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Institutional shaping of affordances: implications on information use in global humanitarian organizations

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Abstract. To support global humanitarian organizations in carrying out interventions in project sites, information is needed that is situationally relevant and timely, while also being relevant to the HQs. The macro-level formal institutional conditions of the HQ and informal constraints at the project sites shape the design and content of Humanitarian Health Management Information Systems (HHMIS), and we focus in the paper on the aspect of information use. We use an ensemble view of the HHMIS, comprising of paper, the computerized system based on DHIS2, and other tools like Excel, to understand how these different components have varying affordances and are influenced differently by the formal and informal institutional conditions. Our theoretical perspective is thus shaped by the notion of “institutional affordances” which we draw upon to understand the affordance actualization of the HHMIS. We identify through our empirical analysis based on a project site in South Sudan, three key affordances relevant to the use of data – operationability, accountability and contextuability. Our analysis makes two key contributions: One, the different affordances of the components in the ensemble have interaction effects, sometimes positively influencing actualization and at other times is limiting. Two, we identify 4 sets of institutional (both formal and informal) influences on actualization coming from availability of information, existing maturity in the use of information, unique features of the humanitarian setting and technical features. We believe this paper makes an overall contribution in helping to situate the informational challenges faced by humanitarian organizations more firmly in the ICT4D agenda.

Keywords: institutional logics, affordances, health management information system, humanitarian organizations

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1 Introduction

In humanitarian interventions, information is needed that is situationally relevant, timely, and at a level of detail to understand the current health status of the people affected, their locations, associated risks and resource needs [CITATION Thi05 \l 2057].

While humanitarian organizations are making systematic efforts to strengthen their supporting health management information systems, these benefits have not materialized in practice[CITATION ALN15 \l 2057]. To understand why is the case and what can be done about it, this paper addresses the following specific research question: *How do constraining and enabling institutional influences shape the actualization of HMIS affordances within the context of global medical humanitarian organization?*

Our empirical site is the Doctors Without Borders Spain / Médecins sans Frontières Spain (MSF-E). We adopt an “institutionalized affordance” approach to analyse how and why are Humanitarian HMIS (HHMIS) contributing to strengthening MSF’s interventions in South Sudan.

In the next section, we discuss our theoretical framework drawing from institutional and affordance theories and develop a synthesized analytical framework. Section 3 describes research methods and sections 4 and 5, we present our case analysis and discussions respectively, followed by a brief future work plan in section 7.

2 Relevant literature

This section includes 4 sub-sections. The first describes our conceptualization of the HHIMS. In the second, we discuss affordance, and conceptualize HHIMS from this perspective. In the third, we discuss the influence of institutional conditions on affordances. Finally, we present our analytical framework.

2.1 Conceptualizing HHIMS: an ensemble perspective

Orlikowski and Iacono [CITATION OrI01 \n \t \l 2057] describe an ensemble view of the IT artefact to include the “ensemble of equipment, techniques, applications, and people that define a social context, including the history of commitments in making up that ensemble, the infrastructure that supports its development and use, and the social relations and processes that make up the terrain in which people use it (pg. 122)”. The HHMIS under study similarly represents an ensemble including multiple inter-connected components of both paper and a recently introduced technology platform, and the work practices around both of them. An ensemble view helps to capture the different techno-social aspects associated with the overall system and their inter-linkages.

2.2 An affordance perspective around an ensemble view of technology

Drawing from ecological psychology, Gibson [CITATION Jam79 \n \t \ 2057] describes affordance as how a goal-directed actor perceives an object in terms of how it can be used without a cognitive analysis. Affordances reflect a relational property emerging from the animal-environment system [CITATION 3stroffregen2003 \ 2057] with a key focus on the relationships [CITATION 3chemero2003 \ 2057] between the users and the technology [CITATION 3chemeroturvey2007 \n \t \ 2057].

