

Better Health

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Executive Summary

Task 3.3 aims at examining the role of human factors in improving eHealth policies and national programmes based on findings from four participating countries of Ethiopia, Ghana, Malawi and Tunisia. Human factors involve “gathering information about human abilities, limitations, and other characteristics and human factors is devoted to better how humans can most effectively contribute towards good services through policy and service provision. On the other hand, policy is very important in the health sector as it shapes the entire health care landscape (WHO, 2022), clarify priorities, and establishes roles and expectations for different groups (UND, 2022). WHO (2022) highlights three main categories of stakeholders who determine the health system and its governance, consequently its policies through their interactions as the government organizations and agencies; the health service providers (both public and private); and the citizen (including population representatives, patients’ associations, etc.) who become service users. The analysis for the four countries, however indicate that most of the stakeholders involved in eHealth policy development are mainly from one category – the government organisations and agencies. The second category is included mostly in token form, whereas the last category, that of population representatives and patients’ association is completely neglected. It is recommended therefore that all countries should be vigilant in ensuring that all the three WHO stakeholder categories are included in the policy development processes, including the neglected patients’ associations.

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Abbreviations

BeH	BETTEReHEALTH
LLMICs	Low and Lower Middle-Income Countries
WP	Work Package
MoH	MoH
GDHI	Global Digital Health Index
WHO	World Health Organization
eCHIS	electronic Community Health Information System

1 Introduction

Human factors involve “gathering information about human abilities, limitations, and other characteristics and applying it to tools, machines, systems, tasks, jobs, and environments to produce safe, comfortable, and effective human use” (Higgins and Higgins, nd.). In health, human factors is devoted to better how humans can most effectively contribute towards good services through policy and service provision. Policy is very important, in the health sector for example, policy shapes the entire health care landscape (WHO, 2022). Further, a health policy helps to clarify priorities and establishes roles and expectations for different groups (UND, 2022). A good example is where health service providers like nurses would contribute towards health policy based on needs encountered in day-to-day practice as they interact with patients. UND (2022) define health policy as a set of overarching principles and goals that dictate how care is delivered and accessed. Task 3.3 examined the role of human factors in improving eHealth policies and national programmes. To have a complete picture of the role humans play towards policy development and implementation; there is need to have a clear understanding of all stakeholders involved and the role that each one of them play towards policy making. WHO (2022) highlights three main categories of stakeholders who determine the health system and its governance, consequently its policies through their interactions. These categories are the state (government organizations and agencies); the health service providers (both public and private for and not for profit, para-medical and non-clinical health services providers; unions and other professional associations; networks of care or of services); and the citizen (population representatives, patients’ associations, CSOs/NGOs, citizens associations protecting the poor, etc.) who become service users.

1.1 Purpose of the document

This document presents the findings of task 3.3 that analyses the human factors that affect successful eHealth policy implementation in the participating countries for the BETTEReHEALTH Project. Mapping and empowerment of stakeholders are some of the key areas that are analysed. The document also describes how Task 3.3 contributes to BETTEReHEALTH objectives; and how it is linked with other deliverables. Further, the

approaches used to collect and analyze the human factors are described. Finally, the human factors drawn from Ethiopia, Ghana, Malawi, and Tunisia are described.

1.2 General Project Objectives

BETTEReHEALTH objective is to inform eHealth policy making towards better health outcomes through a bottom-up evidence-based holistic approach. To achieve this, three aspects related to successful eHealth are addressed: human, technical and public policy factors. The BETTEReHEALTH project also aims to increase the level of international cooperation in eHealth, inform and strengthen end-user communities and policy makers in making the right decisions for the successful implementation of eHealth. The project has four focus areas: research, human factors, technical factors and public policy factors. This document focuses on the human factors' component.

