations by guiding the search for representations and making data choices, which is increasingly important given that ML depends on the availability of workable representations that capture the target phenomena in an informative way. Our findings have implications for how we understand machine learning development, as well as how to train experts and organize collaboration between them. Beyond showing that domain expertise matters for making ML meaningful [5, 11] our case additionally emphasizes how data science expertise is enrolled as its companion. On the one hand, digging into the domain helps developers learn more about underlying phenomena. On the other hand, filtering and evaluating relevant pieces of that domain knowledge is performed with references to technical specifications of how to capture this knowledge by data. Moreover, it is by cycling between knowing the domain and knowing how representations are produced, that developers make their filtering choices and discover “imperfections” of the data in the first place. Our study also informs the scholarship on representations by further explaining practices of dealing with their imperfections. While representations are known to be socially, politically, and materially constructed [3, 4, 8, 9] less is known about the work that goes into coping with, and overcoming, their limitations. We show that this work involves interlacing between domain and data science. In our case, it was the specialists with different backgrounds and perusing academic articles who brought in the required expertise, but in other settings, such hybrid expertise may be instantiated in one person or distributed across teams. Future research should look into how these hybrid expertise practices manifest in different settings and how these practices differ depending on the nature of the phenomena they are trying to capture.

References


Imagining Hope: Exploring Self-Representations of Vulnerable Migrants on Social Media

Mette Von Deden, Loughborough University
m.von-deden@lboro.ac.uk

Silvia Masiero, University of Oslo
silvima@ifi.uio.no

M. N. Ravishankar, Loughborough University
m.n.ravishankar@lboro.ac.uk

Abstract: while the use of digital technology among resettled migrants has been researched across disciplines, migrants’ agency is often erased from the picture. In this paper, we use the agential notion of imaginative horizons to investigate how vulnerable migrants represent themselves, their lifeworlds and aspirations on social media. Drawing on digital ethnography combined with 6-month fieldwork with recently resettled migrants in Southern Italy, we elicit three themes – posterity and materiality; morality and religious practice; and political statements and opinions – as core of respondents’ social media representations. All these themes are traversed by the domain of hope, which comes across as a common matrix of the web imaginaries explored. As a result, we contribute to research on hope in ICT4D by using the notion of imaginative horizons to illuminate depictions of hope in respondents’ voices.

Keywords: ICT4D; hope; imaginaries; migrants; social media

1 Introduction

Forced international migration is one of the most pressing issues of our time, with an estimated 86.5 million people forcibly displaced worldwide (UNHCR, 2019). As vulnerable migrants often face difficult processes of settlement and integration in host countries (Diaz-Andrade & Doolin, 2016), social media offer them a unique arena for a narrative construction of the self, preserving identities which are constantly threatened by the dismissal suffered in host societies. Giddens (1990) speaks of identity as “symbolic construction”, which helps people find their own place and preserve continuity with their perceived selves. A recent stream of research investigates the role of ICTs for migration (cf. Diaz-Andrade & Doolin, 2016, 2019; Latonero & Kift, 2018; Leurs, 2019) which include the use of social media by migrants and refugees.

Social networking sites such as Facebook, Instagram or Twitter have become popular arenas in which users can construct and perform their chosen identities online (Risam, 2018). In this paper we focus on use of social media platforms by vulnerable migrants, and specifically what their self-representations on social media reveal about
their lifeworlds, hopes and aspirations. We use Crapanzano’s (2004) theoretical notion of imaginative horizons, which offers powerful tools to investigate the formation and representation of human imaginaries. Crapanzano conceives of imaginative horizons as the blurry boundaries that separate the here and now from what lies beyond it in time and space, and determine not only what is experienced but also how experience is interpreted. The theoretical notion of imaginative horizons leads us to ask: how do undocumented migrants represent themselves on social media and what imaginaries do they represent?

Investigating migrant imaginaries as self-representation on social media platforms provides an important glimpse into what is at stake for undocumented migrants trying to gain a foothold in society. Specifically, migrant representations in the public are often portrayed through images of human distress, depicting vulnerable migrants as passive humans in need (Malkki, 1995) rather than agentive participants of mediascapes (Georgiou, 2018). This erases migrants’ agency from the picture, an issue that our research addresses by the agency-centred notion of imaginative horizons. For this reason, this paper is also an attempt to provide new insights and visibility into the lifeworlds and imaginaries of a social group subject to much contemporary public and political debate, but often silenced and seldom heard.

2 Data Collection and Analysis

Data collection for this study was carried out from 2018 to 2020 and builds on a combination of ethnographic fieldwork and digital ethnography (Pink, 2016). The study was structured around 52 West African undocumented migrants who lived in rural areas of South Italy. The first author has conducted six months of in-depth ethnographic fieldwork with the migrants’ community in South Italy, then staying in touch with her respondents after fieldwork through several channels, including the social media where the representations investigated here have been produced.

Primary research methods were participant observation in the local context of the migrants’ lives involving ‘deep hanging out’ (e.g., Geertz, 1998) and interviews. Online data were collected using an ethnographic approach where we observed informants’ digital practices on social media platforms (Pink, 2016). We analysed more than 500 screenshots of relevant posts and videos, and 47 interviews were conducted with the migrants in their homes. These ranged from 30 to 120 minutes and the far majority were recorded to be used for later data analysis.

To contextualise the lifeworlds of migrants, 27 interviews were conducted among secondary informants consisting of locals, programme officials, NGOs and other refugee groups. The analytical process was multifaceted and was produced through stages of writing: writing of field notes (taking notes and collecting information), writing out data (sorting and exploring the notes written down and collected), and writing up in preparation for presentation (Madden, 2010). The research received institutional approval and adhered to the ethical guidelines of the American Anthropological Association Code of Ethics, 2019.
3 Findings

Early findings show three consistent themes in our respondents’ self-representations on social media. These revolve around (1) posterity and materiality; (2) morality and religious practice; (3) political statements and opinions. The domain of hope, traversing all themes, acts as a common matrix for the representations involved.

1. Posterity and materiality. Many of our respondents portray images of success and posterity as a result of their “new” life in Europe. Numerous posts consist of self-portraits with or without the poster’s significant other and/or children. Backgrounds seem carefully selected, with the poster typically standing next to an expensive car or a beautiful house. There is a clear element of celebration of the “good” life portrayed, which groups these images as a common theme. It is noteworthy that, when comparing these images to observed everyday life practices, the self-portraits appear fanciful, only partially representing the observed reality of the community.

2. Morality and religious practice. Another common theme across media representations is that of expressing faith and their love for the poster’s mothers and brothers. Many of the migrants are Muslim and devoted to Allah, or Jesus in the case of the Christians. Many Muslim migrants use the app “Muslim Pro” to get the prayer times at their specific location, and the Qibla direction. Posts resembling religious posts comprise those about gratitude to life itself. One example is a post from one of the informants who uploaded a post about his gratitude to a specific Spanish lifeguard who had rescued him at sea.

3. Political statements and opinions. In a third common theme, we find that our respondents use social media as a forum to express political statements and their views, which are often in opposition to current European migration policies. Focus on the oppression of black people tends to be strong with clear historical undertones of colonial times, the slave trade and contemporary African migration into Europe. Often, one will see posts on rescue operations of migrants in sinking wooden boats in the middle of the big deep blue Mediterranean Sea. Some also try to form unions and online communities, especially in opposition to the oppressive policies enacted in Italy at the time of the research.

The domain of hope appears in all three themes, and emerges as a pervasive feature of our respondents’ imaginaries. In the first theme, representations of the “good life” are imbued with aspirations for it, aspirations that however clash with the rougher daily life observed in the resettled community. Representations of religious practice portray the concept of hope for a “better life” from a spiritual dimension, where the posters’ faith is represented through images and statements of religious devotion. When it comes to political representations, hope is substantiated into the intention and, in some cases, enactment of activist practices: politically involved migrants seek to build a more livable world for themselves and their communities, and see political action as an organisational means to achieve this.
4 Expected Contribution

Heeks and Krishna (2016) note the limited relevance of the theme of hope in academic research, with just little research on it in development studies. Such limited relevance clashes with the importance of hope for subjects in development and ICT4D, empirically elicited across the literature and indeed, in our research with resettled migrants. Against this backdrop, Heeks and Krishna (2016) build a first framework for studying hope in ICT4D, a framework that invites further substantiation through empirical work and analyses. In this paper, we use Crapanzano’s (2004) imaginative horizons as a theoretical device to research hope, as it features in the self-representations of our migrant respondents on social media platforms.

While based on in-depth fieldwork whose data collection phase is concluded, our research is now in the phase of refining analytical categories and arriving at a complete map of the themes emerged from the data. As we do so, we stress the agential role of our respondents, marking the transition between objectified victims and active agents articulating their views. The notion of hope emerging here has an emancipatory value, which converts into aspiration and provides our respondents with the epistemic basis for building new lives. We hence propose the notion of imaginative horizons as a theoretical device to research hope in ICT4D.