Affordance Actualization (AA) theory [CITATION Str14 \ 2057] describes affordance as “the potential for behaviours associated with achieving an immediate concrete outcome and arising from the relation between an artefact and a goal-oriented actor (pg.69)”. AA theory is relevant to our analysis of how the HHMIS strengthens or not the use of information [CITATION Lan16 \ 2057]. From an ensemble view, emphasizes how different components of the HHMIS responds to specific needs of users in varying ways, representing a multiplicity of affordances. Actualization of affordances in shaped by various conversion factors [CITATION Placeholder1 \n \t \ 2057], such as personal, social and environmental. We conceptualize these as institutional conditions. We adopt an expanded form of AA by emphasizing a multiplicity of interacting affordances which are shaped by different institutional conditions. Understanding the institutional-affordance linkages is the focus of our analysis.

2.3 An institutionalized perspective on affordances

Institutional theory is relevant to understand the implementation dynamics of health information systems in developing countries [CITATION Sah \ 2057] by understanding the nature of institutions and their influences [CITATION Dou90 \ 2057]. Concepts of the organizational field [CITATION DiM83 \ 2057], [CITATION OrlikowskiBarley2001 \ 2057] and institutional logics [CITATION Alf85 \n \t \ 2057] inscribe the organizing principles that guide individual behaviour [CITATION Fri91 \ 2057]. Institutional logics are multiple and could be simultaneously in play and not in synch, often contributing to institutional contradictions[CITATION Fri91 \ 2057]. Piotti et al. [CITATION PiottietAl2006 \n \t \ 2057] also include the role of ICT and formal rules and informal practices surrounding their use.

The ensemble perspective allows to discern the formal and informal practices surrounding the sub-components of the system, and their enabling and constraining conditions. The organizational field perspective helps to understand the different influences and how they interact and sometimes create contradictions.

2.4 Proposed analytical framework

We conceptualize the HHMIS as an institutionally ensembled system comprised of ICTs, paper, associated protocols in use, infrastructural limitations and existing work practices of users. The affordance perspective helps to analyse the relationships between different components of the system for interaction effects with users, to

understand to what extent they are able to make expected use of it - to actualize the affordances. This framework helps us to analyse the relation between institutional conditions, affordances, and their actualization and trajectory.

3 Research Methods

3.1 Case context

Médecins Sans Frontières (MSF) is an international, non-profit, self-governed, member-based organisation that delivers emergency aid to people affected by armed conflict, health epidemics and natural disasters [CITATION Abo \l 2057]. Our research focuses on the operational directorate of MSF Spain, who during 2017 worked in 25 countries, with 43 % of emergency interventions and 57 % long-term missions [CITATION MSF18 \l 2057]. Specifically, we analysed MSF's HHMIS implementation in their South Sudan Mission (SSM), including coordination office in Juba, two projects in the Greater Upper Nile Region, north of the country. The first project runs 2 hospitals, 4 mobile clinics and community health promotion activities. The second project runs 1 hospital, 2 mobile clinics and community health promotion activities. The HHMIS project was launched in MSF headquarters in 2013 and was deployed in South Sudan in 2015.

3.2 Data Collection

Our research covered two sets of data collection methods: one, at MSF Spain HQ where the HHMIS was first designed. This helped to understand the HQ's institutional influences on projects. The second concerns the field site in SSM to understand how micro-level dynamics around affordances are shaped and actualized.

Headquarters

This research builds upon 4 years exploratory period (2013-2017) in which the first author was leader of the MSF Spain HHMIS team. She later left MSF to start a PhD programme in 2017 under a formal research agreement between MSF and the University of Oslo. For this reason, she is positioned as an "insider" researcher [CITATION Walsham1995 \l 2057] and the second author an "outsider", collaborating on analysis, interpretations and theory development. Moving from insider to researcher helped in developing sharper insights of the HHMIS phenomenon [CITATION Vil18 \l 2057]. Between July 2017 and February 2018, she made 3 visits to the HQ for data collection, in addition to regular emails and skype calls.