2 Task 3.3 Objectives and Relationship with Other Deliverables

The human factors component aims to create increased opportunities for all three main categories of stakeholders who determine the health system and its governance as determined by WHO; these include eHealth innovators, patients, health care personnel, health system stakeholders and patient associations by understanding the factors that can improve their participation in eHealth policies and strategies. Specifically, Task 3.3 aims at empowerment of stakeholders to engage in eHealth policy and draws a lot from the findings in Task 3.1, where a stakeholder's analysis was done. This comprises the following tasks: Mapping of existing organisations representing eHealth stakeholders in the four participating countries (Ethiopia, Ghana, Malawi and Tunisia); organisation of a network for organisations representing eHealth stakeholders in Africa with main focus on the four participating countries. The mapped organisations and countries will arrange common webinars, workshops and conferences with the participation of similar European organisations with experience in eHealth policy influence. The organisations can be any of the following: National Medical Associations, National Nurses Associations, Federations of Health or Medical Informatics and patient organisations from European countries and African LLMICs. Finally, raise awareness among stakeholders, regarding the importance of a set of interpersonal skills

for successful policy related interactions.

3 The Key Terms

3.1 Human Factors

The term ‘human factors’ has grown increasingly popular with the realisation that mostly it is the human error, rather than technological failure that causes setbacks. Human factors involve gathering information about human abilities, limitations, and other characteristics (Higgins and Higgins, ud.). Although different authors (Salvendy, 2006; Health and Safety Executive, 1999); International Ergonomics Association, 2018; Roberts, 2016) define human factors in different ways; they categorize the human factors into three categories namely individual, Job and organizational. The individual human factors include issues pertaining to competence, skills, personality, attitude, and risk perception. The job-related human factors on the other hand include areas such as the nature of the task, workload, the working environment, the design of displays and controls, and the role of procedures. Finally, the organization's human factors include work patterns, the culture of the workplace, resources, communications, leadership and so on. It is important to ensure that all these aspects of human factors are taken into consideration particularly when it comes to policy issues as they have a significant influence.

3.2 Empowerment

Fostering individual empowerment is central to policy development. Like human factors; empowerment has been defined and measured in many different ways (Perkins, 2010). Perkins (2010) defines empowerment as *an intentional ongoing process centered in the local community, involving mutual respect, critical reflection, caring, and group participation, through which people lacking an equal share of valued resources gain greater access to and control over those resources; or a process by which people gain control over their lives, democratic participation in the life of their community, and a critical understanding of their environment*. The common elements being that empowerment (1) is a process, (2) occurs in communities (and in organizations), (3) involves active participation, (4) critical reflection, awareness and understanding, and (5) provides access to, and control over, important

decisions and resources. Therefore, stakeholder empowerment is the process of increasing the ability and confidence of stakeholders to make choices and decisions (Ouko, et al 2020).

3.3 Stakeholder Involvement

The third concept in this study is stakeholder involvement. Stakeholder involvement aims actively to increase attention to and inclusion of the interests of those who are usually marginalized or poor people. There is a need to define more clearly and adapt key terms to promote stakeholder involvement in eHealth policy. There are several key constituents of stakeholder involvement including: Level of stakeholder involvement: Prioritizing stakeholder engagement; Process of stakeholder empowerment/involvement; Communication medium of Platform for stakeholder involvement; Role of consultation; Institutionalization of stakeholder participation; Role of ICT. Most of these elements are already identified as human factors. Stakeholder involvement is a special human factor referred to as user centered design.

3.4 eHealth Policy

The fourth concept in this study is eHealth Policy which is defined as a set of statements, directives, regulations, laws and judicial interpretations that direct and manage the life cycle of eHealth (Murray, 2010). According to WHO (2010), National Health Policies, Strategies and Plans (NHPPs) play an essential role in defining a country's vision, policy directions and strategies for ensuring the health of its population.

4 Methodology

4.1 Overall methodology

In order to identify the human factors and the role they play towards the success of eHealth policies; both secondary data from literature review and empirical data were used. The empirical data was collected from the four BeH African countries as part of task 3.1. through an online survey. A working group including researchers, government officers, and IT professionals from partner organizations, namely, Ghana Health Services (Ghana), Jimma University and University of Gondar (Ethiopia) and Health Information Systems Programmes

organization (Malawi), and HealthTECH Cluster (Tunisia), was created and facilitated the data collection and analysis process. Online meetings with the BeH Working Group and a local workshop for Malawi eHealth Policy development team were also scheduled and organized by HISP Malawi to aid the process of data collection. To identify the role that human factors play, it was important to understand the concept of human factor, hence the extensive literature review. The literature review also helped to understand factors that are applicable in other countries outside the four participating countries.

