Evaluation Report

Swiss Agency for Development and Cooperation (SDC) & Fondation Botnar

External Evaluation of the Dynamic Electronic Decision Trees to Manage Sick Children (DYNAMIC) Project (2019-2024)

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Abbreviations

A&R	Analysis and research
ALMANACH	Algorithm for Managing Childhood Illness Using Mobile Technology (first-generation algorithm, 2010-2011)
AMR	Antimicrobial resistance
API	Application programming interface
CAGR	Cumulative annual growth rates
CDSA	Clinical decision support algorithm
DHIS2	HMIS software
DMO	District medical officer
DYNAMIC	Dynamic electronic decision trees to manage sick children
EMR	Electronic medical record
ePOCT+	Electronic point of care testing (second-generation algorithm, 2014-2016)
ERP	Enterprise resource planning
GoTHoMIS	Government of Tanzania HMIS System
HMIS	Health management information systems
ICT	Information and communication technologies
IMCI	Integrated management of childhood illness
JADF	Joint Action Development Forum (Rwanda)
M&E	Monitoring and evaluation
MCH	Maternal and child health
medAL	Software solution of DYNAMIC
medAL-creator	Treatment decision tree
medAL-data	Patient data
medAL-mentor	Experimental dashboard
medAL-outbreak	Experimental dashboard
medAL-reader	Interface used in health facilities
mHealth	Mobile health
MoH	Ministry of Health
MOHSW	Ministry of Health and Social Welfare (Tanzania)
MoU	Memorandum of Understanding
MUHAS	University Hospital of Dar es Salaam

NGO	Non-governmental organization
NIMR	National Institute for Medical Research (Tanzania)
OpenMRS	Open medical record system
PPP	Public-private partnership
PO-RALG	President's Office, Regional Administration and Local Government Tanzania
R4D	Research for development (Research programme by SNSF and SDC)
RBC	Rwanda Biomedical Centre
RMO	Regional medical officer
RSSB	Rwanda Social Security Board
RTSL	Resolve to Save Lives
SDC	Swiss Agency for Development and Cooperation
Swiss TPH	Swiss Tropical and Public Health Institute
ToC	Theory of change
ToT	Training of trainers
UNICEF	United Nations Children's Fund
WHO	World Health Organization

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Executive Summary

Introduction:
DYNAMIC was a five-year research project aimed at improving the quality of healthcare for children aged 0-14 years through the implementation of e-POCT+, a clinical decision support algorithm, combined with point-of-care diagnostic tests. The project was co-funded by the Swiss Agency for Development and Cooperation and Fondation Botnar.

Evaluation Object and Country Contexts: The core of the DYNAMIC project was the development of the ePOCT+ algorithm and its implementation in Tanzania and Rwanda. The algorithm guides practitioners through a decision tree, visualized on a tablet interface, to arrive at the correct diagnosis and treatment option. In Tanzania, the project was rolled out in 2021 in the Mbeya and Morogoro regions, involving 60 health facilities. In Rwanda, the was implemented in 39 primary health facilities in Rusizi and Nyamasheke districts.

Evaluation objectives: The evaluation aimed to provide a learning-oriented, ex-ante assessment of the DYNAMIC project. It was structured around selected OECD DAC criteria – relevance, coherence, and sustainability – with a particular focus on sustainability strategies and potential scalability. In addition, the evaluation provided targeted, actionable recommendations to both the project team and relevant local decision-makers.

Methodology: The evaluation was carried out in three distinct phases: In the *inception phase*, the evaluators reviewed existing documents, conducted exploratory interviews with key stakeholders, and refined the project's theory of change and the suggested evaluation approach as well as underlying questions. During the *implementation phase*, data was collected from September to November 2024, both in the target countries and at global level. In Rwanda, 15 stakeholders were engaged, and participatory observations were conducted in two health facilities. In Tanzania, interviews were conducted with eight stakeholders. Data collection in Tanzania was substantially compromised due to a pending ethical approval. In addition, eight more interviews with project partners and funders were held in Switzerland, as well as with relevant international experts. The *reporting phase* included workshops to validate preliminary findings, discuss potential sustainability scenarios and concluded in the compilation of a comprehensive evaluation report.

Findings on Relevance: The DYNAMIC project proved to be highly relevant in both countries' contexts. It aligned with each country's national health plans and commitments towards antimicrobial resistance, improved child health and digital health strategies. Particularly in Rwanda, the project could build on a momentum of an emerging digital ecosystem. The project successfully ensured relevance by engaging stakeholders at an early stage and at different levels of the health system, including key ministries and agencies, ICT departments, local government authorities, international partners and health workers at facilities. Social acceptance of the tool at target group level was high in both countries and the added value was recognized by health facility staff and patients/caregivers. However, there were two drawbacks regarding the project's contextualization: first, mandatory existing paper-based processes in both countries led to parallel documentation processes that were perceived as burdensome by health facility workers. In addition, the tool was implemented in vulnerable districts with challenging contextual factors in terms of electricity, internet connectivity and, in some cases, digital literacy of staff.

Findings on Coherence: The DYNAMIC project started before Rwanda and Tanzania had taken firm decisions on their universal digital health systems in primary care. As a result, ePOCT+ was rather designed independently of any existing local digital health infrastructure, with the intention of exploring interoperability at a later stage. However, it proved to be complex to integrate in or interoperate with the national software

systems developed during the DYNAMIC period, given that the ePOCT+ solution was technically demanding both from an IT and a clinical point of view. Technical coherence was therefore only partially achieved at the at the point of the evaluation. From a scientific coherence perspective, DYNAMIC has actively engaged with the wider ecosystem of digital health initiatives.

Findings on Sustainability: The proof-of-concept and the effectiveness of the DYNAMIC solution could be thoroughly validated in both countries, positively influencing the interest and engagement of public actors and underscoring the value of digital health solutions. At the point of the evaluation, the Rwandan government has shown commitment to continue using the tool and potentially integrate it into its recently implemented digital healthcare framework (ERPNext). In Tanzania, the commitment of national governmental stakeholders could not be clearly confirmed during this evaluation and integration into the national software (GoT-Homis) remains insecure. However, there were significant challenges to wider adoption and sustainability of the solution in both countries. The complexity of the solution, coupled with a general lack of IT expertise within public institutions, makes future integration into national health systems challenging, especially in case no further financial and technical support is provided. Net benefits at health facility level are compromised by the lack of maintenance of the tablets and application at the end of the evaluation, while capacities that were built and strengthened as well as the awareness created likely will be sustained. Other barriers to sustainability include inadequate infrastructure at local level and limited skills and confidence to effectively manage and maintain the Android-based solution. A long-term sustainable capacity development strategy is needed as well as sufficient human resources.

Conclusions and Recommendations: The evaluation confirmed the effectiveness and relevance of the ePOCT+ tool in addressing antimicrobial resistance and – during the project implementation - improving health outcomes in target districts. The tool's ability to reduce antibiotic prescriptions is well-supported by empirical evidence and has received substantial endorsement from the healthcare community. The project team initiated important steps to support the translation of research into practice, but the technical sophistication of the tool appeared to be a hindering factor for direct take-up and continued use, when the evaluation was conducted. The sustainability and scaling of ePOCT+ now depends on the commitment of the governments of Rwanda and Tanzania to continue its use and integrate it into their national healthcare frameworks.

Findings derive from the evaluation, allowed to put forth the following recommendations and learnings, directed at both project implementers, funders as well as national governments:

- Selection of transformative research contexts: Initiate digital projects like DYNAMIC in contexts where the political groundwork has been laid, and projects can respond to decisions taken and capacities available. A thorough understanding of current priorities and the ecosystem is crucial and should be encouraged e.g. via feasibility studies.
- Combining research and implementation: An impact-oriented project design, with clear impact goals, and a team constellation that entails expertise in both fields, support transferability and sustainability in the countries.
- Develop adaptable solutions: Digital solutions should follow a modular approach, allowing for flexibility to accommodate and respond to ongoing changes in the digital and technological landscape, as well as shifts in healthcare policies and priorities.
- Exit-strategy: A clear and comprehensive documentation is necessary to foster understanding among decision-makers. This includes detailed reports on the key functionalities of the project, tailored

integration strategies for each country's system, and supportive policy briefs.

- Funding networks: Funding institutions should play a crucial role in connecting stakeholders during implementation, supporting the diffusion of solutions through their networks, and leveraging the digital solution as a knowledge repository to e.g. inform international guidelines.
- *If a political decision is taken in favor of the continued use:* Additional investments in IT resources, a contextualized capacity-building program and frugal innovations in health facilities to deal with contextual issues (e.g. problems with electricity) could support the project's sustainability over time.

Update 03/2025:

In Tanzania, on the 19th of December 2024, the GoT-Homis team officially informed the IT team of NIMR and IHI that their project of reprogramming (i.e. integrating) the key modules of medAl-suite into their EMR has been approved by the Ministry of Health, which is an important step. However, reprogramming would also require a substantial amount of work and technical expertise. They, apparently, would like now to collaborate with the IT specialist of the partnering national research institute who has been working for the last four years on the DYNAMIC project. However, there is insufficient funding to continue to pay the salary of this specialist beyond the end of the DYNAMIC project. There is no further information on the way forward at this point.

In Rwanda, between the end of the evaluation (11/2024) and March 2025, significant advances could be made. The international organization Resolve to Save Lives (RTSL) acted as "middlemen" between the government and the project team and pushed forward the discussion on scaling the solution. The Ministry of Health and the Rwanda Biomedical Centre recommended the continued use of e-POCT+ (medAL-creator and medAL-reader) in pilot health centers and its scale-up across all primary healthcare facilities in Rwanda, including Health Centers and Health Posts, in collaboration with RTSL. A way of interoperability is pursued, as the EMRNext software is deployed and scaled up across health facilities and the e-POCT+ algorithms can be accessed via a web-browser. This approach is realistic and feasible and allows for quality assurance and maintenance. This decision and its respective way forward mean a significant step in improving health outcomes for children between 0-14 in Rwanda.

1. Introduction

The **Swiss Agency for Development and Cooperation (SDC)** funds research to reduce poverty and global risks, promoting sustainable development in the global South. Managed by its Analysis and Research (A&R) section, SDC fosters partnerships between Swiss academics and researchers in the Global South. DYNAMIC is part of the TRANSFORM program, emphasizing impactful research for societal change with a strong focus on putting research evidence into practice. **Fondation Botnar**, a Swiss philanthropic foundation, focuses on enhancing the wellbeing of youth in urban and digital settings by advocating for fair and responsible use of AI and digital tech. The collaboration between SDC and Fondation Botnar led to the co-funding of the "Dynamic electronic decision trees to manage sick children" project (in the following abbreviated as **DYNAMIC**) in Rwanda and Tanzania, a research project which aimed to support clinical decision making and improve the quality of diagnoses and treatment for sick children, thanks to an innovative clinical support algorithm available on an Android tablet.

Mainlevel Consulting and BSS were commissioned by SDC and Fondation Botnar to carry out an independent evaluation of the DYNAMIC project. The evaluation was implemented by four international consultants and two national consultants in Rwanda and Tanzania. The evaluation report at hand describes the evaluation object and contexts in the implementation countries (chapter 2), states the evaluation objectives (chapter 3) and methodology (chapter 4), and summarizes the evaluation findings along the selected OECD DAC criteria (chapter 5) before diving into sustainability scenarios (chapter 6) and the conclusions and recommendations (chapter 7).

2. Evaluation Object and Country Contexts

Project objective

SDC and Fondation Botnar co-funded the DYNAMIC project (2019-2024), which aimed to support clinical decision-making in order to improve diagnosis and treatment for children under the age of 15 in Tanzania and Rwanda. The project developed and implemented a Clinical decision support algorithm (CDSA), called ePOCT+, designed to support health workers in correctly diagnosing and managing pediatric conditions while reducing unnecessary antibiotic use.

Evaluation object

Building on two prior research projects (ePOCT and ALMANACH, both in Tanzania), DYNAMIC focused on developing, testing and implementing a clinical decision-support algorithm called ePOCT+ and related tools across primary care services. The clinical content of ePOCT+ is an improvement and extension of the previous clinical algorithms developed throughout the two prior projects (Impl_partner_1). ePOCT+ introduces several extensions and improvements compared to the previous ePOCT and ALMANACH tools. It expands its scope to manage children aged 0 to 14 years, including specific components for young infants, non-febrile medical conditions, and surgical reporting. Advanced technologies such as rapid diagnostic tests are incorporated to enhance diagnostic capabilities. The tool furthermore facilitates the collection of individual-level data for analysis and integration into national health information systems, supporting improved disease surveillance, epidemic detection, and targeted public health interventions. The interface is meant to allow for intuitive navigation and to include features such as learning content, translations, and real-time alerts. Additional modules for patient registration, triage, and laboratory connectivity enhance its functionality. Complementary training and supervision components, including e-learning modules and data-driven feedback tools, are integrated to improve the clinical skills of health workers (Botnar project proposal 2018).