Field engagement

Field engagement included a visit to the South Sudan Mission in February 2018. In MSF interventions, each country has a mission, with an office which coordinates the

different projects in the country (usually 2-5). Projects have sub-offices which manage health facilities.

Data was collected primarily through interviews, observant participation, and informal conversations with staff. Some interviews were conducted in Spanish and others in English. As the first author is a native Spanish speaker, she experienced no problems in switching between these two languages. A semi-structured protocol guided the 22 interviews conducted, including of field staff (21) and medical profiles (20). Interviews ranged from 15 minutes to an hour, and they were recorded after obtaining explicit consent from the respondents.

Participant observation was ongoing and integrated with project activities like coordination and weekly medical meetings. Visits were made to 3 hospitals and 2 facilities to observe the data collection flow and have informal discussions with staff about their experiences. Notes were made of each interaction. All the recordings and notes were subsequently transcribed, and the raw data was ordered and made ready for analysis.

3.3 Data Analysis

Data analysis involved both qualitative and quantitative methods. Qualitative analysis involved a process of iterative coding, while quantitative analysis included aggregating the frequency of codes and ranking them to interpret their salience. The most salient codes were then interpretively analysed to understand their underlying meanings.

Interviews were transcribed by the first author, and then shared with the second author. Both then independently read the transcripts and developed first level codes to help answer the research questions. Following this, both had face to face discussions to discuss the respective codes and resolve disagreements, which were limited. A total of 408 raw codes were identified, such as difficulty to find information, lack of time, data used for accountability, data quality problems and the predominant use of paper. For example, quotes leading to the code "Data is highly valued" were: "*data is important because we care about results*", "*Having access to HHMIS makes us autonomous*", "*use of HHMIS should be available for all staff*". After this followed a second-round of higher-level analysis in which codes were combined and grouped in more generic themes, such as different use of data, perceptions of data, challenges in work practices, challenges in the use of the system. Example in the development of a theme: **Theme:** Mature use of information and good perception of data. **Codes:** Data highly valued, Use of heuristics, Collaborative analytical process.

The developed themes provided the analysis basis for a third level of analysis, were they were linked to predefined theoretical concepts of affordances and institutions. 75 of the 408 codes were classified as affordances (18.5 %), 162 as institutional conditions (39.7 %), 162 as resulting influences (39.7%). Remaining 9 codes were not matched.

4 Case study and analysis

We present an analysis of affordances, followed by a description of relevant institutional conditions. Next, we present our analysis of the impact of institutional conditions on affordances actualization.

4.1 Affordances and their actualization

Affordances refers to the relation between the users and the system and their capacity to use it to support their everyday actions, in our case related to the use of information. Within an ensemble perspective, we focused on both the paper and computer-based components of the HHIMS, their interactions and implications on actualization. The 3 most important affordances identified were: operationability (62.7% salience), accountability (12%) and contextuability (8%). These contributed to 82% of overall salience.

Operationability

Drawing from MSF's use of the term operational as related to the field intervention, we describe operationability as *“the possibility to use data to follow up trends and identify alerts for constant response and adaptation of activities”*.

Respondents, both the medical and management staff, saw this affordance as significant given that they were operating in a dynamic environment requiring constant follow up of day-to-day project management and organizing of health service delivery at the facilities, including decisions related to logistics, budget, capacity building and human resources.

Predominantly, staff saw paper-based data to be more operationally useful than computers, and they reverted to the paper clinical files to routinely provide patient care. To analyse trends and incidence of diseases, most doctors would directly use data from the paper forms or their own personal note books and diaries. They saw HHIMS data as not always available or sufficient: *“I don't have the information in HHMIS to follow up the community health workers, I have made my own records”*. Another doctor said: *“I do check my data, but I do it at data entry for current data. I do not build charts or follow trends (...) paper is always there “*. The higher-level follow-up from the mission coordination office was based on HHMIS data and through email communication. Access to the paper records was not possible there, and so its use was not an option.