4.2 Data Collection Tools

A comprehensive questionnaire was developed that collected data for all tasks in WP.3 for the empirical data. The secondary data was collected using search strings in different online publications such as PubMed.

5 Findings

Data search and collection have been performed through literature review and by partners in their respective countries Ethiopia, Ghana, Malawi, and Tunisia. The section

5.1 Findings from Literature Review

The literature review has illuminated human factors that are essential for consideration in implementation of activities where humans are involved including in the strengthening of stakeholder participation in eHealth policies. The first output from the literature review is the identification of the domains of human factors.

5.1.1 Identification of Domains of Human Factors

Literature shows that human factors have been classified differently by different groups of authors (Roberts, 2016; Horrock, 2017; Moura et al. 2017). The first group of authors categorize as: i.) characteristics of people ii.) contributors of outcomes and iii.) occupation and set of best practices. The second group of authors categorize them as: i) human factors, ii) factors of humans and iii) factors affecting humans. The third group categorize them as i) individual factors, ii) as job factors and iii) as organization factors. While the terminologies vary from author to author in terms of the human factors categorizations there is consistency

in the categorization of human factors into the three groups. Another school of thought is where researchers have studied human factors with focus on safety and accident prevention, others on computer security, others on design of machines in factories and so on.

Recognizing that the identification of human factors affecting humans varies depending on the context and the environment of application, the second output of the study was the listing of specific human factors under the three domains. Other authors identify human factors in the principles for implementation of security controls as employee participation, information and communication, training and learning, feedback and project management. Moura et al. (2017) define organization factors that affect human performance as communication (communication failure, missing information), organization (maintenance failure, inadequate quality control, design failure, inadequate task allocation, design failure), Training (insufficient skills, insufficient knowledge) and irregular working conditions e.g. irregular working hours. Under similar nomenclature Roberts (2016) identifies organization human factors as culture, work patterns and fatigue, available resources, communications and leadership.

However, Horrock (2017) describe general factors affecting humans tend to include: Aspects of planned organizational activity (e.g., supervision, training, regulation, handover, communication, scheduling); Organizational artifacts (e.g., equipment, procedures, policy); Emergent aspects of organizations and groups (e.g., culture, workload, trust, teamwork, relationships); Aspects of the designed environment (e.g., airport layout, airspace design, hospital design, signage, lighting); Aspects of the natural environment (e.g., weather, terrain, flora, fauna); Aspects of transient situations (e.g., emergencies, blockages, delays, congestion, temporary activities); Aspect of work and job design (e.g., pacing, timing, sequencing, variety, rostering); Aspects of stakeholders (e.g., language, role); Aspects of human functions, qualities and states that affect performance (e.g. cognitive functions such as attention, detection, perception, memory, judgment and reasoning, decision making, motor control, speech; physical functions and qualities such as strength, speed, accuracy, balance and reach; physical, cognitive and emotional states such as stress and fatigue).

Based on these authors several organizational human factors keep recurring and these

include: stakeholder participation, information and communication, training and learning, feedback, project management, culture, available resources, leadership, organizational artifacts (e.g. equipment, policy, procedures), trust, teamwork, relationship and roles. Table 2 summarizes organizational human factors based on the three domains.

Table2: Mapping of these three human factor classifications and attributes

Human Factor Category	Key Attributes/Elements
Person Characteristics/human factors/individual	Psychological attributes eg awareness, intention, consciousness, meaning, value, creativity, personality, attitude etc and physical attributes eg strength, resilience, speed, competence, skills
Contributors of outcomes/factors of humans/job related factors	<p>Cognitive functions (such as attention, detection, perception, memory, judgment and reasoning (including heuristics and biases), decision making – each of these is further divided into subcategories)</p> <p>Cognitive systems (such as Kahneman’s dual process theory, or System 1 and System 2)</p> <p>Types of performance (such as Rasmussen’s skill-based, rule-based, and knowledge-based performance)</p> <p>Error types (such as Reason’s slips, lapses, and mistakes, and hundreds of other taxonomies)</p> <p>Physical functions and qualities (such as strength, speed, accuracy, balance and reach)</p>