The decision trees of ePOCT+, which interacted with each other, allowed for more than 150 different diagnoses and corresponding treatments. Given that no software could be found capable of dealing with the required complexity when the project started (and possibly still not today), the project opted to develop its own software, the medAl-*suite*. The tool followed a split logic of (i) hosting patient data (*medAL-data*), (ii) designing the decision trees (through the so-called *medAL-creator*) and (iii) making the content accessible to clinicians through the *medAL-reader*, the interface used in health facilities. These components were furthermore accompanied by a series of (iv) dashboards; the experimental *medAL-outbreak* and *medAL-mentor*, used respectively for disease surveillance and clinical mentorship by district teams, which reverted to and aggregated data from field level to allow for the deduction of trends and needs for intervention.

Geographical delineation and context background

Tanzania: In Tanzania, the development and research around ePOCT+ built on a 20-year research path and relationship between the Swiss Tropical and Public Health Institute (Swiss TPH) and the Ifakara Health institute (Impl_partner_2). Back in the early 2000s, the research cooperation to improve patient management at primary care level primarily focused on decreasing the non-rational use of resources, particularly with regard to an over-prescription of antimalarial medicines. As the over-prescription of such drugs went down following the introduction of rapid diagnostic tests, antibiotic prescriptions increased as an unintended side effect. However, the clinical decision on whether or not to use antibiotics is far more complex than the decision on whether or not a patient suffers from malaria and cannot be taken based on a single rapid test. The bilateral research experimented with electronic and paper-based decision trees and concluded that an electronic algorithm was needed to tackle the challenge. DYNAMIC particularly aspired to determine the effectiveness of ePOCT+, i.e. whether it could have a sufficient impact (even if less than in previous, more controlled studies) in terms of rational use of antibiotics, while still not harming children in terms of clinical outcome (Impl_partner_2).

In Tanzania, DYNAMIC was implemented in the Mbeya and Morogoro regions / districts, which were selected for their diverse climates, topographies, and epidemiological profiles, both exhibiting higher under-5 mortality rates than the national average. Key stakeholders of the project comprised Unisanté (Principal Investigator) and the Swiss TPH, the Ifakara Health Institute (National Principal Investigator) and the National Institute for Medical Research (NIMR) (National Co-principal Investigator). Given a rather decentralized political system in Tanzania, the project worked with both the central and the local government in this country context (Impl_partner_2). At field level, the project operated in 60 health facilities across the implementation districts (Progress report 2023).

Tanzania has had electronic patient registers / electronic medical record systems (EMR) in some health facilities for the past ten years (Impl_partner_2),. However, these are mostly used for billing purposes. Clinicians are expected to fill in patient / treatment information, but the records do not serve as patient records which clinicians could use throughout the treatment cycles (Impl_partner_1). Until recently, the country had two EMRs and recently agreed on the usage of one centralized health management system, the so-called "Government of Tanzania Health Operation Management Information System" (GoTHoMIS).

Rwanda: The DYNAMIC project in Rwanda started eight months after the project start in Tanzania and was driven by the idea to foster South-South exchange between the two countries, e.g. with regard to relevant IT expertise, as well as funding requirements by the second donor, Fondation Botnar (Impl_partner_2).

In collaboration with the Rwanda Ministry of Health (MoH) and the Rwanda Biomedical Centre (RBC), the Rwandan local office of Swiss TPH implemented DYNAMIC in Rwanda, the project operated in 39 primary health facilities in the Rusizi and Nyamasheke districts of the Western province (Progress report 2023). In comparison to the Tanzanian context, Rwanda reverts to a more centralized system, which implied that decision-making level was mostly at central government (Impl_partner_2), while the project also included district-level government.

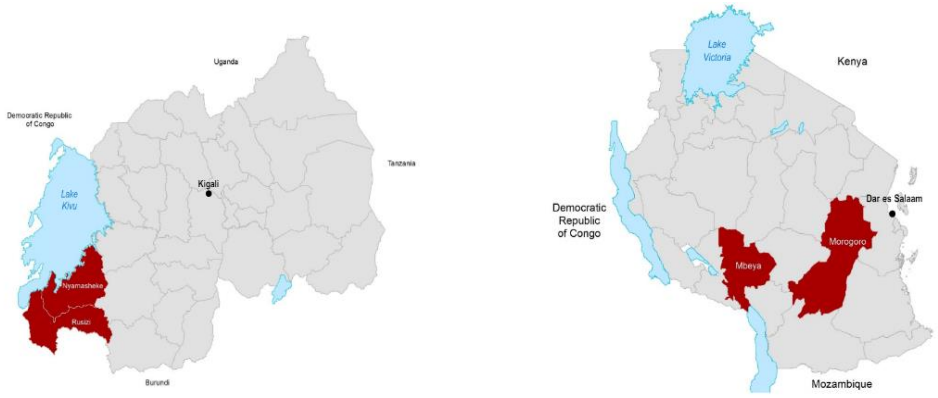

Figure 1: Target areas in Rwanda and Tanzania

3. Evaluation Objectives

The evaluation aimed to provide a learning-oriented, ex-ante assessment of the DYNAMIC project, particularly focusing on sustainability and potential scalability. Key objectives included:

1. Analyzing the feasibility of the DYNAMIC model across the two different contexts, especially with regard to acceptance and resources at the local level.
2. Understanding the potential for long-term sustainability of the solution.
3. Assessing pre-conditions for scaling as well as potential integration strategies.
4. Offering contextualized and actionable recommendations directed to the project team and relevant decision-makers in the countries.

The evaluation, structured along selected OECD DAC criteria, focused on relevance, coherence, and sustainability. It addressed the model's relevance to national healthcare strategies and social acceptance, coherence with national developments and the work and mandate of national public actors as well as the adaptation to the two contexts. The sustainability dimension furthermore explored ownership, medical capability, ongoing tool usage and net benefits. Sustainability scenarios were discussed and documented. Additionally, contextual lessons learned in both countries, and factors of success and weakness were gathered and analyzed in both countries. The specific evaluation questions and detailed assessment criteria are outlined in the attached evaluation matrix[1] (Annex 1).

4. Evaluation Methodology

The methodological framework applied for this evaluation aimed to ensure a comprehensive understanding of the project's relevance, coherence, and sustainability, while also capturing contextual lessons learned and preconditions for scaling. It was based on a phased approach, beginning with an **inception phase** where existing documents were reviewed, exploratory interviews with key stakeholders were conducted, and the project's Theory of Change (ToC) was

[1] To maintain precision and brevity, the findings in chapter 5 are clustered thematically. While they are guided by the evaluation questions per OECD DAC criterion, efforts have been made to minimize duplications across the criteria wherever possible.

refined which served as the core analytical framework of the evaluation and can be found in Annex 2. This phase allowed for the fine-tuning of the evaluation approach and questions, which were then operationalized into an evaluation matrix.

The evaluation was furthermore based on **two scientific models** that provided guidance to the evaluators and supported the operationalization of evaluation questions. The first model on science-policy relations by Boswell & Smith (2017) shows different approaches on how knowledge flows occur from research to practice. It is highly relevant to the DYNAMIC project which, as part of the TRANSFORM programme by SDC, has the core mandate of linking research and implementation. It is relevant to take alternative understandings of knowledge transfer into account in order to assess actual and potential/future scaling strategies of the DYNAMIC project, which are heavily dependent on the interconnection between scientific research and the determination and specification of policy directions to ensure its larger-scale application and adoption in the real world. In practical terms, this means that the evaluation verified which of the four knowledge interactions outlined in the theory has applied in the case of the DYNAMIC project.

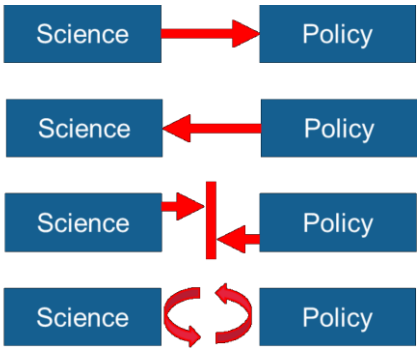

Figure 22: Science policy relationship. Source: Boswell & Smith, 2017

The second stream of literature elaborates on scaling processes of social innovations. With the help of a scaling framework (based on Dees, Anderson & Wei-Skillern 2004; own compilation), an innovation's core, potential scaling pathways (dissemination, affiliation and branching) as well as drivers and barriers are pointed out for verification throughout the evaluation. Further information on the theoretical considerations can be found in the inception report (see separate Annex).

During the **implementation phase**, data collection took place between September and November 2024 in the two countries and at an international level. In total, 15 stakeholders could be engaged in Rwanda and 8 individuals participated in interviews in Tanzania. In addition, 8 interviews were conducted with project partners and funders in Switzerland as well as with other international experts. While in Rwanda, participatory observations were conducted in two health facilities (best/worst ranking facilities), no data was collected in Tanzania at health facility level.

Table 1 summarizes the number of stakeholders interviewed per group.

Stakeholder Category	Number of people interviewed
Funding Institution	5 (1m, 4f)
Project partner (international and national)	8 (5m,3f)
National stakeholder Rwanda	6 (5m, 1f)
District stakeholder Rwanda	4 (4m)
District stakeholder Tanzania	3 (2m, 1f)
Health facility Level Rwanda	3 (2m, 1f)
International Organization	2 (1m, 1f)
TOTAL	**31 (20m, 11f)**

Table 1: Overview of stakeholder engaged in data collection

The **reporting phase** included a capitalization workshop to validate preliminary findings. In addition, a participatory session with funding institutions and the international project partners was conducted, to discuss potential sustainability scenarios. Eventually, the evaluation team analyzed the collected data and compiled the evaluation report at hand. For detailed information on the data collection and analysis process, kindly see the inception concept as an external annex to this report.

5. Evaluation Findings

5.1. Relevance

The relevance assessment focused on evaluating how well DYNAMIC responded to the needs and priorities of Tanzania and Rwanda and the international community. It addressed three key questions:

- **Alignment with priorities and strategies:** It assesses the relevance of DYNAMIC to the beneficiary countries and the international community based on strategies in the areas of digital health, child health and antibiotic resistance.
- **Project initiation and design:** At the national level, the assessment analyses how the perspectives of the various stakeholders were taken into account in the project design.
- **Relevance at target group level:** Finally, it assesses how well aligned DYNAMIC was with needs and capacities at field level, e.g. health facilities, practitioners, patients. This includes the social acceptance of the tool.

Overarching findings

Alignment with international strategies

Improved diagnosis and treatment, including the rational use of medicines are critical global health priorities, reflecting a broader commitment to enhancing healthcare outcomes and ensuring effective treatment. Digital health solutions that support accurate diagnosis and adequate use of medicines, such as the DYNAMIC tool, can accelerate advances in this regard, an emphasis supported by both the **World Health Organization (WHO)** and the **United Nations Children's Fund (UNICEF).**

Specifically, WHO's Global Strategy on Digital Health 2020-2025 aims to strengthen health systems through the application of digital health technologies. These technologies shall empower patients and support health professionals and healthcare providers in delivering health for all (WHO, 2021). WHO underscores the importance of accurate diagnosis and rational medicine use as fundamental components of effective healthcare systems, stating that "diagnostics are important to ensure quality, comprehensive and integrated primary health care and health services" (WHO, 2023a). The DYNAMIC tool with its focus on improved clinical diagnoses and reduced prescription of avoidable antibiotics hence aligns very well with this WHO Digital Health Strategy.

Furthermore, WHO has declared antimicrobial resistance (AMR) as "one of the top global public health and development threats" (WHO, 2023b), further underlining the relevance of the DYNAMIC tool. The rational use of medicines helps prevent resistance, reduces unnecessary expenditures, and ensures patients receive the most effective therapies. WHO identifies antimicrobial resistance (AMR) as a major global health threat, disproportionately affecting children, with nearly one in five of the 1.27 million deaths from antibiotic-resistant infections in 2019 occurring in children under five, predominantly in low- and middle-income countries (WHO 2020). UNICEF asserts that it is "essential that children are not left behind in the global AMR response, which must explicitly address their specific needs and vulnerabilities. AMR has the potential to undo many of the gains in child health and well-being achieved by UNICEF and the global development community in recent years" (UNICEF, 2023). The DYNAMIC tool with its specific focus on the treatment of sick children (aged zero to below 15 years) aligns well with this focus.

Leveraging mobile technology and artificial intelligence can develop diagnostic tools such as the DYNAMIC tool that assist healthcare workers, especially in remote areas with limited laboratory facilities. In UNICEF's Digital Divide in Health Equity Report (2022), the organization emphasizes

that such applications can empower healthcare workers to make more informed decisions, even in resource-constrained settings (UNICEF, 2022).

Findings from Rwanda

Alignment with national priorities and strategies

While the project has its roots in Tanzania, as previously outlined, a second country was added to allow for South-South exchange and learning and to meet donor funding requirements. Rwanda was chosen by the project team for its receptiveness to digital (health) projects and the confirmed need to improve quality of care for children. An external preparedness analysis, conducted previously by PATH International, as well as factors like geographical proximity and existing networks were further taken into consideration when selecting Rwanda as second country.