Accountability

We describe accountability as *“the possibility of data to be accountable for day to day activities and operational decisions”*. This was especially relevant for mid-range coordination positions, and for reporting and justifying operational decisions cross

different levels by both medical and management staff. At the health facility, the laboratory technician and the medical officers were aware of the importance of having their work reflected in numerical values, for example: *“you need your data to prove your work to others”, “if I have empty records, means that that day I have not worked.”*

The clinical officers at the facility always interacted with paper, which was their primary source for accountability, as they did not have access to the system. For expatriates and higher-level positions, the HHMIS was used when information was available to generate their reports. When unavailable, they used parallel tools (like Excel) that allowed for sharing reports to higher levels as a temporary solution. However, they were conscious of the importance of having data in the “official” channel. We saw a nurse to be collecting data on the number of deliveries in paper. She had asked for a maternity service in the system, which was not offered at that moment in the facility. She realized only when data on deliveries went through the HHMIS would her request for a maternity service be heard by the higher ups.

Contextuability

We describe contextuability as *“the possibility to know and analyse context when you are new to the situation”*. This was relevant when users needed access to medical data from the previous periods when they were new in a project or mission. When new staff arrived to the project, they requested access to HHMIS to follow up data on daily basis: *“when I just came to the project, data was my daily bread”*. This prior data helped them understand the context and how to readjust their interpretation of data. A very descriptive example of this was: *“Now when I arrive to DRC, with the same population, the number of malaria cases is 200 per week, and for me that was a normal situation... and the Medical Coordinator was surprised of why was I not raising an alarm... because was increasing... 200, 250, 300... but for me was normal... I was actually focussing on Cholera, because in my country (Niger) one case of cholera is an outbreak and we had 10 cases, and no one was talking about it... so I was like... what happens here? “*

4.2 Institutional conditions and their influences

We identified 4 institutional conditions reflecting pre-existing aspects which influence the interaction of the users with the HHIMS: i) mature use of information and positive perception of data (29.6% salience); ii) limitations of information available (24.7%); iii) humanitarian setting characteristics (20.4%); and, iv) technical features (16.7%). Together, they comprised more than 90% of the total salience. These are now discussed.

Mature use of information and positive perception of data

Most users perceived the important role of data in shaping their everyday work and the overall effectiveness of the project and of the HQ. Despite the limitations of existing data and systems, the value of data was universally recognized. Some

illustrative quote: *“data is important because we care about results”, “Having access to HMIS makes us autonomous” “use of HMIS should be available for all staff”.*

The medical teams had weekly meetings where they discussed service by service important events of the week, and the underlying reasons. There was a generalized use of heuristics and experience-based knowledge to analyse data and follow up on particular diagnosis. A doctor said: *“Numbers tell me the workload of staff and the treatments that I could need based on diagnosis. If there have been many diarrhoeas, I know I will need ORS (...) I also see if treatment consumption matches diagnosis.”*

The mature use of information and positive perception towards data was an enabling condition for affordances actualization and promoted the use of the paper and parallel tools to predominate over the use of the new technical solution. For example, to enable operationability, in weekly meeting all doctors had the numbers that they wanted to share in their notebooks, copied from the manual system. For accountability, they used the parallel excel files to show their numbers. For contextuality, they complemented the computer system data with a printed version of the past reports. Overall, we see a positive affordance actualization of the ensemble system.

Limitations of unavailable information

The institutional condition of unavailable information is related to the technological component of the HHMIS, specifically its configuration in terms of content, metadata and logic. The system is configured to collect certain data points from each health service and calculate a set of indicators. This configuration is standard for all interventions, across settings, and often is inadequate to cater to local specificities.

The available data was described by the user as, paradoxically, extensive and limited at the same time: *“there is a huge amount of data collected in HHMIS that is not used”, “too much data, but yet important data not collected”.* While users recognise the value of using standard systems, they also see their limitations *“using standard systems is needed but it will not work for those in the extremes”.*

Having limited information available affected negatively the actualization of all three affordances. In the case of operationability and accountability users had to find alternative ways to collect and manage their data, such as through paper or parallel tools. For contextuality, the lack of information limited actualization of the affordance and users tried to find alternative sources of information, but since data is studied retrospectively, it did not result in the creation of parallel channels.