	<p>Behaviours and skills (such as situation awareness, decision making, teamwork, and other 'non-technical skills')</p> <p>Learning domains (such as Bloom's learning taxonomy)</p> <p>Physical, cognitive and emotional states (such as stress and fatigue).</p>
<p>Occupation and set of best practices/factors affecting humans/the organization</p>	<p>stakeholder participation, information and communication, training and learning, feedback, project management, culture, available resources, leadership, organizational artifacts (eg equipment, policy, procedures), trust, teamwork, relationship, roles</p>

Based on the terms used, the study has found a significant overlap between these classifications with differentiation identified through the perspective being used across domains. The main perspectives being that the individual focuses on person specific attributes, the factors of humans focusing on general constituent human characteristics and not the person as an individual while the organization factors focus on the institution. This overlap is also highlighted in Figure 1 below to demonstrate that each of these factors should be taken in isolation.

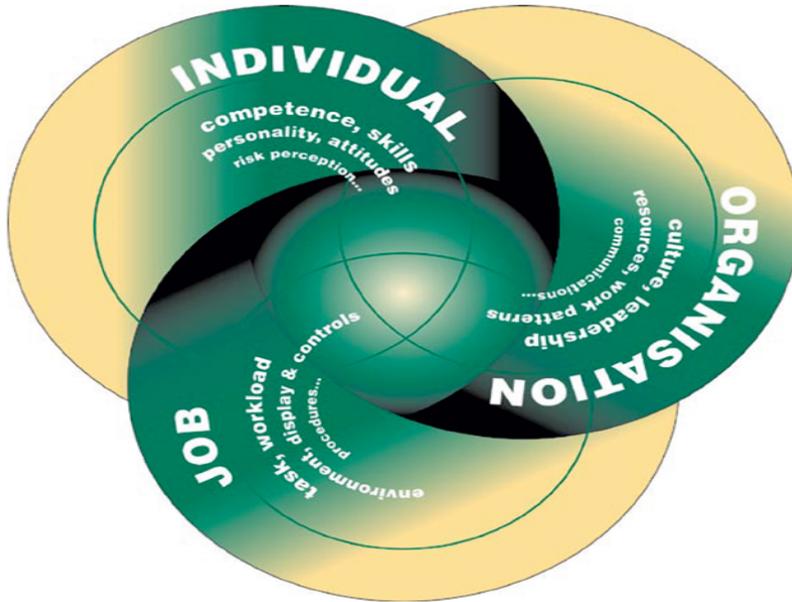


Figure 1: Inter-Relationship Among Human Factor Dimensions

Depending on how these factors have been addressed or not addressed they have been observed to either inhibit or facilitate implementation of eHealth programs and policies. Analysis of selected use cases from Malawi, Ethiopia, Tunisia and Ghana highlight lessons learnt on how these factors inhibit or facilitate implementation of eHealth programs and policies as indicated in the assessment sections below.

5.2 Assessment of eHealth Policy Stakeholders

This study is part of a series of activities to understand human factors in stakeholder participation in eHealth policies and strategies. The assessment affirmed that stakeholders of eHealth are actors who could: Affect or be affected by eHealth policies, be actively involved in the development of eHealth, be actively involved in the implementation of eHealth, Be potentially involved in the development and implementation of eHealth. Its findings underscore how addressing human factors facilitate or inhibit the implementation of eHealth policies and strategies. First, the study observes the significance of organizational factors by highlighting the need to prepare an inventory of stakeholders in each eHealth project or policy implementation. While the assessment acknowledges stakeholders to consist both at individual and organization levels its classification of stakeholders is in line with organization

level stakeholders. The assessment, therefore, identified the following broad classifications of stakeholders: National Political/Public Institution, International Organization/Donor, Civil Society, Commercial/Private- for- profit Institution and User/Consumer Organization. The user or consumer organizations are expected to represent the interests of individual health system clients. The study acknowledges that better understanding of stakeholders can contribute to successful development and implementation of eHealth programs and policies, with adequate availability of resources to facilitate their participation.