References


T8

Public Side Digital Work
Sustaining The Actualized Value Propositions of Implemented E-government Projects in Sub-Saharan Africa

Yusuf Chidama\textsuperscript{1}[0000-0002-7733-2690] and Chidi Ononihu\textsuperscript{2}[0000-0003-1803-8085]

\textsuperscript{1}American University of Nigeria, Yola, Nigeria
\textsuperscript{2}American University of Nigeria, Yola, Nigeria
yusuf.chidama@aun.edu.ng

Abstract. Governments in emerging economies have implemented e-government projects that are funded by host governments or donor agencies in Sub-Saharan Africa. Achieving sustainable and robust e-government value propositions that are citizens-centric are becoming problematic leading to unrealized values over-time. Some scanty studies have been done on the value propositions of such implemented projects but they lack theoretical underpinnings. Consequently, drawing from theory of affordance actualization and a program theory of realist evaluation, we conduct an evidence-based theory driven evaluation of implemented e-government projects in Rwanda and Nigeria using focus interviews and archival documents. We aim to identify the actualized value proposition of such implemented projects, mechanisms and enabling conditions that could sustain such value propositions in the investigative contexts.

Keywords: E-government, value propositions, realist evaluation.

1 Introduction

There is an increasing scarce resources at the disposal of governments in emerging economies [1], and citizens’ expectations for quality service delivery is continuously rising. Government plays pivotal role in delivery of efficient, effective and prompt services [2]. With the pervasive and emergent role that information and communication technologies (ICTs) play in disruptive quality service delivery; governments in developed world and in emerging economies are adopting ICTs projects in public sectors in the form of e-government [3]. Robust quality e-government value propositions that improve service delivery to citizens are increasing in sub-Saharan Africa [4]. Examples are the Rwandan e-government initiative known as Irembo, (meaning “access” in local language) and various e-government initiatives in Nigeria such as the Immigration e-passport service, but sustaining them are becoming problematic [5]. Value propositions take various shapes from previous works such as business value, customers’ value that manifest as brand awareness, security and privacy protection or customers’ easy access to products when it comes to e-business. However, when particularized to e-government, it can come in the form of public trust and improving governance. As such, value proposition is perceived to be a means of accommodating all dimensions of government’s performance to prove its relevance to stakeholders. Besides, such value propositions are also anchored on the capability of e-government projects to actualize different needs of stakeholders and deliver services they value most; thereby legitimizing and sustaining the implementation of the projects [6]. Sustaining e-government projects
here is leveraging the existing structures, processes and resources associated with the implemented e-government projects [7]. By doing so, such projects continue to deliver the value propositions outcomes in an effective manner, over time, in a given context for the benefits of the stakeholders and to build local capacities [8]. Most e-government projects funded by World Bank, G20, and donor agencies such as Bill and Melinda foundation [6] have been underutilized by the host countries. Besides, anecdotal evidence has shown that after handover of the e-government projects to the appropriate host countries, the envisaged value propositions are partially actualized or not actualized at all [9]. Some scanty attempts by literature to uncover these were seen to lack theoretical underpinnings [10, 11]. Thus, there is a need to conduct an evidence-based theory driven evaluation of such projects in order to understand what works (what are the citizens actualized values), for whom (stakeholders), why (what mechanisms get such actualized values sustained), and under what contextual conditions (institutional, socio-cultural, economic and wider administrative contexts). Whereas different Information System (IS) evaluation frameworks have emerged and used in e-government domain, literature reiterates the dearth of evidence-based, theory driven evaluation to inform policy makers, especially in sub-Saharan Africa [12]. Thus, this study aims to understand “How the actualized value propositions of implemented e-government projects in sub-Saharan Africa can be sustained and under what conditions, and why?” The investigative contexts for the research is the Nigerian and Rwandan implemented e-government projects. In response to our research aim, the following research questions (RQ) will guide the research.

RQ1 Do citizen-centric value propositions of implemented e-government projects in sub-Saharan African counties of Rwanda and Nigeria exist? And if they exist how can they be sustained?

RQ2 What mechanisms are in interaction to cause the sustenance of such value propositions?

RQ3 Under what contextual conditions can such value propositions be sustained?

2 Abridged Literature Review

From the systematic literature review we conducted, four themes emerged as our value propositions of implemented e-government projects; (a) Quality service delivery: implemented e-government projects are avenues for generating value propositions through delivery of better services [10, 13]. (b) Effective public organizations: e-government has the capacity to improve efficiency of public organizations through cost cutting mechanisms, synergy and synchronizing public organizations [11]. Efficiency in public organizations ensures that there is a reduction in duplicate tasks, effective prompt delivery of services and easy access to services [7]. (c) Open government and democratic value. Within our literature review, we realized that IS scholars seek to refocus attention to a broader array of values, especially those concerning open government (OG) and democratic value [15, 16]. The foundation of OG idea is the optimism over that which can be achieved through the use of e-government open data initiative. The essence of OG is to avail information and decision making processes of government accessible to the public for scrutiny and input [16]. In so doing, citizen’s social
and political engagements are facilitated about the outcomes of e-government policy making. (d) Finally, social value and wellbeing: IS scholars always advocates that the expectations of e-government goes beyond mere citizen satisfaction, but they encompass a desire for much broader social outcomes [17, 18]. For government, examples of such goals include social inclusion, community development, well-being and sustainability [19]. Equally, citizens attach value to their general wellbeing such as quality of health care, threshold standards of education, and access to civil and criminal justice [13].

3. Theoretical foundation

The theories we adopted for this research are theory of affordance actualization [20] and program theory of realist evaluation (RE) [21]. Theory of affordance actualization is adopted because of its strength in identifying the actualized values of applications in organizations and the resulting changes to the organization and users in general [22]. Affordances are possibilities for goal-oriented action emerging from interactions between IT artifacts viewed as IT features, organizational systems, e-government platforms [23]. Therefore, affordances are potentials for action that when triggered or actualized by a human actor will produce intended and unintended outcomes [23]. IT artifacts here simply depict various technical objects, their component parts, interface in which human actor interacts with it, and outputs of the IS. Furthermore, the program theory of RE originally designed by Pawson and Tilley [21]) and modified by Mukumbang, Van Belle [24]) was specifically chosen because of its appropriateness for theory-driven evaluation. Following Richter, Jackson [25]) in choosing RE, we are deploying RE as both a theory and a methodology.

4. Research Methodology

Being a RE approach, this study is anchored on the six stages iterative process of RE. These stages are: (1) development of a preliminary program theory; (2) search strategy and literature search; (3) study selection and appraisal; (4) data extraction; 5. data analysis and synthesis; and (6) program theory reformulation and recommendations. However, following Mukumbang, Van Belle [24]) the six stages are encapsulated in three phases and adopted as the methodology to answer our research questions as shown in Figure 1.
4.1 Phase 1: Initial Program Theory Development

In Phase 1, we conducted a systematic review as well as documents review related to value propositions of implemented e-government projects. Consequently, we visited Kigali, Rwanda and the passport section of Nigeria Immigration service for observations of the e-government service platform as being used. Subsequently, we gathered initial empirical evidence to support our initial program theory (IPT) development as shown in Figure 2. In doing this, we conducted face-to-face interviews with the IT vendors, managers of Rwanda online (Irembo), and their technical assistants, Rwandan Minister of ICT, Immigration Passport Controller, and data capture room technical staff. We triangulated the interview data with (1) literature (2) participant’s observation (3) archival document analysis (4) scoping review of affordance actualization guiding the understanding of the human-IT interaction and extractions of the value propositions outcomes seen as product in process [26]. These data from the primary and secondary sources were used to develop the IPT. We anchored this process of IPT development through abductive data analysis that aligned with Layder’s [27] version of adaptive theory development. Thus, we adopted the dialectical interplay where prior theoretical concepts of affordance actualization [20] and context-mechanism-outcomes-configuration [24] “both shape and inform the analysis of data that emanate from the ongoing research at the same time the emergent data itself shape and molds the existing theoretical materials” [27]. Therefore, we adopted the adductive thematic analysis that involved five key steps [28, 29]. Such steps which are recursive between collection and

![Fig. 1. Realist evaluation methodology as adapted from Mukumbang, Van Belle [24]).](image-url)
analyzing of data as well as being iterative until data saturation include: (1) familiarization and coding of data, (2) identifying themes and converging such themes with the same functional meanings into contrastive categories with a match with theoretical concepts, (3) creating and describing linkages among such categories using theoretical memos, (4) developing plausible model as IPT that are grounded in the context, and [31] assessing the IPT using “realist theory of data collection” [29]. We stopped at step four to develop our IPT as seen in Figure 2, while the last step of data analysis (i.e., step 5) will be done in phase three of Figure 1. Thus, the IPT is subject to refinement and rigor from further data collection and analysis using realist theory of data collection and analysis [21, 29]. Besides, by participants’ observation we strongly note that the e-governments value propositions emerged from IT-human interactions that lead to actualized outcomes of value propositions. Based on this, we observed that mechanisms namely; ownership [32], leadership, vision and strategy [33], institutional capabilities [34], design versus reality [35] as well as capacity and awareness [36] as gleaned from literature might be in operation. These provisional mechanisms were envisaged to shape the sustenance of actualized value propositions.