Paper and parallel tools are components of the ensemble system, and it is planned for the technical component to gradually replace them. Paper is inherently limiting to the quality of data as it leads to data loss and impedes the creation of historical trends. Use of parallel tools also creates multiple flows and potential duplications. In the long run, the use of paper and parallel tools negatively impacts user’s motivation for data tasks: *“time dedicated to data collection does not compensate if you don’t use data”.*

Humanitarian setting characteristics

The atmosphere in the project office is of intense activity. The working day is long and there is no clear distinction between work and personal spaces as also the project office and residences are co-located. In addition, medical staff are on call at night and on weekends. In the interview records, there was always a lot of background noise, with sounds of radios and walkie-talkies, and many interviews were frequently interrupted. All users talked about the lack of time: *“I don’t have time to sit and look at data”*.

There is also a high staff turnover, the average time an expatriate medical staff in one field location was 2 to 12 months. Since field staff are working with sustained high intensity, they find difficult to be responsible for teaching newcomers. One field staff said: *“high intensity makes you rely on the ones who know instead of teaching the newcomers”*. Users do not find the time to train themselves: *“Paper is always there, and you don’t need to learn”*. And the same is the case with Excel files.

The institutional conditions of the humanitarian setting tend to be restrictive to the actualization of all affordances as users are unable to dedicate quality time for learning, and their transitory mindset makes them rely on shortcuts and local improvisations.

Technical features

Institutional conditions inscribed in technology were both enabling and constraining. While the technical system is centralized and web-based on the District Health Information System platform [CITATION DHIS2 \l 2057], the architecture includes offline servers which store all collected data from each project and synchronize with the central instance when internet is available. Having data integrated from the field, directly into one centralised system contributes to the actualization of operationability and accountability, specially at coordination level, where data is available almost in real time. It also improves data quality in contrast with other means of data collection.

The centralized offline-online architecture enables data to be entered and modified only from the field project, which was not the case before. This improves data ownership by field users, which will have a positive influence in the long term. On the other hand, offline deployment limits content updates to once a year, contributing to a perceived rigidity and complexity which constrains the actualization of operationability at the project level and limits availability of data.

Regarding the user experience, all users without exception were able to enter data, but only a few could use the analytic tools for generating charts or tables, generally the ones in management positions. It was common practice to extract data from the HHMIS as a simple table, and then create more elaborate tables or charts in Excel, because *“I already know it”*. The complex user interface of DHIS2 prompted users to use Excel.

4.3 Summarizing analysis

The paper sought to answer the research question: *How do constraining and enabling institutional influences shape the actualization of HMIS affordances within the context of a global medical humanitarian organization?*

Firstly, we have identified through our empirical analysis three key affordances relevant to the use of data – operationability, accountability and contextuability. Operationability refers to the ability to work with data in routine use, accountability concerns the ability to show the value of a user’s work to the higher levels, and contextuability reflects the ability to get historical data to guide current use of data in an unknown environment. All these affordances are particularly relevant to a humanitarian setting given the high importance of data, the challenge of people in the field in isolated settings to make their work visible to the coordination levels, and the dynamic nature of the humanitarian setting where it is challenging to access historical data.

Secondly, while we find the actualization of affordances to be shaped to different degrees by the features of the paper and the computer-based system, our ensemble view also helps to understand how these individual affordances interact with each other. For example, with respect to operationability, paper allows the affordance of quick local availability of data found in local diaries of the staff, which enables the use of data combined with experiential knowledge of the staff. With respect to the same operationability, the HHMIS designed with an integrated database helps build perceptions of sounder data quality, which encourages data use. These individual affordances have interaction effects. In some cases, the easy access to paper-based data discourages users from using the computer-based system, in other cases the paper printouts are used in conjunction with the computer reports of aggregate data.