The country's ambitious Vision 2050 strategy envisions a knowledge-based economy, and its innovative policies and infrastructure investments have laid a strong foundation for digital transformation across various sectors (Republic of Rwanda 2020a). At the time of the project's start, Rwanda was characterized by a dynamic digital landscape with many digital projects being initiated. Furthermore, countries worldwide, including Rwanda, developed national action plans to address the problem of AMR (Tan et al. 2023). Rwanda translated the action plan into national treatment guidelines (Impl_partner_1). An assessment of relevant strategies and policies shows that DYNAMIC aligns very well with Rwanda's key priorities and strategies, particularly supporting the goals of the Fourth Health Sector Strategic Plan (2018-2024) (Rwanda MoH 2018a). The project's objectives coincide with priorities set in the domains of i) digital health, ii) quality of child health care and iii) antibiotic resistance reduction as follows.

- **Digital Health:** The Rwandan Digital Health Strategic Plan (2018-2023), was released, updated and launched by the Ministry of Health in the e-health Unit in collaboration with the Rwanda Information Society Authority to improve health services delivery and accessibility through Digital Health (Rwanda MoH 2018b). The Rwandan Digital Health Strategic Plan's specific policy objectives explicitly mentioned the strengthening integration and interoperability of Health information systems, the improvement in service access and delivery through Digital Health, the improvement of collection, management and use of data at all levels of care, and the improvement of ICT infrastructure and software support in the healthcare and promoting research and development to adapt innovations and use of emerging technologies in the health sector. In addition, it is envisioned to promote accountability at the district level, leveraging dashboards for real-time data access (Rwanda MoH 2018a). Interviews confirmed the project's relevance for the mandate and work of MoH. Stakeholders emphasized, however, their preference to pursue a comprehensive approach in digitizing health journeys of patients of all ages (Public_actor_3_RW), while DYNAMIC focused on a specific age group.
- **Quality of Child Health services:** The National Plan as well as interviews confirmed that Rwanda aims to enhance Maternal and Child Health (MCH) services, with a focus on increasing antenatal and postnatal service uptake and quality of care (Public_actor_2_RW). Concrete steps towards improved quality of child health were voiced comparatively less than in other strategic domains.
- **Antimicrobial Resistance Reduction:** Rwanda's Fourth Health Sector Strategic Plan includes mechanisms for both prevention and management of antimicrobial resistance. Interviews with public stakeholders showed that, apart from the health objectives, there is strong interest in saving financial resources through the reduction of antibiotic use (Public_actor_1_RW, Public_actor_4_RW, Public_actor_5_RW).

Capacity building: Rwanda's Health Sector Plan also considers capacity building at the sector strategy to ensure that efforts are focused on national and sector priorities set for Vision 2050 and National Strategy for Transformation (Rwanda MoH 2018a). Therefore, in July 2023, Rwanda

approved the 4*4 Reform as a visionary strategy to quadruple the number of healthcare professionals in the next four years leading to four healthcare providers per 1000 population density (Republic of Rwanda 2020b). DYNAMIC has a strong educational component, building on strengthening capacities for health workers. The recognized need to increase the number of health workers favours interventions like DYNAMIC. **Project initiation and design**

As outlined before, the project in Rwanda started after the initiation in Tanzania. The approval procedures were extensive and required the engagement of key stakeholders from both research and implementation. The project was overseen by a steering committee, nominated by the MoH, with representatives from MoH, RBC, WHO, UNICEF, Rwanda Food and Drug Administration, Rwanda Pediatric Association as well as Rusizi and Nyamasheke districts representatives. The steering committee met regularly and conducted field visits to the project sites. Key stakeholders were involved from the very beginning. Conclusively, while having a strong research component, the inclusion of TPH Kigali office as well as the organizations represented in the steering meeting supported the mission of transformative research. Views of stakeholders to what extent the implementation perspective was sufficiently integrated in the project design and implementation differed among interviewees though (IO_3, Impl_partner_1, Public_actor_3_RW). On the one hand, TPH Kigali was perceived as an NGO with a mission beyond research, discussions regarding continued implementation and scaling were held with government representatives from the beginning and findings were disseminated via an event (at the point of this evaluation no external non-academic publications had been compiled). On the other hand, it was voiced that conducting thorough research while finding feasible solutions were also sometimes contradicting goals throughout the project, e.g. when the issue of interoperability of the solution emerged (see Coherence and Sustainability chapters) or when elements in the research were used that did not correspond to contextual factors.

At district level, the study team first engaged the districts through the Governor of the Western Province, followed by coordination with the Mayors and the Joint Action Development Forums (JADF). The team attended JADF quarterly meetings in both districts, providing regular updates on project progress. The project was then formally introduced to district hospitals, and collaboration agreements were signed with each participating health centre. Finally, the study was presented to the Sector Council, and community engagement events were held in the catchment villages of each health centre, with over 7,000 community members participating.

The districts chosen for the implementation of DYNAMIC are highly relevant from a social needs perspective. According to National Census Data (National Institute of Statistics of Rwanda 2012 & 2017) the Western Province is largely rural (88%) and has some of the highest rates of extreme poverty in Rwanda (21.6%). While this yields high potential to positively affect health outcomes of children during the project and beyond, it also brings along certain challenges, as health facilities chosen are rather resource-weak. Specifically, the issue of continued electricity and the internet were mentioned by district level stakeholders, hindering consistent use of the tool (Impl_partner_3, District_actor_1_RW).

Relevance at target group level / social acceptance

Interviews and observation in the field showed that at target group level, the solution was widely accepted and deemed relevant. It proved to be relevant for health personnel involved, as it supported them in their decision-making process for the prescription on antibiotics (see quote below). Thorough community sensitization measures and the additional time required to go through the CDSA made the majority of final beneficiaries trust the process that they received a thorough consultation. Children and their caretakers perceived the use of the tablets positively proactively requested the tool to be used (Impl_partner_3, HF_1_RW).

"The main change I noticed is the reduction of antibiotic. We really used to prescribe antibiotics when we were not sure the child absolutely needs it, or to avoid sending a child back home

without medication. But now DYNAMIC guides us, and even when we do not have to prescribe any medication, we can explain to the parents confidently and reassure them. The tablet gives us the option of follow up, in case we send the patient home, we do a follow to know how the child is, and it reassures the parents that we are doing what we know. This tool has changed healthcare positively. That's all I can say."

– Nurse HF_1_RW

Interviews confirmed that the project provided sufficient capacity building to train health personnel as well as ad-hoc technical support in case issues arose (District_actor_1_RW, District_actor_2_RW). The additional staff member provided by the project to support the categorization processes of patients according to age was perceived as very helpful to manage the treatment of a large amount of patients in a given time. Interviewed health facility staff also confirmed that the tool was easy to understand and use. Yet, digital literacy and education levels of nurses do play a role in acceptance and continuous training demand was identified for existing and new staff.

A remaining challenge throughout the project was that it took a lot of time to fulfill documentation obligations (Steering Meeting Report, District_actor_1). Most HF in the country still rely on paper-based documentation, which is mandatory as per national requirements, and no electronic record system or health facility management system was in place yet in most health facilities at the time the project was implemented. During the project timeline, this led to issues with double or even triple documentation and additional time needed to pass through DYNAMIC's decision-making tool. This challenge was pointed out by several stakeholders as well as the project team themselves and remains unsolved until a more integrated system is installed.

Interim conclusion – Relevance RW: Rwanda has featured a high degree of receptiveness towards digital (health) initiatives at national level and the projects aligns with (inter-)national strategies and priorities set. At target group and beneficiary level, health facility personnel and patients and their caretakes show social acceptance of the DYNAMIC solution, underlining the relevance of clinical decision-making support to better manage the use of antibiotics.

Findings from Tanzania

Alignment with national priorities and strategies

The Tanzanian MoH recognizes the relevance of various key aspects tackled by the DYNAMIC project in its health policies.

- **Digital Health**: the *Tanzania eHealth Strategy 2013-2018* was a five-year plan developed by the Ministry of Health and Social Welfare (MOHSW) to improve Tanzania's healthcare system by integrating Information and Communication Technologies (ICT), including mobile health (mHealth) initiatives (Tanzania MoH 2013). The subsequent *National eHealth Strategy and Action Plan 2019-2024* explicitly includes improving diagnostic capabilities as a component of its broader goals. It states that "the integration of eHealth solutions is intended to enhance diagnostic accuracy and support the rational use of medicines by providing healthcare professionals with better tools and information" (Tanzania MoHCDGEC 2019). The strategy highlights how digital health technologies can facilitate better diagnosis and more effective medication management. *Tanzania's Essential Medicines List (*Tanzania MoHCDGEC 2021*)* asserts that digital platforms can promote the rational use of medicines and explains that preventing the misuse of antibiotics and other drugs remains a challenge. Digital tools can educate clinicians and patients about medication use, provide medication reminders, and flag potential drug interactions, ultimately promoting better health outcomes. In addition, the *Digital Square strategy*, among others support by Fondation Botnar in close collaboration with the Tanzanian Ministry of Health, focuses on strengthening the health system through the use

of digital health technologies, thereby striving to enhance healthcare access and quality. Central to the strategy is the integration of digital health tools with existing national health information systems to ensure interoperability and scalability. It emphasises the use of real-time, individual-level health data to support monitoring, evaluation, and planning at various administrative levels. This includes the development of dashboards and tools for disease surveillance, epidemic detection, and targeted health interventions. The strategy also highlights the significance of capacity-building efforts, providing training for healthcare workers and health information system teams to ensure sustainable and effective use of digital technologies. Innovation and collaboration are key elements, with a focus on integrating advanced technologies such as machine learning and point-of-care diagnostics into healthcare delivery. It prioritises equity by addressing the challenges of low-resource settings to ensure that healthcare services reach underserved populations. Furthermore, the strategy aims to create a supportive environment for the sustainability of digital health initiatives by establishing frameworks that facilitate scaling solutions at regional and national levels.

- **Improved Diagnostic Services and Rational Use of Medicine:** the *National eHealth Strategy and Action Plan 2019-2024* outlines key objectives related to improving diagnostic services and the rational use of medicines (Tanzania MoH, 2019). The plan states that "enhancing diagnostic capacities and promoting the rational use of medicines are essential for improving health outcomes and ensuring that treatments are both effective and sustainable" and highlights the need for stewardship initiatives targeting clinicians (Tanzania MoHCDGEC 2019).
- **Skilled Health Workers:** WHO emphasizes the critical role of a skilled healthcare workforce in its *Global Strategy on Human Resources for Health: Workforce 2030 (WHO 2016)*. However, Tanzania, like many other countries, faces a significant shortage of healthcare professionals, especially in rural areas. This deficit is further highlighted in the *Tanzania Digital Health Strategy 2019-2024 (MoHCDGEC, 2019)*, which recognizes the urgent need for innovative solutions to bridge this gap.

By harnessing the power of digital solutions, it is expected that the gap between limited resources and optimal healthcare delivery in Tanzania can be bridged. This approach aligns with the goals of both the Tanzania Digital Health Strategy and global health initiatives like the WHO's Global Digital Health Strategy (WHO 2021).

Similarly to Rwanda, Tanzania developed a national action plan to address the problem of increasing global antimicrobial resistance (Tan et al. 2023), even though the operationalization into a national treatment guideline was yet pending at the time of the evaluation (Impl_partner_1).

Project initiation and design

In Tanzania, the project targeted primary health facilities in five councils in the Morogoro (Ifakara, Ulanga and Mlimba) and Mbeya (Mbeya Urban and Mbeya Rural) regions. The two regions were selected because of differences in climate, topography, and epidemiological profile, such as differences in the prevalence of malaria, HIV and anemia. Both regions furthermore featured higher rates of under-5 mortality than the national average (project documentation).

In Ulanga, where data collection for this evaluation could already be completed, interview partners reported that thorough assessments were conducted at health facility level to ensure that the necessary context conditions were, to the extent possible, met. Missing elements, particularly medical equipment such as oximeters and medications like Salbutamol inhalers, was identified and provided to the facilities if needed (Impl_partner_7) Furthermore, the project made an effort to tailor its implementation to fit Tanzania's healthcare settings, with adaptations made for both types of available health structures, i.e. health centers and dispensaries (Impl_partner_6).

With regard to **stakeholder engagement**, the project engaged a wide range of stakeholders from the outset. Key ministries and agencies, including the Ministry of Health (MoH) child health department, ICT department, HMIS division, and preventive services, as well as local government authorities (PO-RALG) and the GoTHoMIS team, were consulted early on. The project also sought the input of influential partners, such as the World Health Organization (WHO) local office, DHIS2 experts at the University of Dar es Salaam's College of Information and Communication Technologies, the MoH Computing Center, UNICEF Tanzania, and local academic and health institutions like the Mbeya Zonal and Regional Hospitals (Impl_partner_2).

To formalize these engagements, a **National Advisory Committee** (NAC) was established, which included representatives from key stakeholders such as the Ministry of Health's reproductive, maternal, neonatal, and child health (RMNCH) division, PO-RALG, regional medical officers from Mbeya and Morogoro, and other health and ICT officials. The NAC met regularly throughout the project, providing a platform for guidance, collaboration, and accountability (Impl_partner_2).