In terms of human factors facilitating or inhibiting stakeholder participation the assessment identified knowledge of the policy, interests related to the policy, position for or against the policy, potential alliances with other stakeholders, and ability to affect the policy process. Knowledge is the level of familiarity with eHealth policies, interest is the perceived benefit from the policy and position for or against the policy is the perception of whether the policy is beneficial or not. Potential alliances are collaborations towards opinions informed by alignment in position towards a policy and ability to affect the policy is the positioning of a stakeholder to influence the outcome of an eHealth policy. The section below highlights how these factors are reflected in stakeholder participation in Malawi, Ethiopia, Ghana and Tunisia.

5.3 Assessment of eHealth Policy Stakeholders in Ethiopia

In Ethiopia, organizational human factors are characterized by increased levels of knowledge with most stakeholders showing medium to high levels of knowledge of eHealth strategies, policies and programs. Additionally, the stakeholders demonstrated medium to high levels of interest in eHealth strategies and policies. It is observed that this interest is facilitated by potential advantages of improving health data collection and reporting, improvement in data quality such as timeliness and accuracy and potential improvement in health services, among others. It is also observed that this interest can be inhibited through potential disadvantages such as lack of sustainability of eHealth interventions, potential disruptions that technologies can bring and lack of technology skills transfer to local staff. All stakeholders support the implementation of eHealth strategies and policies in Ethiopia with the exception of patient and professional associations. All stakeholders are willing to collaborate which is crucial to

leverage each other considering that their power to influence varies from one stakeholder to another.

5.3.1 Evidence from Cases for Ethiopia

In Ethiopia we learn from the deployment of the District Health Information Software version 2 (DHIS 2), on how human factors can facilitate or inhibit successful implementation of eHealth policies and programs. This use case demonstrates the role of organizational human factors by highlighting a stepwise approach in the coordination for the deployment of DHIS 2. Implementation has been staggered such that not all features were enabled from the beginning. Key features such as Geographical Information System (GIS) and mobile version of the platform are yet to be activated. The use case also highlights a user centered approach through engagement of key stakeholders in order to solicit feedback. Institutionalization of software development skills have been observed as a key success driver for sustainability of DHIS 2 implementation in the long term. However, inadequate digital skills at the sub-national level is identified as an inhibitor for deployment of the DHIS 2 in Ethiopia.

A second learning area from Ethiopia is the implementation of the electronic community health information system (eCHIS). The eCHIS implementation addresses organizational human factors by centering coordination around a project document which outlines the terms of reference for the implementation of the community intervention. This is done by engaging all the stakeholders through a user centered approach to design-based end user requirements and using a family folder approach to group family members. Additionally, adherence to local hosting policies facilitated the adoption of Comcare HQ as eCHIS platform. As part of a sustainability strategy Comcare HQ development skills were transferred to local Information Technology (IT) staff and a local university was identified to anchor the implementation as a center of excellence. Furthermore, a full package of documentation was prepared comprising the source codes, end user manuals and technical manuals. While these factors facilitated the implementation of eCHIS there were other human factors that inhibited successful implementation of eCHIS. Among them, a comprehensive strategy for the deployment of the eCHIS has not yet been developed although an initial project document is available. This

affects partner coordination and vision for long term deployment of the eCHIS. Additionally, inadequate ownership of the eCHIS at all levels affected the implementation as eCHIS activities are not included in all work plans. Inadequate availability of work tools and job aids presented as ICT infrastructure such as servers, connectivity and end user devices slowed the process for adoption of eCHIS.

5.4 Assessment of eHealth Policy Stakeholders in Ghana

In Ghana, organizational human factors are addressed through knowledge in eHealth strategies and policies characterized by high knowledge among the stakeholders although this knowledge was observed to be low for patient and professional associations. Additionally, there is interest in eHealth strategies and policies with medium to high interest levels observed among the key stakeholders. This interest is affected by the need to achieve an effective and efficient health system in Ghana, the possibility for better and quality information and the ability to improve health system procedures, among others. On the other hand, it is inhibited by fears of technology failures leading to loss of data, high initial costs for infrastructure and high cost of staff training pre-roll-out of eHealth initiatives, among others. eHealth stakeholders strongly support the implementation of eHealth solutions and they are willing to collaborate among themselves to strengthen their varying abilities to influence eHealth program and policy implementation.