Fig. 2. Initial Program Theory (IPT) expounded from literature review and data collected from multiple investigative contexts subject to refinement. Source: Authors
5 Future Work

5.1 Phase 2: Theory validation and refinement

We will use both quantitative and qualitative methods to validate the IPT fusing the three investigative contexts as shown in Figure 2. First, we will conduct a quantitative (contingency evaluation) survey through instrument that will be in the form of seven point Likert scale-based to identify the actualized values. Subsequently, in-depth interviews that will last for about 30-45 minutes with Irembo and e-passport service users, program designers, implementers, managers, and citizens. Then, focus group discussions that will last for about an hour with stakeholders. Analysis and review of secondary data, key documentary evidences such as technical specifications, operational activities of the multiple investigative case studies. Such case studies hold three dominant entities: typical, deviant and crucial. The “typical” case will be Irembo in Rwanda. The “deviant” case will take the shape of E-passport of the Nigeria Immigration Service. The e-procurement platform in Rwanda will be considered as our “crucial” case.

5.2 Phase 3: Theory consolidation

The third phase will be data analysis and synthesis of cross sectional multiple cases CMOC and emerging patterns of the IPT. The analysis and synthesis of the three cases will be through retroductive and abductive form of data analysis and reasoning to identify the structural mechanisms and their enabling conditions in interaction to sustain the actualized values.

6. Conclusion

Our review reveals a distinct paucity of research on the value propositions of implemented e-government projects in sub-Saharan Africa [3, 6], and also a gap in methodology where most of the studies are positivist, interpretivist, and a-theoretical works. Through our preliminary literature review, data collection and analysis in an abductive way, we revealed the following value propositions of implemented e-government projects: (a) quality service delivery, (b) effective public organizations, (c) open government and democratic value as well as (d) social value and wellbeing. Besides generative mechanism namely; ownership, leadership, vision and strategy, institutional capabilities, design versus reality as well as capacity and awareness are in operation to shape the sustenance of actualized value propositions in Rwanda and Nigeria. Future research will negate or confirm such value propositions and generative mechanisms that will sustain the implemented e-government projects in Rwanda and Nigeria. Overall, at the end of the study, it is envisaged that it will produce a middle range program theory on sustaining the actualized value propositions of implemented e-government projects in sub-Saharan Africa as a contribution to knowledge. To practice, the developed theory will identify the actualized value propositions in the investigative contexts. Beside it will guide decision makers to understanding the contextual conditions the technology is situated, mechanisms triggered that can sustain the actualized value propositions of implemented e-government projects over time in sub-Saharan Africa.
References


Understanding the end-user’s role in value co-creation within innovation ecosystems: A global South perspective

Elijah Chirwa, Pamela Abbott and Jonathan Foster

Information School, The University of Sheffield, Regent Court, 211 Portobello, Sheffield, S1 4DP, United Kingdom.
echirwa1@sheffield.ac.uk, p.y.abbott@sheffield.ac.uk
j.j.foster@sheffield.ac.uk

Abstract. The purpose of this paper is to develop a conceptual framework that is intended to help understand the role of the end-user in value co-creation within innovation ecosystems for a global South context. The framework is needed because the current strategic construction of the innovation ecosystem construct presents a diminished role for the end-user who is considered as a passive recipient of supplier-orchestrated offerings. To illuminate this end-user role, we integrate the social learning in technological innovation approach in the ecosystem model to glean deep and detailed insights on how value is co-created at the micro level from individual creativity and filters through to macro level structures of the ecosystem during the innovation process.

Keywords: innovation ecosystems, value co-creation, social learning, innovation process

1 Introduction

Discussion around digitalization continues to be dominated by supplier-led rhetoric largely driven by technologically-deterministic perspectives that mostly ignore socially-informed analysis on the adoption and use of digital innovations (Allen, 2017; Williams, Stewart, & Slack, 2005). Successful innovation processes have created technological innovations leading to potential opportunities for transformative digital products and services, more so in the global South. However, for these countries to fully utilise the opportunities provided by digital innovation, context should be considered, as well as end-users’ needs and embedded usages of digital offerings into their daily lives (Avergerou & Walsham, 2017; Cañeque & Hart, 2017; London, 2008). Innovation could be a means to surmount some of the challenges prevalent in the global South such as the unavailability of market information, poverty, lack of knowledge and skills as well as unique product requirements (Dos Santos, Krämer, & Vezzoli, 2009).

Despite the literature highlighting the significant role of the end-user in value co-creation during the innovation process (Viswanathan & Sridharan, 2012), there is a dearth of research on the end-user’s role in value co-creation in innovation ecosystems for global South contexts (Cañeque & Hart, 2017; Nakata, 2012; Praceus, 2014). This paper will propose a way of conceptualising the role of the end-user in innovation ecosystems specifically for a global South context. It focuses on understanding the
critical role of the end-user in value co-creation during the innovation process. An innovation process is described as the combination of invention, development and implementation as ideas are turned into products or services (Garud et al., 2013). Value creation is described as the process where different actors interact to create mutual benefit that addresses particular needs and thus depends on the capabilities of a firm or individual to innovate successfully (Adner & Kapoor, 2010; Gummerus, 2013). Thus joint value creation by a firm and its network of actors such as end-users is termed value co-creation. An innovation ecosystem (IE) is characterised by the principles of interdependence amongst a set of actors as they co-evolve their capabilities and work collaboratively and competitively towards a common set of goals to co-create value in an innovation process (Adner, 2017; Adner & Kapoor, 2010; Iansiti & Levien, 2004). This paper adopts the structuralist approach of ecosystem defined by Adner (2017, p. 40) as “… the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialise.”

2 Motivation

Williamson and Meyer (2012) argue that due to the growing demand for sophisticated and integrated products and services which draw on knowledge and capabilities from a diverse and dispersed set of actors, the innovation ecosystem approach is gaining wide adoption for undertaking the innovation process. We will argue in this paper that the strategic construction of innovation ecosystem approach as currently understood requires a clear conceptualisation of the end-user’s role during the innovation process for low-resourced countries in the global South. Dedehayir et al., (2018) suggest that the end-user is a prominent actor in an innovation ecosystem because they contribute directly to value co-creation by defining the problem which needs to be addressed and thus are a trigger for the emergence of an innovation ecosystem.

Two distinct perspectives of the innovation process are the micro level of individual creativity and the macro level of structures and interactions (Van de Ven, Polley, Garud, & Venkataraman, 1999). Various authors also argue that for successful innovation to be attained, firms need to gain access to valuable BoP market and needs information, which calls for local embeddedness to understand the needs of BoP contexts (London, 2008; Nakata & Weidner, 2012; Viswanathan & Sridharan, 2012), i.e., a macro-level view of innovation is inadequate for accessing these insights. We thus draw on the social learning in technological innovation (SLTI) framework which provides an analytical framework for the role of end-user and other intermediaries as they adapt technological innovations into daily use in a particular social context (Stewart & Hyssalo, 2008; Williams et al., 2005). Thus we propose to integrate the SLTI micro level view into the innovation ecosystem approach (macro level view) to gain more insights on the end-user’s role in the innovation ecosystem. We thus address the question: How is the end-user’s role conceptualised in value co-creation within innovation ecosystems for the global South context? To illustrate the utility of our proposed conceptual model, we will use the case of M-pesa, a mobile money digital innovation from Kenya, whose success provides empirical evidence to support our proposed approach.
3 Literature review

3.1 Innovation Ecosystem

Adner and Kapoor (2010) argue that a growing interest has emerged in IE due to end-user’s needs for complex products and services that require a diverse set of capabilities and knowledge which are not confined to a single firm or supply network. Thus, the IE approach broadens the locus of value creation beyond the boundaries of a single firm to a wider set of actors operating with interdependence and complementarity between them as they contribute towards a value proposition espoused by the lead firm (Kapoor, 2018). The innovation ecosystem approach, is drawn from the systems of innovation (SI) approach (Freeman, 1987; Lundvall, 1992) and business ecosystems (Moore, 1996), is characterised by a macro-level structural perspective and interdependencies in which actors interact to produce knowledge and develop new capabilities. The biggest conceptual challenge for SI approach, however, is to elucidate linkages between the innovation event and the innovation structure. This structural perspective in IE is meant to be dynamic and the end-user should represent a unique significant actor, but their role is not clear in organisational networks such as clusters and value networks (Autio & Thomas, 2014; Dedehayir, Mäkinen, & Roland Ortt, 2018).