The project pursued an **integrated approach to implementation** by engaging actors across various levels of the healthcare system. It was purposefully decided to not integrate an NGO in the implementation but rather engage the district health management team, the local governments, and the Ministry of Health to be as close as possible to the conditions in which this intervention would eventually be implemented if scaled up (Impl_partner_2). However, due to tight timelines in the initial research phase (2021–2022) and a broad project scope, this approach encountered challenges, limiting active engagement in the early stages. Nonetheless, by the project's second phase (2022–2023), district health management teams began participating more actively in joint monitoring visits, facilitated by the study team (Impl_partner_2). This bottom-up approach, beginning at the district level and gradually involving central government stakeholders, was perceived as having strengthened the project's foundation and garnered support at each stage of implementation by interview partners (Impl_partner_5).

Relevance at target group level / social acceptance

Another core aspect scrutinized under the relevance criterion is the social acceptance at field level, i.e. at health facilities and surrounding district structures. As health facilities in Tanzania could not be visited by the on-site evaluator due to a limited research permission, external perspectives close to the health facility level were obtained to respond to these analytical dimensions.

The evaluation revealed mixed results with regard to the acceptance across clinical stakeholders towards the DYNAMIC solution. While many healthcare workers appreciate the thoroughness of the solution, others perceive it as an additional burden (Impl_partner_5, Impl_partner_6). On a positive note, the solution was reported to be highly beneficial for healthcare providers, as it aids in making informed treatment decisions. Essential aspects that might be overlooked in busy clinical settings are highlighted through the DYNAMIC solution, ensuring accurate dosing and reducing unnecessary medication, particularly for pediatric care. Hence, interview partners reported an increased effectiveness and anecdotal evidence of fewer patients returning to health facilities was collected due to a correct diagnosis and treatment during the first visit (HF_1_TZ).

While Tanzania has its own systems of medical record software, these are, as mentioned previously, mostly used for billing purposes. This means that clinicians are asked to input information but that the medical record software of Tanzania does not provide added value to them / they do not get to see the record of the patient (Impl_partner_1). In this sense, the DYNAMIC solution equally aligned well with clinicians' needs by not only providing diagnostic support, but also a patient record, resulting in higher satisfaction and effectiveness among clinicians.

However, the fact that the DYNAMIC solution was not integrated into the existing EMR software added a parallel process which resulted in inefficiencies as clinicians had to fill in the same information into various tools / formats, eventually leading to an "underutilized of the tool due to workload issues" (HF_2_TZ).

Additional challenges at health facility level further contributed to partly undermining acceptance and included limited digital literacy, especially among older staff, which slowed data entry on tablets. These issues were exacerbated by staffing shortages and the mentioned inefficiencies from parallel processes. As a result, one interview partner indicated that the use of the DYNAMIC solution extended diagnostic times from an average of three to ten minutes per patient, which health workers, already burdened with heavy workloads, found difficult to manage (Impl_partner_7). This led to resistance among clinicians, posing a challenge to widespread adoption (Impl_partner_5, Impl_partner_6).

In addition, it was reported that some patients misunderstood the use of tablets, leading to the perception that clinicians are "just hanging out at the computer" instead of providing care. Last but not least, context challenges were reported in rural health facilities, including frequent power outages and poor internet connectivity, and economic hardship (e.g., anecdotal reports of stolen chargers) partly undermine the tool's relevance (HF_2_TZ).

Interim conclusion – Relevance TZ: The Tanzanian MoH supports the DYNAMIC project's goals, aligning with national strategies to enhance digital health, improve diagnostics, and promote the rational use of medicines, as outlined in its eHealth strategies. Though the DYNAMIC tool is highly regarded by healthcare providers for improving diagnostic accuracy and treatment, its lack of integration with Tanzania's existing electronic medical records created inefficiencies, adding to clinician workloads. Additionally, obstacles like low digital literacy, connectivity issues, and misperceptions among patients in rural areas have impacted adoption, highlighting the need for further adaptation and support to optimize acceptance and impact.

Cross-cutting conclusions and country comparison

The DYNAMIC project has demonstrated relevance in both Rwanda and Tanzania by aligning with each country's digital health goals and national plans / commitments to combat antimicrobial resistance, leveraging on digital health solutions. Both countries featured a steering / national advisory committee which helped foster awareness and participation among national stakeholders. The restriction to a certain age group was perceived as a limitation by some national actors, who emphasized the importance to pursue a comprehensive approach, across all patients, when digitalizing the health sector. However, from a technical point of view, this would be complex and would take years to be implemented (Impl_partner_1).

In both countries, the tool was implemented in districts characterized by a high share of a disadvantaged population, featuring typically lower health outcomes and challenging context factors in terms of electricity, internet connectivity and, in parts, digital literacy. Nevertheless, at target group level in both countries, the tool was widely accepted and its added value recognized by health facility personnel and patients / caretakers. Yet, the mandatory paper-based processes in both countries led to parallel processes in documentation, which were perceived as burdensome. Against this backdrop, the solution was generally accepted but also perceived as additional workload. Addressing this and other contextual and operational barriers will be essential for the sustained relevance of DYNAMIC within the evolving digital landscapes of both countries.

A country comparison shows that the mode of implementation differed between the two countries due to both contextual and organisational factors. A gaining momentum of digital health and solutions in Rwanda, a centralized stakeholder landscape as well as the inclusion of SwissTPH Kigali, registered as NGO but with the mandate of a research institute, which was

positively perceived, resulted in the fact that DYNAMIC could avail of a comparatively stronger implementation character in Rwanda than in Tanzania, where the project was mainly led by two established national research institutes. Referring to the theoretical model on the relationship between research and policy, through steering meetings and the inclusion of NGOs as well as the pro-active involvement of SDC when the issue of interoperability arose, various interactions during the project timeline between the two fields can be noted in Rwanda, reinforcing the relevance of the solution and the need to utilize research findings made.

5.2. Coherence

The coherence assessment focused on assessing how well the project design and implementation of DYNAMIC was adapted to the distinct contexts of Rwanda and Tanzania. It addressed two key questions:

- **Technical coherence:** It examined the lessons learnt from differences in the health systems of both countries and efforts to achieve interoperability / integration of the DYNAMIC tool with EMRs.
- **External coherence:** Furthermore, the evaluation explored the alignment with the agendas of relevant external stakeholders and their engagement in the project.

Findings from Rwanda

Technical coherence

Regarding coherence, the debate on interoperability versus integration of the DYNAMIC tool into national structures is crucial in assessing how well the solution was adapted to the national context. Interoperability is the ability of different systems to exchange and make use of information. Integration refers to combining different systems to work as one cohesive unit. In an interoperable solution, DYNAMIC would be operated in parallel with the national EMR. The EMR would have access to the information via an interface (Application Programming Interfaces, API). In the case of integration, the application of DYNAMIC would be programmed directly into the respective national EMR software, which is a technically demanding exercise both in terms of human resources as well as software requirements. According to IO_4, integration is the first best solution for two reasons: 1) It allows the government to adapt and maintain the software themselves, and 2) necessary funding and resources, such as IT experts and infrastructure, are secured. Interoperability, on the other hand, can, according to literature (e.g. Wheelwright und Clark 1992; Langlois und Robertson 1992) work in specific contexts very well, as a certain group of designers focuses on a specific module, ensuring that it is stable and effective during implementation.

Given that no universal national EMR existed at the start of the project in Rwanda, the DYNAMIC solution, based on the different med-AL components, was designed in a way to be potentially interoperable with any software systems. However, the final technical solution has proven to be highly complex and sophisticated, which ultimately exceeded the current IT capacities in the public sector in Rwanda. IT capacities at this level are yet insufficient to compile, manage and maintain such a solution. Simplifying the software and hence decreasing the size and complexity of the clinical algorithm could be beneficial for an integration, but would come at the price of a lower impact in terms of quality of care.

During the project timeline, the Rwandan government made a strategic decision to employ an Enterprise Resource Planning (ERP) system, called ERPNext, a comprehensive ERP system intended to integrate existing tools, modules, and solutions. It is a commercial solution that the Rwandan government adapted to their context with the help of external software developers. Based on this development and according to preferences within the MoH voiced during the evaluation period (Public_actor_3_RW, Public_actor_5_RW), it became clear that the

interoperability of medAI-*reader* with the new national system is no longer preferred and that instead, an integration into ERPNext would be required. However, the sophistication of the DYNAMIC solution and the different programming language has complicated a straightforward integration into ERPNext, requiring reprogramming and a breakdown into different modules to fit ERPNext's structure.

As a reaction to this new reality, the SDC Kigali office, which was engaged since the beginning of the project and closely involved in progress monitoring, pushed for a new technical committee to discuss opportunities to integrate DYNAMIC into national structures (IO_3). Apparently, stakeholders of the committee engaged in discussions with other government levels (e.g. Rwanda Information Society Authority, RISA, or the Ministry of Infrastructure, MININFRA). This reaction to the changes in the environment was deemed necessary to foster a more concrete discussion on sustainability. Recognizing these environmental shifts, the project timeline was extended by 18 months, partly to compensate for Covid-19 pandemic delays and also to allow for a transition phase towards a sustainable implementation of the solution. Chapter 5.3 on sustainability will further elaborate on the current status of expected sustainability and scaling.

At health facility level, the technical solution and accompanying measures were to a great extent contextualized and adapted to local circumstances and, thus, accepted (see relevance chapter). Positive elements of the project design at health facility level include sensitization trainings and measures in local language, on-site support by DYNAMIC staff, which was highly appreciated given that there is in general a shortage in staff, and the inclusion of the local community. A potential area for improved coherence is that the DYNAMIC CDSA suggests diagnostic tests and medicines, which was not always covered by insurance, making it difficult for poverty-ridden families to afford and follow the prescribed medical treatment (Impl_partner_3).

External coherence

In Rwanda, the project integrated a range of different actors in the project.

At national level, the most important stakeholders are the Ministry of Health (MoH) for health policy, the Rwanda Biomedical Center (RBC) for service delivery, the Rwanda Social Security Board (RSSB) for health insurance and the Rwandan Paediatric Association to improve children's quality of care. Approval was secured from the National Maternal and Child Health Technical Working Group, which includes representatives from government and NGOs. Oversight was provided by a steering committee appointed by the MoH, with members from the MoH, RBC, WHO, UNICEF, Rwanda Food and Drug Administration, Rwanda Pediatric Association, and the Rusizi and Nyamasheke districts. This committee held regular meetings and conducted field visits to the study sites. The steering committee also demanded a dissemination event to share and discuss research findings, which was held on April 16th, 2024, and well-received by different stakeholders (Public_actor_4_RW, IO_3).

At district level, the study team first engaged the local officials, before formally introducing the project to the health centres and communities (see more in Relevance).

At international level, the DYNAMIC team collaborated with and consulted the WHO, which is working on a different, paper-based treatment decision tree for children and is starting now to do the same for adults. The simplified WHO solution does not strive for a reduction of unnecessary antibiotic prescriptions (Impl_partner__2). A follow-up project by the Swiss TPH in collaboration with the WHO just received new grants. The organization Resolve to Safe Lives, which is closely

collaborating with the MoH, advising on how to digitize its health sector, was invited to visit health centers, but during the project implementation not more closely involved[2].

Interim Conclusion – Coherence Rwanda: DYNAMIC shows high alignment with international initiatives by WHO. At technical level, the decision by the Rwandan MoH, which came late in the project duration, to set up its own, universal EMR software, integrating other solutions, undermined early efforts towards interoperability. DYNAMIC has developed into a tool of high technical and clinical sophistication to ensure effectiveness, that requires additional resources and, most likely, external IT capacities to be implemented in the two countries.

Findings from Tanzania

Technical coherence

Just like in Rwanda, assessments of coherence in Tanzania are closely linked to questions of interoperability versus integration of the DYNAMIC tool into national structures.

As raised in the relevance chapter, the DYNAMIC solution in Tanzania addresses critical gaps in rural healthcare and complements existing health initiatives by offering diagnostic support to clinicians. However, it currently adds to clinicians' workload, introducing an additional tool and a parallel data-entry process. Greater and hence more efficient integration with GOTHOMIS is hence essential to streamline the solution's use and eliminate these inefficient, duplicative processes.

The project team in Tanzania reported that they engaged with Tanzanian ministerial and local governments' IT departments to discuss interoperability from the onset of the project. However, progress was hindered by an ongoing institutional debate over which EMR software would be adopted for deployment at national level. There was initial contention between PO-RALG's GoTHoMIS system (developed with Mzumbe University for primary health centers) and the Ministry of Health's EMR system, developed in collaboration with the University of Dar es Salaam's computing center for use at hospitals. A decision was finally reached in mid-2023, selecting GoTHoMIS as the national EMR software. This decision prompted a reprogramming effort to make GoTHoMIS a centrally web-based platform, as opposed to the previously localized, facility-based system. Reprogramming of the tool went on until early 2024. Once a more stable situation was reached, the DYNAMIC team began more in-depth discussions on interoperability and integration (Impl_partner_2), which had not been feasible previously.