5.4.1 Evidence from Cases for Ghana

From Ghana, the primary insight is on how human factors affect participation in the implementation of eHealth policies. Lessons are drawn from the use case on the development and implementation of the national digital health strategy of 2010. It is observed that organizational human factors were addressed by setting up of a coordination mechanism, the eHealth Committee, for the development of the digital health strategy and another taskforce to consolidate eHealth training needs. For the implementation, technical working groups and committees were established to oversee and coordinate implementation. In addition, Institutionalization of IT governance structures contributed to the successful implementation of the digital health policy. The strategy contributed to the success of implementation of IT

initiatives as it provided a context and guidance for the digital health roadmap. While attempts were made to include all stakeholders through intersectoral collaboration it is also observed that stakeholders participated in a limited way in the development of the digital health strategy.

5.5 Assessment of eHealth Policy Stakeholders in Malawi

In Malawi the role of organization human factors in facilitating stakeholder participation in eHealth policies and programs are characterized by high levels of knowledge among the stakeholders with more than two thirds having knowledge and participated in the country's eHealth policy formulation and implementation. Additionally, there is high levels of interest in eHealth with reported interest ranging from medium to high among all stakeholders. It is reported that key contributors to this interest include potential to gain more knowledge, improvement in efficiencies, improved technology and availability of data. However, this interest can be affected by concerns on sustainability of eHealth initiatives, inadequate privacy and confidentiality of eHealth initiatives and resistance to change by health care providers, among others. Almost all stakeholders support the implementation of eHealth programs and policies and are willing to form alliances to reinforce their varying abilities to influence eHealth program and policy implementation.

5.5.1 Evidence from Cases for Malawi

The implementation of the integrated Community Health Information System in Malawi provides insights on addressing human factors in the implementation of national digital interventions. Organization human factors were addressed through leadership and coordination from the Government. In a multi stakeholder environment political will was vital in establishing long term work plans and facilitation of joint funding approaches. Another success learning point on human factors was the deployment of a user-centered and integrated approach in conducting the community health information system situation assessment and in the design and implementation, supervision and monitoring of digital platform. Digital literacy was identified as a key inhibitor in the implementation of the

integrated community health information system such that digital skills training is recommended in order to increase the probability of success.

A second learning point from Malawi, on how to address human factors for success, is the integration of OpenLMIS and DHIS2 to enable data sharing between these two aggregate data systems. This use highlights the need to address organization human factors by development of standard operating procedures and other documentation to guide standardized implementation of interoperability in a multiplatform and multistakeholder ecosystem; multi stakeholder consultation was used in order to engage key beneficiaries and to understand the ecosystem.

5.6 Assessment of eHealth Policy Stakeholders in Tunisia

In Tunisia high levels of knowledge were found to be associated with high participation in eHealth policy and strategy development and implementation. Although patient associations were found to be less involved in eHealth policies and strategies. Stakeholders generally have interest and support for eHealth considering potential benefits of improving patient satisfaction and security, improving communication and improvement in work efficiencies, among others. This interest is, however, affected by inadequacies in eHealth technologies such as poor infrastructure, interoperability and general attitude towards use of technology. Stakeholders are willing to collaborate through formulation of potential alliances, which is good considering that their power to influence participation in eHealth varies from one organization to another.

5.6.1 Evidence from Cases for Tunisia

Further lessons on how human factors can facilitate or inhibit implementation of eHealth strategies and policies are drawn from Tunisia through understanding the setup of a medico-economic information system. The aim of the medico-economic information system twinning program was to reform health services in university hospitals and selected regional hospitals to establish management autonomy and operate an integrated information system which will enable the government to review the financing methods of the sector. Key outputs under this reform program include establishment of a management information system, the creation of

the Computer Center of the Ministry of Health (MoH) and cost analysis based on data provided by integrated computer applications. It is observed from the implementation that the project addressed organizational human factors by establishing a framework referred to as the Association Agreement and the Neighborhood Action Plan. This framework established terms of reference for how the Tunisian Government collaborates with the European Union as the key stakeholders. To improve on its odds of success the program leveraged existing experiences and good practices from European Union countries and other countries with similar situations as Tunisia. To ensure sustainability the program emphasized capacity building through transfer of knowledge and skills from European counterparts to Tunisian medical and administrative staff. It is further observed that proper financial costing and mobilization is vital to successful implementation of eHealth projects and policies. The use case underscores that inadequately addressing other human factors can inhibit successful implementation of eHealth projects and policies. These factors include legislation and human resources.