3.2 Social learning in technological innovation (SLTI)

SLTI involves understanding the roles of end-users and intermediaries in the development and appropriation of digital innovations during the innovation process (Williams et al., 2005). SLTI is a sociotechnical analytical framework that explores how end-users understand technological innovations, interpret and bring meaning to their usage. The SLTI model incorporates “innofusion” which entails that innovation continues to occur during implementation and use of the offering (Fleck, 1988); and “domestication”, which is the process of integrating the offering into end-users’ daily usages (Schuurman, De Moor, De Marez, & Evens, 2011; Silverstone & Haddon, 1996). The focus is on determining how generic ICT capabilities and affordances are applied and used through collaboration and knowledge flows between the actors (Rip, Misa, & Schot, 1995; Williams et al., 2005). Stewart and Hyysalo (2008) argue that embedding technological innovations into daily usage involves a prolonged journey of learning and collaboration between a diverse set of actors. Thus, technological innovation is a process that involves temporal periods of interaction and negotiation amongst various sets of actors in interrelated cycles of development, and is subject to divergences of power and interest (Rip et al., 1995; Stewart & Hyysalo, 2008). The SLTI approach allows for representations of end-users and uses, and their interpretation, which ultimately assists to define both the innovation designs and relationships between sets of actors.

3.3 End-users’ role in value co-creation within innovation ecosystems

Caneque and Hart (2017) argue that the success of innovations in BoP markets is contingent on firms harnessing the opportunities and knowledge available by interacting with other actors during the innovation process. In this value co-creation
process, the end-user has an important role to play in defining their needs and providing ideas on how the innovation can be developed further (Dedehayir et al., 2018). At a micro level, co-creating solutions with the poor is crucial during the innovation process in BoP markets (Cañeque & Hart, 2017). It is argued that for products and services to address needs of BoP markets, they are largely shaped by, among other things, life experiences, literacy levels and social barriers of the end-users rather than being consumer-driven (Viswanathan & Sridharan, 2012). Chandler and Vargo (2011) highlight the criticality of context during value co-creation process. Global South countries are thought to provide significantly different contexts for end-user innovation under various constraints such as low levels of literacy, availability of meagre resources and poor access to new technologies (Nakata & Weidner, 2012; Praceus, 2014). To draw attention to the exclusion of the poor during the innovation process, Msiska and Nielsen (2018) propose the concept of social-technical generativity which seeks to highlight the complementary roles of social relationships with various actors that include end-users and the capacity of technology as critical success factors in supporting value co-creation in these BoP settings (Msiska & Nielsen, 2018). Thus, the SLTI framework provides an opportunity to capture the socially-informed perspectives visible when digital offerings are embedded into daily usages whilst acknowledging the role of human agency in shaping the innovation process (Poole, Ven, Kevin, & Holmes, 2000; Williams et al., 2005).

4 Theoretical foundation for the proposed framework

Conceptually, thus, the IE approach represents an alignment structure of a constellation of actors that interact in an innovation process to achieve a specific value proposition. This framework describes the structure and sociotechnical interactions that influence the innovation process at a macro level but lacks the detail of how end-users create meaning and practical usage of the innovations in their daily lives. Since value co-creation is deemed a crucial component of successful innovation in BoP settings (London, 2008), people at the BoP must not merely be a source of information but should be availed the opportunity to influence and shape innovations through their ideas and solutions during the innovation process.

The SLTI framework conceptualises innovation as a learning process to understand the active role and involvement of end-users as they contribute towards the evolution of the innovation during the innovation process. However the SLTI approach considers the innovation venture from a stand-alone firm perspective with its success or failure driven by a firm’s strategy, business model or value proposition, among others. Yet, as argued by Caneque and Hart (2017), to address the unmet needs of BoP contexts, innovation cannot only occur within a single firm but must be integrated into ecosystems on the ground comprising different actors such as value-demanding consumers, creative entrepreneurs and such other similar entities in the global South.

By integrating the two frameworks, as depicted in figure 1, the strengths of both perspectives can be leveraged to address the specific needs of BoP markets in low-resource contexts. Whilst the IE approach affords us the opportunity to focus on the structures and actors needed for the innovation process, the SLTI framework elucidates on the activities and processes to be undertaken by the end-users and intermediaries.
during value co-creation which are key for successful innovation. This value co-creation employs generic mechanisms that include learning-by-doing for understanding the uses of the innovation, learning-by-interacting for knowledge sharing, and learning-by-regulating through rules and policies.

Figure 1: Conceptual integration of the SLTI model and the innovation ecosystem during innovation process (Source: author)

5 Discussion

Kenya’s success story on M-pesa, provides empirical evidence to support our proposed integrated model. At its genesis, Safaricom as the focal firm that formulated the value proposition of targeting the unbanked with M-pesa, provided the ecosystem leadership by identifying the key actors, creating relationships between the actors, designing the platform and managing value as part of the innovation process (Hughes & Lonie, 2007). These structures and actors can be considered as forming the innovation ecosystem that provided the macro-level view of the innovation process and provided the digital platform. The actors identified included the regulator, banks, microfinance institutions and end-users (Foster & Heeks, 2013). At the micro level, Safaricom engaged the end-users through the agents and other intermediaries and in turn provided the innofusion and domestication contexts to M-pesa service as it was being appropriated into their daily lives as part of value co-creation process. This enabled unanticipated or unintended uses of M-pesa to emerge as the end-users interacted with the offering to co-create value in a social learning process (Hughes & Lonie, 2007). In turn, Safaricom supported the social learning activities and processes as it integrated them into its offering as part of the innovation process and figure 2 provides an illustrative diagram for the process.
6 Conclusion

The integrated model provides deep and detailed insights on how value is co-created at micro level from individual creativity and filters through to macro level structures during the innovation process. The success of digital innovations in BoP contexts is not only based on the structures setup by the lead firm in the ecosystem but the social learning from end-users that creates a potentially important source of knowledge on the effective uses of digital innovations and an opportunity for supplier-enduser interaction which is crucial in contributing towards value co-creation through knowledge exchange between the ecosystem actors.

The proposed framework can be used to understand the key elements that enable or limit the successful participation of the end-user in value co-creation in innovation ecosystems; the social learning perspective draws attention to the critical experiences gained from active end-user involvement in the innovation process and thus leads to elucidating on the social implications in the use of the digital offering. From a practical perspective, this framework is being used to understand the evolution of the innovation process for mobile money as a financial technology in Malawi and its implications in facilitating value co-creation in the innovation ecosystem.

As much as the framework attempts to provide microlevel insights on the role of the end-user in an innovation ecosystem, more work has to be done to investigate other roles played by various actors in the ecosystem, beyond that of the end-user and understand their implications in the value co-creation process.
References


‘Give me Freedom’: The Role of Mobile Payments aiding Socioeconomic Development in India

Rohan Sharma1 and Abhipsa Pal2

1 Delhi Technological University, New Delhi, India
rohansharma_2k17ps40@dtu.ac.in
2 Indian Institute of Management Kozhikode, Kerala, India
abhipsapal@iimk.ac.in

Abstract. With the rapid diffusion of mobile payments across developing economies, there is a persistent question if the technology truly facilitates socioeconomic development. We investigate this question through the lenses of Sen’s developmental freedoms, examining how mobile payments would provide individual emancipation leading to development. The interviews of users across cities in India reveal that economic facilities, transparency, and protective security were offered by mobile payments to a certain extent. However, critical social and infrastructural issues continue to act as barriers to the enjoyment of these freedoms by the users. Government and policymakers should focus on eliminating these issues.

Keywords: ICT4D, mobile payments, socioeconomic development, Sen’s Freedoms.

1. Introduction
Development was earlier seen as growth in terms of economy, achieved by the ways in which economic systems of poor countries can be made more effective (Sachs, 2006). However, Sen (2001) established the perception of development in a more holistic fashion, as a process of freedom that individuals enjoy. This has led several studies to understand the developmental role of technologies through the freedoms prescribed by Sen (Andersson, Grönlund, & Wicander, 2012). Mobile payment services, providing an alternative banking channel by enabling financial transactions through mobile phones, are believed to have developmental capabilities through financial inclusion (Lashitew, van Tulder, & Liasse, 2019). The shift from physical to virtual payments has already brought significant benefits to consumers and small vendors in terms of convenience and speed in various nations (Ondrus & Pigneur,
It is also a cheaper alternative to existing digital options like debit/credit card payments, which has high transaction costs unsuitable for micropayment transactions (Mallat, Rossi, & Tuunainen, 2004). Yet, there are criticisms related to the sustainability of mobile payments in low-income economies due to issues like poor digital penetration, lack of digital literacy, and traditional cash culture (Pal, Herath, De’, & Rao, 2020). This contradiction in the evidence for mobile payments in developing economies has led us to critically analyse the technology through the lenses of freedom as prescribed by Sen (2001). The purpose of this research is to examine the developmental role of mobile payments from the freedoms it offers (or does not offer) to the citizens.