External coherence

Given the challenges encountered in obtaining research authorization and completing all envisioned interviews in Tanzania, the evaluation team currently has access to only limited information regarding the involvement of and alignment with key stakeholders.

However, interviews conducted to date suggest that the project in Tanzania collaborated with key national-level institutions. Specifically, DYNAMIC involved the Ifakara Health Institute (IHI), the NIMR, the districts health authorities, the MoH and the President's Office, Regional Administration and Local Government Tanzania (PO-RALG) . The IHI specializes in health research and interventions aimed at enhancing healthcare delivery and disease management, while NIMR serves as Tanzania government's primary health research body, responsible for medical research coordination, disease monitoring, and setting health research priorities across the country. The MoH, on the other hand, focuses on developing health policies. The project hence engaged both research and policy-focused institutions.

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[2] Update: 03/2025: Towards the very end of the project, they were actively involved again, functioning as "middlemen" between the MoH in Rwanda and the DYNAMIC team (Impl_partner_1).

An additional platform worth mentioning at the national level is the *Tanzania Sustainable Development Platform*. This platform plays an important role in coordinating efforts between development partners and the government across various sectors. In the health sector, coordination is structured into clusters, with specific working groups addressing distinct health-related topics, such as IT. Each working group is chaired by a government representative, and all active entities in the field are members. Participation in these working groups is not only essential for coordination and alignment with other initiatives but also serves as a means to share research findings with potential donors and government technical advisors. DYNAMIC was not part of this important platform (Impl_partner_1), as it was not initiated and implemented by a civil society organization but by research institutions (IO_2).

At local level, the Tanzania project team adopted a more bottom-up approach. While engagement with district health management teams was initially limited, activity intensified in the second phase and were progressively expanded to include the central government (see chapter on relevance for more details).

Interim Conclusion – Coherence TZ: DYNAMIC was developed together with IHI and NIMR, research institutions close to MoH. While the tool therefore aligns with national priorities and addresses critical gaps in rural healthcare, its parallel and hence inefficient data-entry processes strain clinicians, emphasizing the need for integration. The late governmental decision in mid-2023 to adopt GoTHoMIS as Tanzania's national EMR delayed efforts to integrate the DYNAMIC CDSA, compounded by ongoing reprogramming throughout early 2024.

Cross-cutting conclusions and country comparison

When the DYNAMIC project began in 2019, no universal digital health facility systems had yet been implemented in primary care facilities, neither in Rwanda nor in Tanzania. While the countries had developed overarching digital health strategies, they had not chosen a specific health facility management system or EMR for future use. As a result, the DYNAMIC CDSA solution was designed independently of any existing local digital health infrastructure with the intent to suggest interoperability at a later stage. Yet, in the dynamic digital landscapes of both countries, the respective governments took the direction of developing their own national software, that should integrate other technical solutions, which proved to complicate later interoperability or integration.

DYNAMIC has not been working in silo and there are other international organizations concerned with digital health solutions to support clinical decision-making. The WHO specifically works on three different streams:

- Unisanté and Swiss TPH have been working with WHO to help in the digitalization of Integrated Management of Childhood Illness (IMCI) adapted for humanitarian settings following the SMART guidelines for children under five years old. It is an app-based solution that can be used on mobile phones or tables. More information on this project: https://www.who.int/tools/CCC
- Recently, Unisanté and WHO are working on a partnership to collaborate on the development of a CDSA to help the management of adults and adolescents at primary care in Least and Middle-Income countries
- Project team members shared that, WHO also works on a simplified tool for clinical decision-making for adults, based on an interactive PDF-version

Lastly, Unisanté and Swiss TPH were part of another research study (Tools for IMCI), funded by UNITAID with the international organization PATH as prime recipient, that implemented the CDSAs developed in Tanzania and adapted it to other countries. Learnings from these contexts could not be retrieved as part of this evaluation but could be insightful to understand contextual adaptations needed even better.

5.3. Sustainability

The sustainability assessment evaluated whether the benefits of DYNAMIC are likely to continue after the funding has ended. It addressed four key questions:

- **Effectiveness:** It assessed the effectiveness of the solution on health outcomes.
- **Continued benefits:** It evaluated whether continued net benefits exist on the national and local level.
- **Political acceptance and ownership:** It examined the acceptance and ownership of the DYNAMIC solution by the national government (and beyond).
- **Research gaps:** It examined potential research gaps which need to be addressed as prerequisite for a successful scale-up.

Findings from Rwanda

Effectiveness of the solution

Within the project timeline, the solution's effectiveness was demonstrated and shared through publications, national and international public health and research events, during interim and final dissemination events. Study results revealed a 46% absolute reduction in antibiotic prescriptions, from 70.5% in control (routine care) to 24.5% in intervention (routine care augmented by CDSA) health facilities, without compromising clinical cure in both groups (Report on the dissemination event, 2024). Quality of care was assessed by the project via quantitative and qualitative data collection. Results of the study part were found to be impressive and convincing by public actors included in interviews (Public_Actor_1, Public_Actor_5). In regard to the research objectives set, the project was successful (Public_Actor_1). A digital system of multiple tools could be developed and implemented in rural health facilities to positively affect quality of care for children and its effectiveness could be scientifically proven.

Continued net benefits and indirect effects

To assess net benefits, a holistic consideration of continued impact at different levels must be regarded. Interviews showed that DYNAMIC has contributed to enhanced sensitization on (i) the importance of reduction on antibiotic use and (ii) the usefulness in digital tools to enhance clinical and public health decision-making at local, district and national level. At local level, health facility personnel benefited from training and mentorship measures by the project team, when introducing the CDSA tool and its related tools and activities (Impl_partner_3). The training strategy was found to be good, as not single persons were trained but all nurses at the health facility were covered. Health personnel interviewed emphasized that they are in the position to train each other, as the tool is easy to use. Public actors emphasized the educational component of the tool as well, guiding health personnel with different experiences effectively (Public actor_1). The awareness created on the importance of adequate clinical decision-making and quality of care most probably sustains among health facility personnel. At district level, interviews revealed strengthened capacities in regard to the use and interpretation of data dashboards and decision-making, sparking interest among district health officers and the local government.

"The main thing DYNAMIC contributed to is data communication through the digitalization of health data. Even for those who didn't go to IT schools, we can access information in a digitalized way, and it helps us to evaluate the country's strategies and priorities easily." - District_actor_1_RW

At national level, different divisions of MoH could be sensitized on the use of real-time data and dashboards, enabling evidence-based decision-making and effective planning processes (Public_actor_1). Furthermore, public actors have also become more aware about the effectiveness of CDSAs and value the expertise built up within the project team, that now requires spillover to the respective public institutions.

As a positive, indirect result, the project also raised awareness on certain medical issues (e.g. the importance of POCT test, e.g. hemoglobin tests / C-reactive protein tests to differentiate bacterial from viral infections and hence help health personnel decide if antibiotics should be prescribed) that would yield both health and cost-related benefits and are thus of interest to MoH and RSSB. Observations revealed that during the project implementation a C-reactive protein test was developed and introduced to provide a support to decide on whether or not the patient requires antibiotics. A positive result speaks in favor of prescribing antibiotics, while a negative result should discourage the prescription. The quote explains the perceived correlation between using the tablets and tests and insurance costs – an issue that is of high interest for RSSB (see next paragraph).

> *"These days, they are no longer using tablets, and they are no longer doing the C-reactive protein test. As a result, the costs rose again from the RSSB side." – District Level Health Management*

As a matter of fact, the continued use of DYNAMIC at health facility level is, however, strongly compromised by **technical maintenance**, given that Android-based app solutions require far more technical updates than Windows-based solutions used on computers. If not adapted to these changes each time, the Android application can no longer be used, which makes net benefits unlikely to persist if no such technical support is provided. Health personnel also reported issues regarding the charging of tablets as well as the occurrence of stolen or missing tablets, which hamper day to day use.

At the time this report is compiled, the number of cases entered into the DYNAMIC tablets in the two districts has already reduced quite substantially but has not yet completely ceased (see figure 3). Currently, 50 cases per week are reported in the DYNAMIC system, whereas previously up to 200 cases per week were documented. Project sources named the removal of registration assistants at health facility level, which were funded by the project, and consequently the decline in the number of trained staff as a reason for the decline, revealing challenges with the sustainability of training access and **sustained capacities**. Furthermore, while interviews at HF level showed that staff indeed show a willingness to continue using the tool, as they are convinced of its added value in providing quality healthcare, the technical issues with the software raised above are expected to hinder this use even further in the near future.

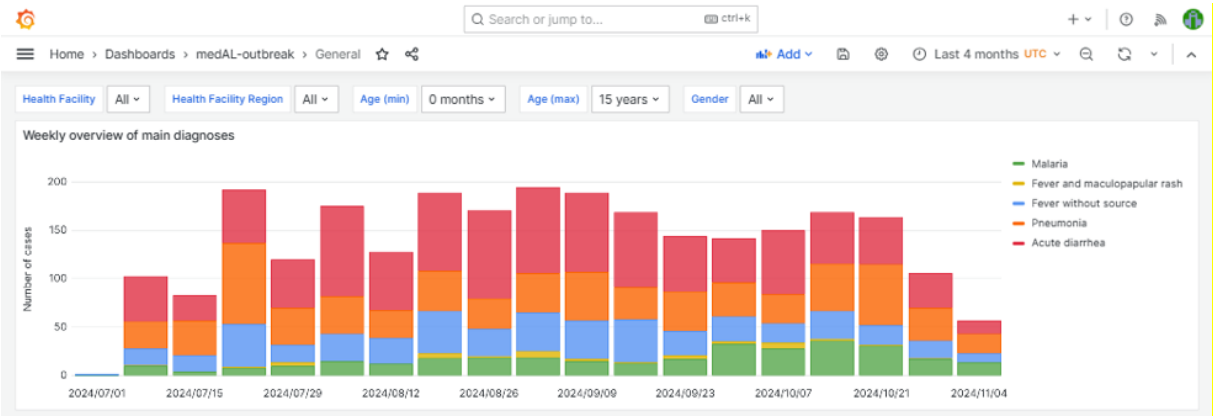
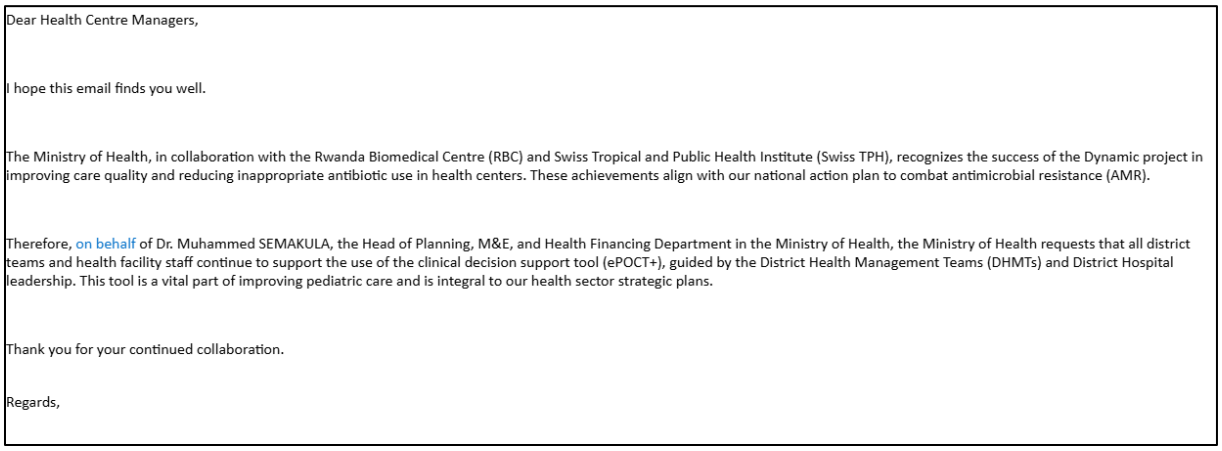


Figure 3: med-AL dashboard featuring use trend of the DYNAMIC solution over time in Rwanda

Political acceptance and ownership

Political and institutional acceptance and ownership is a key pre-requisite for the successful integration of the solution into national processes. In Rwanda, acceptance and interest could be evidenced at different levels.

Firstly, the government shared a letter of endorsement, encouraging the districts to continue the use of the tool (see figure 4). Secondly, interviews revealed that the MoH and RBC are convinced of the usefulness of the tool and show commitment towards the continued and learnings made. They, however, also emphasized that they require a universal system, integrating all important functionalities, of which DYNAMIC would be one of them. Thirdly, RSSB, the institution in charge of health insurance management (including enrolment and claims management), even though not directly involved throughout the implementation, started an internal medical cost analysis after they listened to results during the dissemination event, which indicated a slight difference in the cumulative annual growth rates (CAGRs). Nyamasheke and Rusizi's CAGRs remain 12% lower than other Western province's Health Facilities where DYNAMIC was not implemented. Yet, as the research has not been finalized, RSSB cannot draw final conclusions to understand the cost reduction effect brought on by DYNAMIC (Public_actor_4_RW). In addition, the institution is very interested in the data display and visualization of results.