5.7 Human Factors Evidence from Other Countries

Beyond the use cases from the four countries, other authors have similarly observed the role of human factors in facilitating or inhibiting implementation of eHealth projects and policies. For instance, in order to disseminate a quality improvement program that optimized blood culture use in critically ill children, Xie et al (2017) conducted a work system assessment to proactively identify and mitigate work system factors influencing blood culture ordering practices. On the basis of the findings of the work system assessment, a participatory ergonomics approach was used to engage local stakeholders in the adaptation of the interventions (eg, revising the content and format of a blood culture decision support tool) and the customization of the implementation strategies (eg, providing biweekly feedback on blood culture use to team members; discussing new blood culture practices during monthly staff meetings; integrating new blood culture practices in new resident orientation; and holding a “blood culture competition” among team members). This HFE approach led to successful adoption of the blood culture program by 3 pediatric intensive care units at 2 hospitals, resulting in a significant reduction in blood culture use. In attempting to mitigate

usability issues related to embedded cultural assumptions in health information technology design, Gibbons et al, (2014) found that addressing human factors reduces health risk concerns among HIT users and their healthcare providers. Other authors like Ferrucci et al (2021) used a needs assessment to understand how human factors approaches such as user centered design of a web-based application can improve the support for complex health care populations. They found that integrating human factor issues like self-management and co-responsibility significantly improved usability.

6 Results Analysis and Discussions

6.1 Purpose of the study on human factors

The purpose of this study is to report on the role of human factors in improving eHealth policies and national programmes. This starts by identifying human factors that are relevant to support the participation of stakeholders in eHealth policies and national programmes. Then the study identifies and isolates selected eHealth programs and policy implementations to understand how human factors affected their implementation.

6.2 Domains for human factors in eHealth policy and national programs

This study has shown that human factors are classified into three main categories: those related to individuals, those related to the job and those related to the organization. These categories are defined by other authors as characteristics of people, contributors of outcomes and occupation and set of best practices, respectively. And other authors have defined the first category as human factors, the second category as factors of humans and the third category as factors affecting humans. These are differentiated by whether you are focusing on the individual's physical attributes, the individual's personality or the grouping to which the individual belongs. Regardless which aspect is the focus; literature has shown that there is interrelationship across these categories through certain attributes that cut across domains.

6.3 Human factors in eHealth policy and national programs

This study extends previous work on stakeholder analysis (BETTEReHEALTH, 2021). The focus of the stakeholder analysis was at organizational level. This study was, therefore, limited to

understanding more on human factors at the organization level. This takes us into organizational human factors or human factors affecting humans. The study also draws from the best practices and lessons learnt report (BETTEReHEALTH, 2022) in order to highlight use cases that demonstrate how human factors facilitate or inhibit stakeholder participation in eHealth strategies and policies.

While there is agreement on the three major categorizations of human factors, there is no agreement on the human factors' characteristics under each category. There is consequently no standard framework to define what constitutes organizational human factors or the human factors affecting humans. Consequently, over 200 human factor methods have been developed to help measure the impact of human factors in various contexts. However, these only apply to specific contexts as such more human factor methods need to be developed or modified so that other contexts can be covered.

The study identified common themes for human factors at the organization level. Labbi (2005) identified employee participation, information and communication, training and learning, feedback and project management. Moura et al. (2017) define organization factors that affect human performance as communication (communication failure, missing information), organization (maintenance failure, inadequate quality control, design failure, inadequate task allocation, design failure), Training (insufficient skills, insufficient knowledge) and irregular working conditions e.g. irregular working hours. Under similar nomenclature Roberts (2016) identified organization human factors as culture, work patterns and fatigue, available resources, communications and leadership. Horrock (2017) describe general factors affecting humans tend to include: Aspects of planned organizational activity (e.g., supervision, training, regulation, handover, communication, scheduling); Organizational artifacts (e.g., equipment, procedures, policy); Emergent aspects of organizations and groups (e.g., culture, workload, trust, teamwork, relationships); Aspects of stakeholders (e.g., language, role). When considered together, these factors are structured into broader groups for organization level human factors. These are identified as leadership and governance, information and communication, training and learning, and culture. Many of the human factors identified by the various authors can fit into these broader categories.