Mobile payments offer freedoms like the 'economic facilities' to participate in the market through easy transactions for exchange or consumption, 'political freedoms' by the ability to participate in citizen-welfare activities like donations and funds, 'transparency guarantees' by disclosure of the recipient, and 'protective security' through safety net during the crises when cash transactions are difficult. Evidence for protective security was witnessed twice – during the banknote crisis in India, triggered by the historic demonetization in November 2016, which led the customers and the merchants to adopt alternatives like mobile payments (Ghosh, 2017; Sobti, 2019). More recently, due to the Covid-19 pandemic, a nationwide lockdown was enforced in India from 25 March 2020 and continues in all major cities. The disease is transmitted by inhalation or contact with infected droplets (Singhal, 2020), thereby increasing the chances of spread through banknote-based transactions. "In the context of COVID 19, RBI and the government together are emphasizing encouraging digital payments" (Press Trust of India, 2020). In both situations, the growth in mobile payment usage offered economic facilities to the citizens and protected them during the crises, who could make transactions in the absence of physical cash.

In the wake of the possible second wave of mobile payment growth, we investigate if Sen's freedoms were indeed offered by mobile payments to the citizen. We conduct in-depth interviews of participants from across India. The interview data is studied through an interpretive research methodology (Klein & Myers, 1999), and the
analysis throws light on evolving freedoms and unfreedoms. The results have practical implications for policymakers and the government promoting mobile payments for inclusion. The remaining part of the paper discusses the background of this study, followed by a literature review, and theoretical background. The findings are then discussed, and the paper is concluded.

2. Background

India witnessed various technological advances in the past few years that enhanced the spread of mobile payments. Unified payment interface (UPI) is a technology that facilitated cross-platform financial transfer on mobile phones, thereby resulting in seamless usage of mobile payments by merchants and consumers (Bhakta, 2019). UPI was launched by the National Payments Corporation of India and regulated by the Reserve Bank of India for instant fund transfer between two bank accounts on the mobile platform, with security regulations including MPIN for guaranteeing transparent transactions (Kakade & Veshne, 2017). Another popular payment option is payment apps referred to as mobile wallet or e-wallet. Mobile wallets are a much-advanced versatile application that includes elements of mobile transactions, as well as other items one may find in a wallet, such as membership cards, loyalty cards, and travel cards. The economic opportunities provided by the options include bill payments, recharges, ticket bookings, beyond the basic payments for merchandise or services. Moreover, the no-contact option of transactions securely protected users from the possible spread of Covid-19 during the pandemic (Bhandari, 2020). However, the question remains, if mobile payments are reaching out equally to the truly marginalized, promoting smaller businesses, and providing the freedoms necessary for development.

3. Literature Review

Mobile payments aiding socioeconomic development have been investigated in the context of M-Pesa in Kenya (e.g., Mbiti & Weil, 2011; Mbogo, 2010). These studies focused on the financial inclusion offered by the technology and narrowed on the direct economic and political developments (Jacob, 2016). However, individual
citizen-centric development is driven by the freedoms enjoyed by them, not inevitably captured by economic growth (Andersson et al., 2012; Sen, 2001). Therefore, ICT4D researchers analyzed the roles of ICT4D artifacts in offering human freedom and capabilities (e.g., Hamel, 2010; Jasek-Rysdahl, 2001). Similarly, mobile payments also need to be critically analyzed to understand the freedoms it offers to its citizens in a developing country context (Donovan, 2012).

In the context of mobile payments in India, literature has observed the factors that drive its adoption and usage (e.g., Chandra, Srivastava, & Theng, 2010; Pal et al., 2020; Thakur & Srivastava, 2014). Recently, mobile money in India is of growing interest in terms of its sustainability and various innovative uses it offers to the marginalized (Muralidhar, 2019; Pal, De’, & Herath, 2020). However, the development role of mobile payments still needs investigation since technology diffusion is heavily promoted by the government for inclusion and transparency (Press Trust of India, 2020). This has intrigued us to examine whether the technology truly holds the promise of development through citizens’ freedoms.

4. Theoretical Background: Sen’s Freedoms

In his seminal book, ‘Development as Freedom’, Amartya Sen illustrates instrumental freedoms that contribute, directly or indirectly, to the overall freedom people have in their livelihoods and daily activities (Sen, 2001). Sen’s freedoms have been influential in determining the role of technologies in development in various ICT4D contexts (Andersson et al., 2012; Jasek-Rysdahl, 2001). These freedoms lead to socioeconomic development through individual empowerment of the individuals. The freedoms identified by Sen include economic facilities, transparency guarantees, political freedom, protective security, and social opportunities. Economic facilities refer to the opportunities that individuals respectively enjoy to utilize economic resources for consumption, or production, or exchange. Transparency guarantees are related to the transparency and lucidity in the system, which allows individuals to trust the system and its processes (Drèze & Sen, 2002). Protective security is needed to provide a social safety net for preventing the affected population from being reduced to abject misery during crises and unnatural events, thereby protecting them from extreme
consequences. We believe these three freedoms can be relevant for understanding the role of mobile payments due to its capability in allowing users to participate in market exchanges, have full information on transactions and recipients, sustain transactions in crisis situations, and contribute to relief funds, respectively.

5. Methodology
To evaluate the role of mobile payments in development, we carried out field interviews of both mobile payment users and non-users. Qualitative research is conducted in natural settings for understanding a phenomenon based on the research results in form rich interview data (Kaplan & Maxwell, 2005). The details of the data and collection process are given below.

5.1. Research Field
To ensure the proper understanding of ’protective security’ freedom, India serves as an adequate research field with two subsequent crises over the period of three years – the cash crisis of demonetization, and the global Covid-19 pandemic. The study was conducted through interviews with users located across five locations in India- Delhi, Gurugram, Noida, Kolkata, and Bengaluru. These locations were among the highest Covid-19 affected places. They also provided a contrasting environment with high and low penetration and varying perspectives of users in different regions, thereby ensuring the generalizability of the findings (Lee & Baskerville, 2003).

5.2. Data Collection
Data collection was done by conducting semi-structured interviews with 20 customers (including both users and non-users), between April 2020 to June 2020. As suggested by Malterud et al. (2016), small sample sizes are sufficient if the interview dialogue is excellent, participants have specific characteristics and there are pre-established theories supporting the argument. Every interview started with asking the interviewer very generic questions to understand their views broadly, followed by the discussion of specific themes, within the theoretical model, in a semi-structured way. Questionnaire was designed to facilitate discussion in the direction of the three
freedoms studied, but free flowing conversation of the participants were encouraged to ensure that the data was confined (Myer & Newmann, 2007). The interviews lasted 6 to 14 min, based on the willingness to speak as the interviews were conducted in a conversational tone. The respondents were chosen based on convenience sampling, with family, friends, and colleagues, who were willing to participate in the study. This was the chosen technique since physical approaching individuals were restricted at the time of Covid-19 pandemic. The interviews were taken over the telephone and were recorded. We assured the respondents that the interview will be confidential, as suggested by Myers and Newman (2007). The respondents were aged 19 to 65 years and were from a range of economic backgrounds and professions. 63 pages of total transcription was collected. The languages of the interviews were English, Hindi, Bengali, or a mix of these languages. Table 1 presents the locations and the number of interviews conducted in the three languages.

<table>
<thead>
<tr>
<th>Location</th>
<th>English</th>
<th>Hindi</th>
<th>Bengali</th>
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<tbody>
<tr>
<td>New Delhi</td>
<td>6</td>
<td>3</td>
<td></td>
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<tr>
<td>Gurugram</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Noida</td>
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<tr>
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<td>Bengaluru</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>6</strong></td>
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6. Findings

We analyzed the interview transcripts based on the seven principles for interpretive field study research by Klein and Myers (1999). In relation to the three freedoms, we identified major themes that emerged during the interview. On further analysis, we identified positive and negative support for these themes and recurring words and phrases within them. The findings revealed that users associated their mobile payment usage with the freedoms, but, contrastingly, in many cases, users were not able to avail the freedoms. The analysis is given below:
**Economic facilities**: Mobile payments provide economic facilities like the ease of transaction while purchasing goods and services from vendors both online and offline and for transferring money between friends and family. A user noted, he used mobile payments “For groceries, cabs, for transferring money to people.” On the other hand, a female urban user said, “Lots of places don’t accept mobile payments, like local shops near your house and all”. Various factors like consumer preference for using cash, better control over physical currency, paying on delivery by cash/card, bigger stores not accepting e-wallets and smaller merchants not accepting mobile payments due to lack of literacy show negative support for economic facilities.