Dear Health Centre Managers,

I hope this email finds you well.

The Ministry of Health, in collaboration with the Rwanda Biomedical Centre (RBC) and Swiss Tropical and Public Health Institute (Swiss TPH), recognizes the success of the Dynamic project in improving care quality and reducing inappropriate antibiotic use in health centers. These achievements align with our national action plan to combat antimicrobial resistance (AMR).

Therefore, on behalf of Dr. Muhammed SEMAKULA, the Head of Planning, M&E, and Health Financing Department in the Ministry of Health, the Ministry of Health requests that all district teams and health facility staff continue to support the use of the clinical decision support tool (ePOCT+), guided by the District Health Management Teams (DHMTs) and District Hospital leadership. This tool is a vital part of improving pediatric care and is integral to our health sector strategic plans.

Thank you for your continued collaboration.

Regards,

Figure 4: Email excerpt illustrating governmental commitment

While different data sources and feedback received underline a positive attitude of key stakeholders towards the DYNAMIC solution and its effectiveness, a clear way forward to enable integration with the now pursued ERPNext software is still pending. Technical modalities of a potential integration of the DYNAMIC solution must still be solved, as it requires re-coding and programming of different medAL-elements. National stakeholders envision a modular approach, integrating certain elements of DYNAMIC into their national system. The question whether this is technically feasible has not yet been fully answered in the course of the evaluation. According to interviews, discussions in this regard between the MoH and project implementing parties have not been successful at the point of the evaluation (Public_actor_3, Public_actor1)[3].

"We already have an automated, digitalized IMCI, which is fit to the protocol. We wanted to take some insights from DYNAMIC tools and systems, such as algorithms, and put them in our system and it was very difficult because the discussions were not successful. The DYNAMIC team was like, you either take it all or don't take it at all. There is no possibility to take bits of the project. That is difficult for the government to implement because of its duplication." – Public_actor_1_RW

In addition, IT and clinical capacities appear to not yet be sufficient to handle this without external support.

"National infrastructure is a big thing. We can't expect it to depend on a small project as DYNAMIC. It's a whole skeleton that cannot be changed so easily. SDC may think we don't appreciate DYNAMIC. We do. We see the potential. We are convinced of the impact, the

[3] Update 03/2025: Later on, Resolve to Save Lives adopted exactly this mediating position between the parties and facilitated a successful way forward towards interoperability.

evidence. We can't just take the national infrastructure apart just because of a small project. There is need of planning, and incorporating DYNAMIC accordingly, without disrupting the existing order of the national skeleton of health sector." – Public_actor_3_RW

In specific, national actors call for (i) a more pronounced sustainability plan, (ii) and transfer of certain modules (adaptation and integration) instead of the solution as a whole and continued support by funding agencies.

The research may end but we need them to support us in scaling it up. Yes, we will adopt it because we can see the benefits, and as MoH we will adopt it but we need a scalability plan from SDC, and they need to show us how they will support us in scaling it. The research may end but we need them to support us in scaling it up. (Public_actor_1)

Additional research gaps identified

In the Rwandan context, the need to better understand the cost-effectiveness of treatment outcomes when the tool is applied is of great interest to RSSB, as the reduction of antibiotics curbs down medical costs. Another research interest that was mentioned is the tracing of patients across different health institutions . Concretely, it would be of interest to understand whether referrals to hospitals yielded the same diagnoses than the ones provided at health facility level through the DYNAMIC solution. This would provide additional evidence for the solution's eeffectiveness (Public_actor_2_RW). In the broader context of antibiotic prescription, it was mentioned to investigate the use of non-prescribed antibiotics[4] through pharmacies (especially in urban areas) and the uptake of antibiotics via agriculture produce (Impl_partner_3).

Interim Conclusion – Sustainability RW: The DYNAMIC system has proven effective and has garnered acceptance and commitment from public actors in Rwanda. Its long-term sustainability hinges on its successful integration into the IT and digital health infrastructure and continued technical capacity building. A more flexible, modular approach, choosing certain elements of the comprehensive DYNAMIC solution, may better accommodate evolving requirements, but the feasibility of the same is still in question.

Findings from Tanzania

Continued net benefits and indirect effects

With regard to net-benefits and the demonstrated **effectiveness** of the tool in Tanzania, a study which was published in the journal Nature Medicine in 2023 showed that in the Tanzanian health facilities using the DYNAMIC solution, the usage of the tool resulted in "a three-fold reduction in the likelihood of a sick child receiving an antibiotic prescription", whereas clinical failure was found not to be higher in patients managed with the help of the tool compared to non-ePOCT+ health facilities. The study concluded that "widespread implementation of ePOCT+ could help address the urgent problem of antimicrobial resistance by reducing excessive antibiotic prescription in sick children while maintaining clinical safety" (Tan et al. 2023).

To ensure clinical staff were trained on the correct usage of the DYNAMIC tool, the project implemented both a centralized and decentralized approach. On the one hand, health facility members were centrally trained on the tool and asked to retrain their colleagues. On the other hand, project staff conducted frequent re-training of new clinical personnel on site. The perceived short timeline of the project and frequent staff turnover at health facilities prevented the establishment of a more structured and sustainable Training of Trainers (ToT) approach that could have empowered trainers to consistently support staff across facilities. One key challenge in

[4] According to the project team, approximately 6% of parents reported giving their child medicine in addition to that prescribed during the DYNAMIC health facility visit (same in intervention and control arms).

implementing an effective ToT model was the lack of adequate transportation and resources at the district level (Impl_partner_5).

Throughout project implementation, interview partners highlighted specific measures taken to promote consistent uptake of the tool within pilot health facilities. For instance, a doctor from Ulanga reported forming a group that "held each other accountable". Weekly check-ins were organized to monitor tool usage, address challenges, and ensure reporting through the tablet. This system of peer accountability helped motivate and engage clinicians, maintaining consistent tool usage (Impl_partner_7). Through systems like this, high usage figures within Tanzanian health facilities of up to 300 patient cases per week (July 2024) could be reached (see Fig. 5).

Interviewees furthermore pointed out that in spite of all positive outcomes at healthcare level, nationwide implementation is expected to encounter challenges unless structural issues experienced at health centers, particularly training gaps and limited resources or infrastructure, are adequately and sustainably addressed (District_actor_TZ_1). Against this backdrop, a widespread adoption of the tool is yet far from reached. Following a peak in usage in July 2024, the number of weekly cases reported through the DYNAMIC tool declined gradually over time as the project slowly phased out. A significant drop in usage was noted starting in early September (see Fig. 5).

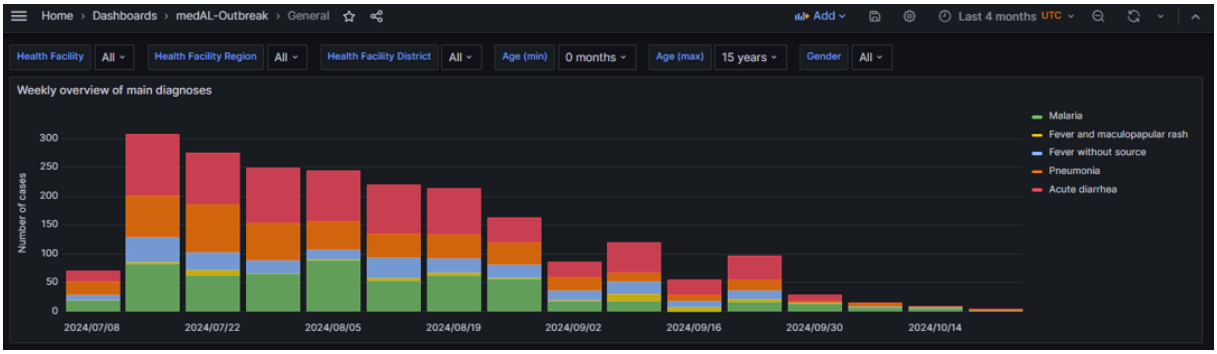


Figure 556: med-AL dashboard featuring use trend of the DYNAMIC solution over time in Tanzania

In line with this decline, interview partners expressed concerns that just like in Rwanda, discontinuation of technical support of the Android-based DYNAMIC solution is expected to lead to a complete discontinuation of the usage of the tool in Tanzanian health facilities (Impl_partner_5). **This underscores the critical importance of integrating the solution into the GoTHoMIS system to ensure its sustainability** (see chapter 6).

> *"We consistently remind facilities about the importance of the tablets, but, as it stands, only two or three facilities continue to actively use the tool. This low adoption rate highlights the need for a stronger push to integrate and utilize the system across all facilities." (Impl_partner_7)*

Political acceptance and ownership

Project and external stakeholders agreed throughout interviews and workshops that a continued usage of the DYNAMIC CDSA solution requires a dedicated support system, from managing server maintenance to facilitating ongoing training, troubleshooting, and providing internet access (Impl_partner_5). This highlights the critical need for **government commitment**.

Throughout its 18-month extension, the project team aimed to consolidate findings into user-friendly formats such as handbooks and human-readable documentation of the tool's contents. Such documentation is crucial for knowledge transfer from science to policy, aligning with the theoretical framework of Boswell & Smith, which underscores the importance of making

scientific insights accessible and actionable for policy adoption. Both, including the open-source clinical algorithm as well as the software used for the CDSA solution, are already or planned to be published on the DYNAMIC website (Impl_partner_2). In addition, the project in Tanzania conducted regional and district level events as well as a total of three national-level **dissemination events** with a reported attendance of 70 participants, including high-level personnel from Tanzanian governmental entities, in June 2024.

While the dissemination events were generally perceived as a positive initiative, a project stakeholder critically noted challenges in making scientific findings comprehensible to non-specialists. Although the project team sought to present results in an understandable format, translating complex scientific insights into practical applications for lay audiences and policymakers proved difficult (Impl_partner_5). This gap reflects a potential limitation in effectively bridging science and policy, as suggested by Boswell & Smith, where clarity and accessibility of evidence are key to influencing decision-making.

On the one hand, it remains uncertain how successfully the project fostered connections between science, the public, and policy, not least through its dissemination events. Although media representatives attended the dissemination events, stakeholders expressed doubts about the reach and impact of these announcements on broader public or political awareness (Impl_partner_5). On the other hand, the project's dissemination efforts did prompt action within the four critical governmental departments - child health, digital health, antimicrobial resistance, and quality of care – which need to coordinate and collaborate for a CDSA (whether that developed by DYNAMIC or another) to take off at a higher level. Following discussions during the dissemination events, representatives from these departments have reportedly begun lobbying at the parliamentary level to secure approval for the broader integration and rollout of the DYNAMIC tool in Tanzania (Impl_partner_2).

Perceptions among stakeholders regarding the likelihood of continued governmental support and commitment varied among interviewed stakeholders. There was acknowledgment that while Tanzanian government processes can be slow on occasions, there is potential for swift adoption once officials see value in a project (Impl_partner_5). At the same time, concerns were raised about competing priorities and budgetary constraints within the Tanzanian government, which could undermine the translation of government commitment into tangible action (Impl_partner_5, Impl_partner_7).

While the project demonstrated positive outcomes such as improved pediatric quality of care and efforts to combat antimicrobial resistance, there is a clear risk that these achievements could dissipate without continued backing, reducing the project's impact to research findings rather than a sustainable change (Impl_partner_5).

Project stakeholders furthermore expressed an unintended side effect of the project prolongation being a delay in political commitment throughout this period, as the entities in charge were well aware that the project was still around and there was hence no perceived urgency to become active on their own (Impl_partner_2). **Within the project team, the perception prevailed that the government would only start feeling the pressure to take a strategic decision once the project support ended** (Impl_partner_2).

However, should the Tanzanian government commit to investing in a CDSA solution and scaling it up, different implementation pathways could be pursued. One approach involves ensuring interoperability between GoTHoMIS and the DYNAMIC CDSA solution through an API integration that links the two systems. While this option would enable seamless access and usage of the DYNAMIC tool within the GoTHoMIS system, it would also create a degree of dependency on external actors, such as Unisanté, to maintain and update the external CDSA tool (Impl_partner_2). To reduce this dependency, the Tanzanian government appears inclined toward reprogramming the CDSA software within GoTHoMIS itself. However, this approach would require

highly specialized technical capacities, which are reportedly difficult to source within Tanzania, particularly in public institutions where salaries are less competitive compared to the private sector. The tool's complexity further complicates this approach. Although technical training for GoTHoMIS personnel has commenced, it is unlikely to be fully completed before the project concludes (Impl_partner_2). From the perspective of the DYNAMIC tool, this approach would also present the disadvantage of losing the ability to implement centralized updates, which could become a significant limitation should the tool at some point be want to rolled out across multiple countries.