The influence of organizational human factors in stakeholder participation in eHealth strategies and policies are visible in the selected use cases from Malawi, Ethiopia, Ghana and Tunisia. First, the use cases highlight the need to ensure clarity in the key stakeholders for any eHealth intervention or strategy through mapping and identification of all the stakeholders. The stakeholders can be classified into different categories that help to understand their interests and how best they can be managed. The use cases highlight the need for stakeholder engagement through participatory user-centered approach in order to encourage ownership and facilitate success of eHealth interventions. Additionally, knowledge and capacity building of eHealth stakeholders and internal government technical and administrative staff are observed to be vital in facilitating eHealth interventions. Other organizational factors such as stakeholder position, interest and power are also observed to be facilitators of eHealth implementation in the four countries.

6.4 The Gaps and Challenges

In the introduction section, three main categories of stakeholders as specified by WHO are highlighted; these include the government organizations and agencies; the health service providers (both public and private); and the citizen who include population representatives, patients' associations and others who become service users. However, from the analysis for the four countries, it is clear that most of the stakeholders involved in e-policy development are mainly from one category – the government organisations and agencies. The second category is included mostly in token form, whereas the last category, that of population representatives and patients' association is completely neglected.

6.5 Key Recommendations

This study was set out to understand the role of human factors in stakeholder participation in eHealth policies. Based on the results and the analysis the study makes the following recommendations:

- i. While there is clear categorization of human factors into three main groups focusing on the individual, the job and the organization cognizance must be taken not to understand them in isolation but ensure inclusion of cross cutting issues.

- ii. It is recommended that all countries should be vigilant in ensuring that all the three WHO stakeholder categories are included in the policy development processes, including the neglected patients' associations.
- iii. Although the domains for organizational human factors have been identified, each with its own range of attributes, countries must include variations in context when attempting to measure or monitor how these factors affect eHealth policy in their context.
- iv. This study has identified human factors affecting eHealth policies and programs. However, there is currently no standard framework for measuring the magnitude of human factors in the context of eHealth policies and programs. Considering that human factors are a vital component in the success of eHealth policies and programs more work needs to be done to define a framework for understanding these factors in the context of eHealth policies and programs. Such a framework will facilitate standardized rapid approaches for measuring human factors in the context of eHealth policies and programs.
- v. Due to the non-standard nature of human factors resulting in context dependent definitions, researchers have developed over 200 human factor methods which can be applied to measure the impact of human factors in a given situation. These human factor methods apply only to specific situations and contexts. This study did not examine or review each of these human factor methods in order to understand which ones apply and can be used in measuring the impact of human factors in eHealth program and policy implementation. Further work can be conducted to assess these human factors methods to identify appropriate methods.
- vi. The use cases from Malawi, Ghana, Tunisia and Ethiopia have shown that human factors can facilitate or inhibit the implementation of eHealth strategies and policies. There is, therefore, need to identify and address these human factors in eHealth strategy and policy implementations in order to assure success. The human factors are organizational in nature and include stakeholder identification, knowledge and skills capacity building, stakeholder positions, interests and power.

7 Conclusion

Through literature review and drawing from outputs from other studies under the BETTEReHEALTH Project this study has examined human factors in the context of improving eHealth policies and programs. The study has identified three main categories of human factors. Furthermore, the study conducted a more detailed examination of the third human factors which are organizational human factors to determine their role in improving eHealth policy and programs participation. The study also isolated selected eHealth program and policy implementation initiatives in order to understand how human factors impacted their implementation. Although the study identified that there were over 200 human factors methods it did not apply any of them since more effort is needed to assess them to identify which ones can be applied to the context of eHealth programs and policies.

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