**Transparency guarantees**: Mobile payments are easy to use, time-saving, and give the individual the ability to budget, track, and record their expenses. In case of technical problems, the individual gets a refund. People felt that Covid-19 donations were more transparent through mobile payments with the automated receipt of acknowledgments. Through the apps, people could reflect on their transactional history, with additional features of categorization of types of payments. However, issues related to internet connectivity, payment getting stuck, slow bank servers, name of a merchant not appearing while transacting lead to reduced transparency amongst users. A user observed the inability of the mobile payments in bribery, despite its digital footprint, when “the person bribing and the person being bribed... mutually decide to keep it a secret”.

**Protective security**: Mobile payments acted as protection twice – once during the cash crisis of demonetization, and for a second time, during Covid-19, when the government promoted digital payments to reduce the spread of the virus through banknote surfaces. This was noted by users: “After demonetization, I moved to Paytm but before it only cash”; “[mobile payment is] definitely a safer option [during Covid-19]”. The protective security offered by mobile payments had been identified repeatedly by the respondents. However, lots of vendors and shops did not accept payments digitally even during the Covid-19 pandemic and hence people still use cash for such transactions because “[smaller vendors] have to go to bank or somewhere to convert the amount [from mobile money] to cash, so they don’t want.”
Actually, they need cash during lockdown. Going to the bank is very difficult during the lockdown, so they want cash directly.” In addition to this, less trust on technology, complex KYC process and social hacking hinders the user to fully adapt to mobile payments.

The three freedoms- economic facility, transparency, protective security are interdependent and work together, however the importance of any particular one is solely dependent on the nature of the transaction, it impacts the other two but does not alter the notion of freedom. For instance, donations using PayTM offer all 3 freedoms to an individual. The freedoms offered by mobile payments is in anticipation, in the moment and in retrospect.

Overall, individuals felt that the process of payments need to be simplified, since learning to use the apps becomes critical with the fear of losing money by mistake and fraud. Individuals also felt that they have psychological barriers to use apps for payments as they are very used to payments by cash/card. They felt that there is a sense of safety associated with using cash and with these apps they even tend to spend more due to ease of transaction. Although mobile payments have contributed significantly to development, it is far from achieving the dream and still has a long way to go to solve all of the issues and challenges associated with it.

7. Conclusion

The paper investigates the role of mobile payments in socioeconomic development through the lenses of Sen’s freedoms. The findings suggest that economic facilities, transparency, and protective security were identified by users. On one hand, the major advantage of using mobile payments is that there is no need to carry cash or wallet. The cash crisis and pandemic have further pushed people to adopt mobile payments. However, on the other side, persistent constraints like infrastructural inadequacies and psychological barriers continue to deprive both users and non-users of enjoying the freedoms completely.
References


Role of Governance and Empowerment in Sustainability of Information System: the Sri Lankan Experience

Pamod Amarakoon1,[0000-0002-6378-7096], Jørn Braa2,[0000-0001-6329-4593], Sundeep Sahay2,[0000-0002-4374-9551], Lakmini Magodarathna3, Rajeev Moorthy3, Roshan Hewapathirana4,[0000-0002-8483-7929]

1 Postgraduate Institute of Medicine, University of Colombo, Colombo, Sri Lanka
pamodm@gmail.com
2 Department of Informatics, University of Oslo, Oslo, Norway
3 Ministry of Health, Colombo, Sri Lanka
4 Faculty of Medicine, University of Colombo, Colombo, Sri Lanka

Abstract. Field level data collection is a core component of public health information flow. Lack of feedback and supervision on data collection by field health staff limits the use of data for action. The use of mobile technology has enabled real-time data transmission from the field level to the supervising staff. This paper focuses on field level nutrition monitoring program implemented in a post-conflict district in Sri Lanka by use of mobile technology. A case study approach was devised to analyse the scenario using qualitative study methods such as participant observation, document analysis, in-depth interviews and focus group discussions along thematic areas. It was observed that in addition to usual governance at district level by provision of resources and training to field health staff, strategies to enable data use for decision making empowers the staff and enhance their motivation. We argue that governance and empowerment are interconnected and should be responsive to the requirements of each other for a successful, sustainable field health information system.

Keywords: Governance, empowerment, dhis2, mHealth, mobile, health information systems, nutrition, Sri Lanka.

1 Introduction

Public health sector is a major component in the health system of a country. Public health sector indicators contribute to a major portion of indicators which reflects the status of healthcare in a country in general. A key distinction between public health services in the curative healthcare service is the field health staff of public health sector providing preventive healthcare the community. Another task entrusted with the field level public health staff traditionally is to collect data of delivery of healthcare services and the status of health in the community. However, the data collected and shared by field health staff is traditionally transmitted up along the health administrative hierarchy without much supervision. The lack of supportive supervision for the field health staff
has been identified as major contributing factor related to low quality of service rendered[1]. Lack of supervision of data flow also suggest that there is minimal feedback received on the data to submit[2]. This is generally a negative factor for career development as well as for the system in general where the employed at. Dieleman et al. highlights that feedback and appreciation from the supervisors are motivational factors driving the career development of public health staff[3]. In fact, Panda et al. has identified by an experimental study conducted in Odisha, India that supportive supervision has contributed to enhance knowledge and skills of healthcare workers[4].

Digital health solutions are considered to be effective in providing transparency of data transmission and making data available to the supervisors in a fast and efficient manner. Use of mobile technology in particular, has immensely contributed for real time data transfer between field level and healthcare managers and has implemented in many low and middle-income country contexts[5]. However, provision of sufficient resources for implementation of mobile technology for field level and sustaining the implementation by provision of support and resources at district level has been an administrative nightmare in most of the contexts. We are encountered with the research question of what strategies could be adopted by district level stakeholders to enhance the autonomy of decision-making by field health staff for better use of data. This warrants further research on empirical grounds in low and middle-income country context.

2 Conceptual framing: Governance and Empowerment

It is worthwhile noting that implementation of digital technology helps to build up capacity and skills in field health workers[6]. However, there has to be sufficient inputs from higher administration in provision of resources as well as to sustain the implementation. In this sense, governance from district level and empowerment of field health staff are the key points that needs to be explored in the empirical setting.

2.1 Governance

The word ‘governance’ is a difficult term to define. The term has been defined by different entities to reflect remaining which is in the interest of the domains of operations of the respective organisations. The United Nations Development Program defines it as the exercise of political economic and administrative authority in the management of country’s affairs at all levels[7]. The world bank defines it as economic policy-making and implementation with a focus on accountability and use of public resources[8]. However, when defining governance, it is cited generally under the three dimensions political, economical and institutional[9]. For the purpose of defining governance in the scope of public health manager at district level, we concern mostly about administration and policy implementation as well as provision of resources for the health facilities under his purview. The administration and policy implementation is concerned with provision of directives on how public health activities should be conducted at field level. These directives helps to ensure the uniformity of operational
activities at field level which somewhat restrict the full level of autonomy exercised by field health staff and direct them to achieve common objectives.

2.2 Empowerment

Empowerment is defined as the means and organisation provides the employees a degree of autonomy in their routine activities. This could include their contributions in decision-making and running expected functionalities with less oversight from supervisors[10]. Empowerment does not mean that the employer or the manager loses control over the employees, but rather allow flexibility in decision-making at service delivery point which has proven to improve the morale of the staff and enhance productivity at the end. However, it has to be designed and implemented in a guided manner prevent undesirable outcomes[11]. Harvard Business Review identified that empowerment of employees encourage them to develop novel ideas which in turn made them volunteer for extra assignments and support the organisation outside the official capacity which is quite important when implementing novel concepts such as information and communication technology for information management at field level[12]. Empowerment of employees require few criteria which includes training in skills necessary for the employees to carry out additional responsibilities, provide access to information for decision making and develop confidence on part of employees to take on greater responsibilities[10].

Both governance and empowerment are required to reap the optimum benefits from the employees. However, how best governance at district level should adapt to sustain the efforts of empowerment should be studied in the context of low and middle-income countries.

3 Methods

We adopted case study methodology to explore the context prevailing within a district at district, Medical Officer of Health (MOH) and field health worker level. As highlighted by Yin, case study method facilitate empirical enquiry into the real-life scenario that happens with involvement of stakeholders at district, MOH and field health worker levels[13].