Whichever path is chosen, a governmental mandate for the GoTHoMIS IT department would be required to integrate and roll out a CDSA solution (whether it be the one developed by DYNAMIC, a copy of it reprogrammed into the IT language used by GoTHoMIS or another existing or completely new software) into Tanzania's newly decided HMIS. This step requires an active decision by the Tanzanian government to allocate government funds to the improvement of health infrastructure at primary care level rather than to other potential government priorities, which stakeholders identified as a key bottleneck to further progress (Impl_partner_2).

Additional research gaps identified

Data collection in Tanzania highlighted a few persistent research gaps. One gap concerns caregivers' perspectives and expectations within the healthcare system. Many caregivers expect that a visit to the doctor should always result in a prescription, reflecting a lack of understanding regarding the appropriate use of antibiotics and other medications, requiring further analysis to understand its implications for health outcomes. In the same line, there is a pressing need for improved education on antibiotic resistance, a global health issue that disproportionately affects children. Effective strategies are needed to educate communities and promote better health practices to mitigate the spread of resistant pathogens.

Interim Conclusion – Sustainability TZ: The DYNAMIC tool demonstrated significant clinical benefits, but its long-term usage faces challenges. A decline in tool adoption during the project's phase-out and concerns about the lack of technical support highlight the need for integration with the Tanzanian HMIS System GoTHoMIS to ensure sustainability. Political commitment remains crucial but uncertain at the point of the evaluation, as competing priorities within the Tanzanian government pose risks to scaling the tool. While there are possible pathways for integration, a lack of technical capacity and government funding represent key obstacles to the sustainability of the project's achievements.

Cross-cutting conclusions and country comparison

In both countries, the effectiveness of the DYNAMIC solution could be scientifically proven. The results supported the sensitization of public actors from district to national level and showcased the usefulness of digital solutions.

A momentum which the DYNAMIC solution can build upon is the fact that after years of volatile decision-making, strategic decisions on **national HMIS** to be used and rolled out have been taken in both countries, which constitutes an important basis for further considerations and steps to be taken on interoperability and integration of digital health solutions like DYNAMIC. In Rwanda, it became clear that the tool has managed to provide the **proof of concept**, which was a prerequisite by the Rwandan government to even consider an integration of the solution into their HMIS. A comparably high **willingness of the Rwandan government** seems to exist to continue using and eventually, integrating the tool into existing structures. However, they have clearly voiced that they would like to integrate certain modules and functionalities but cannot adopt the full-size solution. In its current form, the tool is perceived as **too complex for integration** by interviewed stakeholders, who suggest that downscaling is necessary before integration – though this, to some extent, also appears to conflict with a need for complexity to fully address the

clinical processes involved in determining whether antibiotics are required for effective treatment or not.

> *"From research to scale, you don't scale up everything, otherwise it would be very expensive. They have to choose the most important and scalable elements" – Public_actor_1*

The core challenge in both countries pertains to the aspired, but **yet unrealized (API-) integration or reprogramming** within national HMIS systems, which, if not successfully completed at some point, is expected to lead to an eventual drop of the ePOCT+ tool due to various reasons.

While both countries are leaning towards reprogramming the DYNAMIC CDSA tool within their respective national HMIS rather than pursuing an API-integration, the evaluation equally showed that the necessary IT expertise is difficult to source, particularly within Rwandan and Tanzanian public institutions. Consequently, integration into the national HMIS in each country is perceived as complex and challenging, given that the respective departments have "never been asked to create something so complex within their systems" (Impl_partner_1). Furthermore, questions of **clinical capacities** in governmental entities are at play when it comes to sustainability prospects. The tool is aligned with clinical decision trees which were designed / set up in line with pertinent national clinical treatment guidelines in the two countries. However, these guidelines are not set in stone and are expected to change over time in line with new clinical or epidemiological insights. Consequently, personnel with the required capacities to adapt the algorithm-based decision trees and hence the fundament of the DYNAMIC tool is required. At the time of the evaluation, no group of people had been identified in the countries who would have the necessary capacities to take over this task as the project withdraws (Impl_partner_1).

However, non-integration / linkage will be unsustainable in the mid- to long-term. The current, non-integrated setup leads to inefficient **parallel processes** in health facilities, given that health personnel need to enter the same data in diverse sheets and tools due to a lack of integration of systems. "Some providers were expected to input clinical data in ePOCT+, the EMR and a paper log, prolonging the consultation time" (Tan et al. 2023).

Additionally, the DYNAMIC solution, which runs on Android tablets, requires regular updates to match changes and requirements of the Android Playstore (Impl_partner_5). Such updates require centralized **IT capacities**, which could potentially be provided by governmental stakeholders if the tool was integrated into national IT systems but are unlikely to be found or made available by governmental institutions, more so if an integration does not take place.

Additional barriers to sustainability exist in regard to available capacities as well as resources at the grassroots level. Barriers relate to partly inadequate infrastructure, including limited or unreliable power supplies, which are indispensable for the frequently required charging of tablets, and the need for safe storage solutions for such valuable devices. The lack of sufficient infrastructure is coupled with limited capacities and confidence of **IT personnel** at health facilities to maintain tablets. These personnel did not receive technical training, which would, however, be required to build up the confidence and capacity to autonomously update Android tablets to latest system updates in the future. Furthermore, at that level, the need for frequent formal **training of clinicians** emerges as a risk to sustainability. While in Rwanda, efforts by the project were underway to develop an e-learning module for the Council of Nursing to ensure that all health workers could access this training (an optional module on the website accessible to students) (Impl_partner_1), interviews with project experts also revealed that online training / training through the tool itself would not suffice to turn future users into competent navigators of the tool; it would require on-site training and continued mentoring (Impl_partner__2). The last progress report hence summarizes that "without initial high quality clinical training and regular efficient on-site supervision of health facilities, even the best interventions cannot work." (Progress report 2023). Hence, partners on the ground, such as representatives of the health authorities, would be required to ensure that training on the tool could be continued.

6. Sustainability Scenarios

Based on the findings identified on sustainability, a participatory workshop involving implementing partners and funding institutions explored potential sustainability scenarios and options for implementation. Key discussions and scenarios are summarized below.

Preliminary remarks:

12/2024: Based on the analysis and discussions held, it becomes apparent that at this stage of the project, it is up to national actors to determine the way forward whether and to what extent DYNAMIC can be integrated into national structures, allocating respective budgets for the same. The subsequent sustainability scenarios consider this condition accordingly.

Scenario 1: "Project ends as planned in 2024"

In this scenario, the project ends at the end of 2024 as planned, while some activities continue …

At the time this evaluation report is compiled, the project is scheduled to conclude on December 31, 2024. Unisanté has expressed their willingness to offer pro-bono support following the project's phase-out, by answering specific and focused IT and clinical technical questions that no expert in the country would be able to answer.

Ongoing measures towards sustainability:

Given that it is yet unclear which elements of the DYNAMIC solution can be integrated into the forthcoming ERPNext / GoTHoMIS, the project team is currently in the process of defining and documenting **important elements of the solution**. According to project sources, this documentation is currently underway and expected to be completed by December 2024, i.e. as the project ends[5]. In the same vein, the project is working on the documentation of contents through handbooks and other easily understandable formats which do not require an IT background. All of these are planned to be provided on the DYNAMIC website by the end of the project.

In Tanzania, the NIMR team is working on **policy briefs** to help foster tangible commitment within the Tanzanian government. However, the level of capacity and the required available time seem to be too little to make considerable progress, and by the end of the evaluation in November 2024, no tangible products (such as a rough policy draft or outline) are available yet[6].

Discussions with project stakeholders furthermore revealed that the DYNAMIC CDSA software solution was transformed into an **open-source tool** (the clinical algorithms have also been all published), which equally constitutes an opportunity for sustainability. In theory, it allows a global or regional community of developers and practitioners to contribute to its ongoing development and maintenance. While uncertainty persists if a community of contributors / IT engineers will evolve around the tool given that every country uses their own EMR system, the tool will be maintained in the future, also independently of the development of such a community, given that some health system stakeholders in the canton Vaud have announced their interest to use the software. Therefore, Unisanté has decided to develop and maintain a Windows-based version of the solution. While the tool was initially developed for countries in the Global South, it is hence now taken up in the Global North (Switzerland), where they are able to absorb the tool more

[5] Update 03/2025: For the IT technical documentation, all the elements are available on this site: https://doc.medal-suite.org/doku.php?id=start, which can be accessed from the website https://medal-suite.com/.

[6] Update 03/2025: The team in Tanzania has prepared a first set of policy brief drafts, which require additional quality assurance support by the Swiss partners.

following a **reverse innovation** approach[7]. The tool will furthermore be transferred into a Windows-based tool, which may facilitate an easier future (re-)integration in other countries. As long as the tool is used in Switzerland, there remains an opportunity to transfer it again to another country in the Global South.

Additional recommended measures:

Following the theoretical framework on scaling social innovation reverted to for this evaluation (see chapter 4), it is recommended to **diligently determine the unchangeable core of the DYNAMIC solution** that must be maintained when scaling to ensure continued social impact. Building on the work of the team to document core elements, it is recommended to specifically identify technical and clinical features that ensure the effectiveness of the solution in the specific context and discuss them with public partners in the two countries. This exercise forms the base for a conjointly developed sustainability plan, pursuing effective integration into national structures.

Given the tool's open-source status, the project team could contemplate actively fostering a **community of practitioners**[8], thereby helping the tool achieve greater autonomy from its original developers and enabling other countries to potentially adopt certain modules, if not the entire tool.

While the project cannot drive this government decision, certain supporting measures may be feasible. Specifically, in Tanzania, the NIMR team could receive further support in drafting the **policy briefs**, thereby laying the groundwork for a formal political decision.

As part of this scenario, it could furthermore be considered to translate selected clinical content of the DYNAMIC CDSA solution into a **simplified, low-cost solution**, such as a sort of interactive PDF, a pathway that WHO is currently pursuing.

Scenario 2 and 3: Scale up with minimal support or scale up with extensive support

Scenarios 2 and 3 involve continued support by the donors.

Prerequisite:

If either or both of the involved governments formally commit to integrating a CDSA within their health system IT ecosystem, the funding agencies of DYNAMIC could consider investing additional resources in a follow-on project to facilitate further scaling within the countries, as openly **demanded by public stakeholders in Rwanda**. For such additional funding, a clear government commitment to integrate and scale the solution, alongside an allocation of public resources, is essential. The evaluation concludes that without this commitment, additional external funding could undermine sustainability and ownership by allowing the government to overly rely on external support.

Additional recommended measures:

In the case of a tangible commitment and a decision for further funding, several additional measures could be implemented to foster country-wide scaling and sustainability of the

[7] Reverse innovation refers to the process where solutions or technologies are initially developed to address needs in lower-income or resource-constrained settings and are later adapted for use in higher-income or industrialized contexts. In this context, it highlights how innovations designed for the Global South can offer effective, scalable solutions for challenges in the Global North.

[8] Update 03/2025: As an offshoot of Dynamic, the project team has secured additional funding from the Endless Network to develop this community and to continue working towards a simpler IT solution that can still support even more complex clinical content than in Dynamic.

(integrated) DYNAMIC tools (the CDSA with or without related tools such as the mentorship and disease surveillance dashboards). Continued engagement across different political levels is deemed essential, including the provision of access to data and the DYNAMIC solution, organizing field trips for firsthand understanding, and publishing findings in accessible language.

A **pre-scale up phase** could shift the focus from research to capacity building among technical and clinical personnel and field-level implementation. In Tanzania, where no NGO has been involved so far, this phase may require the support of a new actor (e.g., implementing agency, (i)NGOs). In Rwanda, technical agencies or (i)NGOs could support the process.

Concretely, the following measures could be considered under these scenarios:

- Now that it is clear which HMIS will be used centrally in both countries, develop a **clear integration roadmap** for each country. The roadmap could include milestones for capacity building within ministries and guidelines for gradual integration into the HMIS.
- Invest in further **capacity building**, specifically (i) governmental IT skills to integrate / recode the software into national HMIS and (ii) clinical capacities to update decision trees.
- Provide **external IT support** to governmental IT departments throughout the reprogramming / API integration of the DYNAMIC tools into the national HMIS.
- Consider engaging local or regional **IT companies / tech hubs** to support the integration, maintenance and eventually scaling of DYNAMIC, e.g. through a **public-private partnership (PPP)**. The PPP could include an agreement for knowledge transfer, gradually reducing reliance on external expertise.
- Following DYNAMIC's software and dashboards integration into the national HMIS, as well as the maintenance of clinical algorithms within the MoH, a long-term goal should be incorporating knowledge on the DYNAMIC modules into **clinician training programs** (e-learning), as already started in Rwanda, to foster institutionalization among future users. Likewise, "to enhance uptake, the module should be linked with license renewal requirements. Currently, doctors and clinical officers undergo periodic exams that help with license renewal, and integrating the module as a part of this process could drive participation." (Impl_partner_5)
- Invest in **ToT capacity building** to build up a pool of trainers at national / district level, which can onboard and train new health personnel in health facilities across the country/countries. In Rwanda, specifically, the Rwandan Pediatric Association could be a suitable player to offer and implement additional capacity building (Public_actor_2_RW).