Thirdly, we have identified four key institutional influences on the actualization of affordances towards data use. These are an existing maturity in the use of information, limited availability of information, the unique features of the humanitarian setting, and the technical features. While some of these conditions, such as technical features of the system can be seen as formal institutions defined by the HQ for the project level, others such as the hectic nature of the humanitarian setting resulting in high staff turnover can be seen as informal institutional constraints. These formal and informal institutions are not isolated, they influence each other enabling and constraining the actualization of affordances. For example, the centrally defined technical architecture is enabling as it is seen as heightening accountability. The same architecture, for operationability, is seen to be rigid and difficult to change which then encourages the use of paper to fill the gaps. A summary of the impact of institutional influences in the actualization of affordances can be found in the table below.

Table 1. Institutional influences in affordances actualization

Operationability	Accountability	Contextuability
		<i>Information limitations</i>
<i>Constraining: increases use of paper and parallel tools</i>	Constraining: increases use parallel tools	Constraining: limits retrospective analysis

Mature use of data	
<i>Enabling: origin, fuel of all affordances. Results in the use of paper or parallel tools which makes benefits of new system explicit.</i>	Enabling: origin, fuel of all affordances.
Humanitarian Setting	
<i>Constraining: impacts the actualization of all affordances as results in the combination of a continuous loss of capacities with lack of time for training.</i>	
Technical features	
<i>Enabling: increases data quality, enables for integrated analysis, enhances ownership of data, and gives almost real time access to information.</i>	Enabling: increases data quality, enables for integrated and retrospective analysis.
<i>Constraining: rigid data model, complex analytic tools.</i>	Constraining: complex analytic tools.

5 Discussion

Humanitarian organization settings by principle are complex because of them having to intervene in dynamic and unstable situations, where project locations are in environments which are remote, politically charged and having sub-optimal infrastructure. For these very reasons, they need robust information support to guide their interventions, especially related to using information for local action. This as our case study has described is a non-trivial challenge.

We have examined these challenges from the lens of “institutional affordances.” Our point of departure and contribution is primarily twofold. One, we have conceptualized the artefact from an “ensemble” view to highlight the artefact is not one monolithic entity but comprised of different components, in our case including the technology, the paper-based records, parallel tools like Excel, and the idiosyncrasy of the humanitarian environment. These components have varying affordances, they are differently influenced by the institutional conditions and have interaction effects – enabling or constraining, which shape the overall actualization of the affordances. Two, we have examined the institutional influences on affordance actualization both with respect to the formal rules of the game (such as the HQ defined technical configuration and metadata) and informal constraints (such as the work practices or the hectic and unstable environment of a humanitarian setting). These influences are also enabling in some cases and constraining in others.

Arguably, our paper makes some notable contributions to the important and emerging field of humanitarian assistance, and the role which ICTs can play in this domain. Till date, the study of humanitarian systems has received scant attention in IS research. And as Walsham [CITATION Walsham2012 \l 2057] has argued, this represents an important domain for ICT4D research and strengthens our quest to make a better world with ICTs.

6 Conclusion and future work

What we have presented in this paper is part of a larger and ongoing work at MSF Spain, where the commitment is to make a real difference in data use for project settings through the use of ICTs. In future, we seek to explore the potential of using mobile devices to bring the technology closer to the user to improve data collection processes. We will be guided by our understanding of institutional affordances to examine how data can be got “closer” to end users, and by supporting local action taking will enhance affordance actualization. The mobile technology will be introduced and analysed as a component of the ensemble system, including the evolution of the trajectory of affordances over time.

The paper contributes to the conference theme by examining how the current north-south (HQ-mission) networks are problematic. The institutional affordance lens helps to understand these challenges and identify approaches to address them. These solutions can subsequently be taken to other projects and missions, and effectively implemented to south-south driven collaborations.

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