All authors of this paper were involved with the research context in multiple dimension. One of the authors (PA) is a specialist in health informatics who was the lead health informatician in designing and implementing the mobile based nutrition information system in 4 districts of Sri Lanka. One of the authors was the Medical Officer of Maternal and Child Health (MO-MCH) of the Jaffna district who functioned at the managerial capacity of public health at district level. One author is the director of Nutrition Division of Ministry of Health who provided oversight at national level. Two other authors are senior professors from University of Oslo who have closely been in contact with training specialists in health informatics in Sri Lanka and also was providing guidance in implementation of the project as well as physically attended field visits and qualitative research studies in Jaffna district.
As proposed by Yin, we devised multiple qualitative methods to explore the research questions of the study. Few of the authors had lived experience on the design and implementation in the Jaffna district which were included in the form of narratives for the study. Observations were made during the initial discussions on design and implementation within the Jaffna district, training programs conducted for end users, monthly meetings held at MOH offices and field visits done at field health clinics where the data capture took place. The documents and meeting notes of monthly meetings were also qualitatively analysed during the study. In addition, focus group discussions were conducted with the public health midwives were the end-users of the system. In-depth interviews were conducted with the MO-MCH, 3 medical officers of health and 2 national level public health doctors of nutrition division. The data collected from the above qualitative methods were analysed based on thematic areas to identify key concerns related to the research question.

4 Case study

4.1 Background

Sri Lanka is a country with a well-established public health system. Public health indicators of the country have outperformed many countries in the region and are comparable to levels of developed countries[14]. In spite of substantial performance in many aspects of preventive healthcare sector, indicators related to nutrition have failed to stay in par with others. Sri Lanka has significant percentages of malnourished children which has resulted in grave consequences to country’s development over the last few decades[15]. Following much research and exploration of expert opinions, it was concluded that the problem of malnutrition could not be solved by pure health related interventions, but rather require multisector collaboration and interventions aimed at affected child as well as the household. However, multisector collaborative interventions were considered as challenging to be coordinated by a single Ministry. Therefore, the task of multisector collaboration and interventions to alleviate childhood malnutrition was decided to be implemented and centrally coordinated by the Presidential secretariat of Sri Lanka.

4.2 Digital Intervention

It was decided to implement a monitoring and evaluation framework to track the progress of multisector interventions and collaborations. It was decided that digital solution had to be implemented as the monitoring and evaluation platform due to additional inefficiencies in paper-based systems. It was also believed that there should be minimum errors that should happen during data trances and that the data has to be captured at the point of generation. Therefore, a mobile solution was decided to be implemented as the data collection tool. After several rounds of discussions the decision was taken to utilise DHIS2 as the central data warehouse and to develop a custom mobile application for capture of data at field level by public health midwives. The key data
items to be collected at field level from undernourished children included sociodemographic factors, nutrition parameters and household risk factors. The design solution was piloted in four districts in Sri Lanka.

**Jaffna District.**

Jaffna district located in the northern province of Sri Lanka is an area heavily menaced by the conflicts that prevailed over three decades[16]. The district which is now in the post-conflict era is still having much issues related to infrastructure and technology. Therefore, implementing a mobile-based field data collection tool was considered a major challenge.

### 4.3 Use of DHIS2 Dashboard in Monthly Meetings

The MO-MCH is the district level public health manager who was in-charge of the implementation of the nutrition information system. He made sure that all public health midwives received the mobile devices with the application and a mobile data package and conducted the initial training program. Following initial implementation he realised that even though the system has been implemented the quality of data was questionable and that the data was not properly used for the nutrition related interventions at field level. To address this issue, he devised a strategy where the DHIS2 dashboards related to nutrition needed to be discussed during the regular monthly meetings which were happening at MOH areas (supervising officers of public health midwives). This implementation made sure that the entered data is accounted for and feedback was provided. It also provided an opportunity for field health staff to understand how to decide on proper intervention with the inputs from the public health medical doctor.

### 4.4 Use of Mobile Technology for User Support

Following establishment of discussions at monthly meetings, the next challenge forwarded by the field health workers was the difficulty of obtaining support and troubleshooting related to use of the application. This was made further difficult by lack of expertise the at the Jaffna district. The MO-MCH decided on an innovative approach to address this issue by creating a group on popular instant messaging platform 'Viber'. He added all end-users and experts from national and district level as well as MOHs and encourage end-users to ask questions in this group through chat messages and screenshots. This became a popular platform for troubleshooting by end users.

### 5 Discussion

Sri Lanka, public health strategy and policy planning occurs at national level which is implemented throughout the country with support of the public health managerial staff based at provincial and district levels. Therefore, even though high-level strategic planning occurs at central level, implementation of the policies occur at district level with certain degree of decentralised operational policies. This leads to a degree of
autonomy which lies at the level of health district level with the administrators and MO-MCH. The operationalisation of public health information flow lies with the MO-MCH who implements through the MOHs. In the context of the nutrition program, the decision of digitalisation of the nutrition information flow and design of the mobile application along with customised DHIS2 platform takes place at national level. However, it is up to the district level to manage their staff at field level to implement the system to meet the expectations set up at national level. Therefore, significant level of administrative power lies with the district level administration. In the context of Jaffna district, the MO-MCH and the district administration staff took several measures to implement the mobile-based nutrition information system at field level by using the field health staff. Kaufman et al. highlights the importance of political and economic support as key elements of governance[9]. The decision of implementing the information system, procurement of mobile devices, customisation of the mobile application to the requirements of Jaffna district and provision of the training are elements of governance which helped to establish the system within the district. The qualitative findings of the study highlighted that possession of a mobile device and using it for routine nutrition monitoring activities were conceived as factors for job satisfaction and motivation from the point of view of field health workers. Therefore, it is observed that initial combination of governance and the empowerment of end users contributed to the establishment of the information system within the district.

However, it was identified from the qualitative findings of the case study that sustaining the establish information system to meet the objectives of enhanced data quality by means of data use was more challenging. The MO-MCH identified that the empowerment of field health workers essentially lies on the autonomy for decision making at field level. He understood that this could be achieved in a more scientific manner if end-users could make use of collected data for routine nutrition interventions. However, the culture of data use was not established in the traditional context. The use of DHIS2 dashboards in monthly meetings was a classic idea that came from district level but made operational at the intermediate level which was the MOH level. Another interesting application of governance is observed in this context by delegating the administrative task from district level to the secondary level. This eases the workload at district level and in turn empowers the middle level managers, the medical officers of health to actively use data collected by field level staff and also to provide feedback to the field health workers. Therefore, this indirectly enforced the supervision of field health staff and established feedback loops. As highlighted by Westcott et al. above actions helped employees to gain access to information for decision making and also helped to build a sense of responsibility to the data they collected by discussing the data in the monthly meeting in front of the peers[10].

The case study identifies that governance and empowerment are tightly coupled and is a continuum. The more empowered the field health staff, their demands to enhance the use of technology increased. The field staff wanted more support for correct use of the tool and troubleshooting. When this was noticed by the district level managers, they had the challenge of assigning limited resources for troubleshooting and user support. This is when the innovation at district level managers was applied to the case study again by use of instant messaging platform ‘Viber’ which was readily installable on the
mobile device to be used as a troubleshooting mechanism. This inadvertently built sig-
nificant level of capacity in end users to use mobile technology which could be utilized
in future by other health programmes. The use of such platforms also contributed to the
peer learning through mistakes of others which further contributed to building the em-
powerment.

These interconnected elements in governance and empowerment make us argue that
management at district level and empowerment of field health staff are interconnected
elements which needs to be responsive to each other’s requests to establish the sustain-
ability of an implemented information system. The Figure 1 depicts the interconnec-
tions between governance and empowerment layers as it progressed during the course
of the case study.

Figure 1: Diagram depicting interconnections between governance and empowerment

6 Conclusion

The case of implementation of nutrition information system in a resource-limited
post-conflict district in Sri Lanka highlights how the district level governance and em-
powerment of field health staff is interconnected and should be responsive to require-
ments from each other to establish a sustainable field health information system. These
approach becomes crucial in addressing long standing public health issues such as
childhood malnutrition of which interventions depend heavily on good quality data for
action.
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Towards Sustainability and Equality in Digital Development

A case study of the cereal seed value chain in rural Mali

Sophie Vos¹, Hella Schaefers¹, Patricia Lago¹,², Anna Bon¹,⁴

¹ Computer Science Department, Vrije Universiteit Amsterdam, The Netherlands
² Chalmers University of Technology, Sweden
³ Centre for International Cooperation, Vrije Universiteit Amsterdam, The Netherlands
⁴ Faculty of Arts and Social Sciences, Maastricht University, The Netherlands

s.o.vos@student.vu.nl h.a.m.schaefers@student.vu.nl
p.lago@vu.nl a.bon@vu.nl

Abstract. Sustainability assessment and ethical considerations are not commonly included as subtasks in the development of digital systems and services and receive less attention in the design process than business and technical aspects. When developing digital systems/services or platforms for people in resource-constrained environments, it is important to take a wider scope and include more aspects than just the business and technical, and anticipate to unexpected negative effects of the introduction of new technologies. In this study we present a method to assess local concerns in the design of digital services that target poor environments and regions in the world.

Keywords: sustainability, (in)equality, architecture design, ethical principles, resource-constrained environments, decision maps.

1 Digital design for resource-constrained environments

In this ongoing-research-paper we present a design science method [1] that includes assessment of sustainability and ethical values, in the process of digital development, i.e. the design and development of digital services for people in poor environments and regions of the world. As a case study, we focus on Mali’s cereal seed value chain. This complex ecosystem was until recently operational in non-digital mode. The implementation of a digital trade (web-) platform in 2019 has brought various concerns. Our study aims to provide a design method to improve digital development of platforms
in resource constraint environments and complex dynamic contexts, taking sustainability and equality as central requirements.

1.1 Knowledge gaps in digital development design

Whereas various studies have criticized the lack of sustainability of digital development targeting poor environments in the world [2,3,4,5], other studies show that in digital development projects the concerns of least privileged citizens and the contextual aspects of their local environment are often disregarded, resulting in digital solutions that may exacerbate inequalities [6,7]. It is important that digital development in low resource environments addresses not only technical and economic concerns, and also other concerns (such as sustainability and ethics) become part of decision-making in software architecture design. To date, a few studies have proposed practical methods how to do Digital Development in practice [7,8,9]. However, suitable instruments for deliberation and proper decision-making about which concerns to address in architecture design are still lacking. To fill this knowledge gap, our ongoing research aims to provide a design science-based method [1] that addresses sustainability and equality issues in digital development. In the case of our research the design question is formulated as:

**RQ: How can we design digital services for sustainability and equality in resource constrained environments?**

To answer this question, we need to know: What ensures sustainability and equality in the existing workflows? What are the requirements of design for sustainability and equality? And after the case study: can we generalize our findings into a new design framework?

1.2 Theoretical background and framework

In this research we use decision maps (DM), borrowed from software engineering, as a theoretical framework. Decision maps guide the design of a software architecture, making sure that the system’s purpose is met, and stakeholders’ concerns are well addressed, by making them explicit. [10,11]. Decision maps help to frame the concerns of a selected problem and their expected or experienced interdependencies. In doing so, they help understand which ICT solution is suitable to solve the given concerns. Further, if a certain concern is associated with target metrics/indicators, we can use this to assess the extent to which ICT solutions really contribute to the target goals [10,11,12].

2 Methodology and research design

Our research methodology is based on an interdisciplinary approach in which we collect local information from the system’s stakeholders through interviews and focus group
discussions. Figure 1 shows an example of a decision map for the current use case. AOPP is the Malian farmer umbrella organization that has commissioned the design and deployment of a seed information system (SIS).

![Decision map for the seed information system in Mali, after the first phase.](image)

Figure 1: Decision map for the seed information system in Mali, after the first phase.

Decision maps in the design of digital platforms, based on concerns expressed by local stakeholders, is a practical method to structure and formalize these concerns and prioritize them e.g. in terms of sustainability or societal impact. This method is useful for complex contexts in which many dimensions (social, technical, economic, environmental, ethical etc) are at play. It is not a static model, as it visualizes immediate, enabling and systemic concerns and impacts of the envisaged digital service or system. The Decision map can be used for the elicitation of concerns that would otherwise remain hidden, in a traditional requirements analysis approach, which focuses only on business profit and technical requirements. In this method, social/ethical aspects and e.g. environmental sustainability are brought to table. These aspects have to be discussed with the users in collaborative and co-creative sessions.

3 Case study: enhancing food value chains in rural Africa with ICTs

For this study we have selected as a case study the cereal seed value chain in Mali. This case is relevant from the societal perspective and illustrates some ethical
considerations. If the research is thorough, a well-designed system can be used in the local case itself (food security in Mali is a pressing issue). Moreover, the case study is expected to provide insights that can be generalized to other contexts.

3.1 Background to the use case

In the concern for food security in countries in sub-Sahara Africa, cereal seed value chains play an important role [13]. Many issues are at play: a need for intensification of agriculture to feed a growing population, concerns about efficiency of local markets, legislation, protection of rights to land use, commercialization of locally bred variations, sustainability, legislation, policy (certification of seeds, control mechanisms). Recently, given the increase in mobile and internet use in Mali, local cooperatives aim to improve access to markets for smallholder farmers through digital trade platforms [14,15,16].

Field research in Mali shows that in low resource environments there is still much digital inequality. Poor or intermittent connectivity, low purchasing power, gender or illiteracy may hamper access to a mobile or the Internet. Since introduction of ICTs is not supposed to increase inequalities or hamper people’s current work. Moreover, unexpected, unforeseen effects of the introduction of the system have to be anticipated upon. Sometimes these effects are not found during the design process. This may involve negative effects for people’s livelihoods, for the environment, or e.g. effects of increased inequality among different stakeholder groups. Our research is done on the actual process of developing a digital platform for seed trade. Our study consists of three phases, visualized in Figure 2.

![Figure 2 Three phases of this research.](image.png)

3.2 First phase of the study

First, we aim to understand the sustainability qualities (SQs) of the current workflow [10]. To answer this, we need to understand the context around the seed value chain in Mali and the role of the current system. The tasks in this research phase consist of the...
interviews and focus groups and the production of trip reports. The current workflow is studied and analyzed using Decision Maps (DMs). To properly identify the sustainability concerns, the stakeholders of the system are involved. We build stakeholder profiles based on and validated by user interviews. The output of this phase consists of the technical documentation of the current Seed Information System which includes a first versions of a decision map (see Figure 1).

3.3 Second phase of the study

From the first iterations in the field research (phase 1) we have drawn a first version Decision Map in which a number of concerns have been identified related e.g. to language, lack of literacy and infrastructure. By mapping these concerns they are included in the process of decision-making (e.g. to build a speech interface to the seed platform in the local Bambara language, and/or a GSM mobile interface to allow access for users without an internet connection). The question now is: “What system design improves the current seed information system with respect to its stakeholder and sustainability concerns?”. To answer this, we identify new requirements and sketch an architecture design of a new platform. Thereafter, the system design is validated by stakeholders. A new Decision Map is constructed to assess the implications of a new, context-sensitive digital platform.

3.4 Third and final phase of the study

In the final phase of the study we assess future implications of the envisaged system, ethical aspects and how to anticipate to unforeseen side effects of the intervention. We then focus on generalizing the findings, asking: “Can we define a general good practice for designing sustainable and beneficial systems in low resource environments?”. To address the term “beneficial” we focus on ethical aspects, in casu, how to design information systems that (i) do not compromise the livelihoods and operational goals of the users (ii) do not exacerbate existing inequalities, but helps to reduce them (iii) does not have unintended side-effects e.g. for the environment, or causes other disadvantage for local users. This phase consists of collaboration and extensive dialogue with stakeholders. This research phase has started, but (especially its generalizability) is still work in progress.

4 Discussion: unforeseen side effects of digital development in resource constrained environments

In the last phase of this study (which is ongoing) we will assess future implications, ethical aspects and how to anticipate to unforeseen side effects of the introduction of a digital platform. From our ongoing research and the lessons from the seed value chain use case in rural Mali, both the long-term sustainability of a digital platform as well as unforeseen side-effects have to be addressed. One of the outcomes of the first cycle deployment shows that existing work flows by farmers trading seeds are being compromised by the implementation of the system. Farmers that do have access to the
SIS (e.g. because they do have a Smartphone, and are able to read in French) are privileged by the system, which facilitates their trading and bargaining position. Others are disadvantaged by the system. This access imbalance has impact on the overall trade. These and other unforeseen negative aspects can be mitigated if a second cycle of testing and evaluation organized, in which the system can be re-assessed by the envisaged users. The process of mapping, categorizing and prioritizing the stakeholders’ concerns against the project goals, creates room for reasoning and deliberation about the implications of decisions from the short- (immediate and enabling impact) to the longer term (systemic impact).

5 Conclusion

In this paper we have presented preliminary results how to design digital services for people in resource-constrained environments, while including sustainability assessment and ethical considerations in the design process. We have shown how decision maps are a useful method for the elicitation of “hidden” aspects of digital development. To make sure that the system reduces inequality instead of increasing it, a proper structure for deliberation has to be in place, not only for the system design, but also for the complete stakeholder ecosystem. How this decentralized, collaborative structure can be included as an integral part of the design phase is subject of our ongoing research.

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