Complementary Scenario 4: Roadshow / global dissemination of solution

Prerequisite:

A complementary scenario to enhance sustainability could involve pronounced dissemination by, for instance, a "roadshow" through other SDC/Botnar countries that might be interested in adopting the DYNAMIC solution. It would involve, first, the identification of potential countries or multipliers like multilaterals or other donors to which the DYNAMIC solution might be of interest. Secondly, a plan would need to be drafted that detailed how these potential beneficiaries could be engaged. Potential dissemination activities could include one-on-one presentations with, for instance, MOH representatives, webinars to interested parties or presentations at conferences.

This scenario does not require specific prerequisites but could go in parallel to other developments.

Additional recommended measures:

The roadshow scenario would allow for a more systematic dissemination of the DYNAMIC solution, collecting feedback from potential adopters / countries and target groups. SDC and Botnar could facilitate discussion with potential countries, particularly those where other health technologies are currently being tested or integrated.

In preparation of such a roadshow, a **decision-making guideline** for relevant stakeholders could help determine whether the DYNAMIC solution aligns with their context. Additionally, it would be beneficial to identify **success factors and barriers** from the Tanzania and Rwanda implementations as well as experience from other countries (e.g. gathered through the work of the TIMCI project) and share these insights through the Swiss representations and networks of Foundation Botnar.

Lastly, the close collaboration between Unisanté, Swiss TPH and WHO could further be explored, integrating learnings from DYNAMIC in ongoing projects and understanding the potential to make use of the evidence identified and solution developed. WHO as independent international organizations could, potentially, offer to work with the Rwandan and Tanzanian government on digitalization of the health system as a whole, integrating CDSA in specific.

Update 03/2025:

In Tanzania, on the 19th of December 2024, the GoT-Homis team officially informed the IT team of NIMR and IHI that their project of reprogramming (i.e. integrating) the key modules of medAl-suite into their EMR has been approved by the Ministry of Health, which is an important step. However, reprogramming would also require a substantial amount of work and technical expertise. They, apparently, would like now to collaborate with the IT specialist of the partnering national research institute who has been working for the last four years on the DYNAMIC project. However, there is insufficient funding to continue to pay the salary of this specialist beyond the end of the DYNAMIC project. There is no further information on the way forward at this point.

In Rwanda, between the end of the evaluation (11/2024) and March 2025, significant advances could be made. The international organization Resolve to Save Lives (RTSL) acted as "middlemen" between the government and the project team and pushed forward the discussion on scaling the solution. The Ministry of Health and the Rwanda Biomedical Centre recommended the continued use of e-POCT+ (medAL-creator and medAL-reader) in pilot health centers and its scale-up across all primary healthcare facilities in Rwanda, including Health Centers and Health Posts, in collaboration with RTSL. A way of interoperability is pursued, as the EMRNext software is deployed and scaled up across health facilities and the e-POCT+ algorithms can be accessed via a web-browser. This approach is realistic and feasible and allows for quality assurance and maintenance. This decision and its respective way forward mean a significant step in improving health outcomes for children between 0-14 in Rwanda.

7. Conclusions and Recommendations

7.1. Conclusions

The assessment demonstrated that the DYNAMIC solution is generally **highly relevant**, addressing the critical issue of antimicrobial resistance driven by the over-prescription of antibiotics, a problem widely recognized by key stakeholders, including policymakers, health workers, and researchers, and overall striving to improve the quality of primary care. The ePOCT+ tool developed under the DYNAMIC project has proven to be a highly effective and evidence-based solution to this problem. Its effectiveness has been rigorously demonstrated in academic studies, such as the one published in *Nature Medicine*, and it is strongly endorsed by relevant stakeholders, emphasizing the need for its implementation and scale-up.

"Based on our experience using the tool, we've seen a notable reduction in antibiotic use and a decrease in drug resistance. Therefore, it is crucial that this tool continues to be utilized, not only in our area but also in other councils. It's important that successful initiatives are shared widely; many people [...] may not even be aware of the positive outcomes we've achieved here." - District_Actor_3_TZ

Social acceptance and appreciation of the tool by healthcare workers and caregivers at health facilities generally appears to be strong. This is a positive outcome the evaluation team wishes to emphasize, as social acceptance cannot be taken for granted and is a critical prerequisite for scaling and achieving impact. Therefore, the project's outreach activities stand out and can serve as a best practice example for other transformative research projects. Key success factors included extensive community engagement, the provision of contextualized information in local languages, the tool's high usability, and the consistent presence and support of team members in the health centers, through training, technical support and mentorship. Nevertheless, site visits and interviews with selected facilities and related stakeholders in both Rwanda and Tanzania revealed several challenges that yet hinder large-scale uptake. One significant issue is the presence of **inefficient parallel processes**, which require clinicians to input the same patient data into multiple tools and documents. This duplication leads to inefficiencies that are particularly burdensome given the already heavy workloads faced by clinicians in health facilities, contributing to resistance against the tool's use. These challenges are further compounded by inadequate infrastructure, especially in rural health facilities, where unreliable power and internet connections, as well as the lack of secure storage for valuable devices like tablets, create additional barriers to effective implementation.

While the research findings provide compelling evidence and establish a robust proof-of-concept, the technical and resource demands of the solution present substantial barriers to its seamless **integration and scalability** in both countries. While both countries had digital health strategies, they had not yet chosen a specific health management system for future use, leading to the DYNAMIC CDSA solution being designed independently of any existing local digital health infrastructure with the intent to explore interoperability at a later stage. Throughout the project's duration, implementers faced the trade-off between delivering an effective solution and ensuring its feasibility and sustainability within the local context. This challenge underscores broader considerations, including the appropriateness of country selection, the adequacy of contextual adaptations, and the timing of a transformative research project such as DYNAMIC.

In Tanzania, the government seems inclined to reprogram / integrate the DYNAMIC CDSA solution (and possibly also the related dashboards) within their HMIS. However, this undertaking may be overly ambitious given the sophistication of the tool compared to the available IT capacities within the governmental department responsible for the integration. In Rwanda, national actors advocate for the transfer of specific modules of the solution rather than the entire system. This approach aligns with the theoretical framework for scaling social innovation, which emphasizes the importance of clearly identifying the unchangeable core of a solution and preserving it during the scaling process.

The project now stands at a critical juncture. Next, the governments of Tanzania and Rwanda have to decide whether they want to **commit** to the continued use of ePOCT+. For the solution to extend beyond the project's lifecycle, governments must allocate resources and formally mandate its integration into national healthcare frameworks and systems. While the project team has taken significant steps to raise awareness and demonstrate the value of ePOCT+ to key government stakeholders, the future of the solution is now largely outside the project's control.

To a great extent, the sustainability of the solution now hinges on government decisions in both countries. There is a tangible **risk** that other priorities may overshadow the DYNAMIC solution on the political agenda, or that it may fail to gain sufficient traction to secure long-term support. It is important to emphasize that this is not a reflection of the project's quality but rather the reality of

competing political and budgetary demands. While the project team has done all that can reasonably be expected, there is a valid question regarding the strategic decision to scale the project in Rwanda and Tanzania.

At the same time, it is unlikely that the solution will vanish entirely, even if neither government makes an immediate decision regarding its adoption. The solution is set to be implemented in the Swiss canton of Vaud through a **reverse innovation** mechanism. This uptake will not only transition the system to a Windows-based platform, potentially making it easier to integrate into HMIS in the future but also ensure its continued development and maintenance. By "keeping the tool alive," this initiative lays the groundwork for a future integration into other HMIS in the Global South.

Looking ahead, one of the most impactful future contributions from the project and its funders may be to share the lessons learned in developing and scaling digital tools through integration the broader digital system. Disseminating the project's findings and highlighting its successes and challenges can provide valuable insights for similar initiatives. Beyond that, any further support the project may choose to offer to the Tanzanian and Rwandan government in scaling the implementation of the DYNAMIC tool hinges upon the governmental decisions to take up the tool first and invest into it.

When it comes to scaling a tool like ePOCT+, the assumption is often that strong research findings alone will compel policymakers to act. But the time required and prerequisites in place for scaling a solution are frequently underestimated. This can hinder their wider adoption (IO_4). To successfully scale digital health solutions in low- and middle-income countries, a **study by Labrique et al.** (2018) highlights six essential focus criteria. These criteria were met to varying degrees within the DYNAMIC project:

1. **Offering tangible benefits to meet unmet needs with end-user input from the outset:**

- This criterion has largely been met. The DYNAMIC project established a robust proof-of-concept through scientific studies, demonstrating significant benefits of improved primary healthcare and a reduction in unnecessary antibiotic prescriptions. These benefits resonate with policymakers and clinicians at health facilities.
- However, a pending cost-benefit analysis remains a gap.[9] Such an analysis could clarify the financial implications of alternative treatments to antibiotics and influence stakeholders like the Rwanda Social Security Board, particularly in shaping reimbursement policies.

2. **Aligning with broader healthcare policies:**

- The solution aligns well with health-related policies and aspirations in both Rwanda and Tanzania. As demonstrated during the relevance assessment, this criterion is successfully fulfilled.

3. **Engaging and motivating all stakeholders:**

- The coherence assessment indicated that the project successfully engaged the relevant stakeholders at local, district, and governmental levels, setting up steering committees and participating in exchange forums.
- However, the motivation of governmental stakeholders to prioritize and scale the solution competes with other governmental priorities, both within and across sectors.

4. **Securing sustainable funding:**

[9] According to project sources, a corresponding analysis is expected to be releaed by 01/2025.

- Securing funding is inherently tied to governmental prioritization and willingness to allocate resources for the solution's scale-up. Without strong governmental commitment, further external funding would not only be challenging to secure but could even undermine sustainability.

5. **Ensuring simplicity, interoperability, and adaptability of the technical profile:**

- This criterion presents a significant challenge for the DYNAMIC solution. Throughout the vast part of the project’s duration, the absence of definitive decisions on which HMIS to scale at the national level, followed by subsequent reprogramming efforts once decisions were made, made it difficult for the project to identify overlaps and opportunities for ensuring interoperability with the DYNAMIC solution. Additionally, the clinical complexity of reducing antibiotic prescriptions without compromising clinical outcomes has made simplicity difficult to achieve. As a result, it remains unclear to what extent the governments of Rwanda and Tanzania will be able to integrate the DYNAMIC solution into their HMIS systems.

6. **Considering the ecosystem, including the necessary infrastructure for supporting digital initiatives at scale:**

- Initial field assessments ensured that pilot health facilities were equipped with relevant medical tools to properly use the DYNAMIC solution. However, critical infrastructure challenges persist in health facilities throughout Rwanda and Tanzania, particularly in rural facilities. Issues such as unreliable power supply, limited internet access, and insufficient secure storage for devices remain significant barriers to large-scale rollout.

7.2. Recommendations

Based on the findings and conclusions of the evaluation scrutinized in the previous chapters, the evaluation team developed specific future-oriented recommendations directed at different actors involved as well as others engaged in transformative research. These should be interpreted along with the sustainability scenarios developed in Chapter 6.

Topic	Conclusion	Recommendation	Directed at
Relevance	I. The **timing of a research project** striving for transformative impact appears to be very decisive. Even though both countries had not yet taken a firm decision on the direction and technical set up of their digital health system, the research findings of the DYNAMIC project are highly relevant. Understanding the priorities, mandates and resources of actors involved appears to be crucial to ensure continued relevance and coherence throughout the project timeline.	1. Initiate digital projects like DYNAMIC in contexts where the **political groundwork** has been laid and projects can respond to decisions taken and capacities available. 2. Conduct thorough situation and **feasibility analyses including the digital health eco-system**, considering both the political direction and technical capacities available within the country. 3. Draw on learnings made within the global digital ecosystem, that has become more structured and aligned in recent years. 4. Involve relevant **actors during this feasibility assessment** to understand their mandates and interest.	Funders and implementers of future transformative research projects
	II. The success of a transformative research project depends on an **impact-oriented project design** and its people involved, combining expertise from both implementation and research. The DYNAMIC project did well in this regard, especially in Rwanda.	1. The project design from the very beginning should reflect pathways of change to combine research with policy action. 2. Clarify clearly **research and implementation goals** in transformative research projects 3. The team composition of a transformative research project should reflect both research and implementation expertise, especially in regard to stakeholder engagement.	Funders and implementers of future transformative research projects

Coherence	III. A (successful) **integration** of the solution or of certain modules of the solution into national structures is yet dependent on the political willingness and the national health strategies in both countries. The evaluation showed that a mindshift on digital solutions and scaling is needed at donor level, as only elements of a solution might be scalable in certain cases.	1. Researchers should try to design **more flexible solutions** that are suitable to the respective (resource) context and allow for adaptation to changing conditions and pre-requisites. 2. To achieve integration or take-over, both donors and researchers should think more **modularly**, identifying **key functionalities which can be integrated** into the national systems. The entire solution cannot always be scaled up. 3. Governments might be sometimes overwhelmed by the amount of possible promising research initiatives. It is the responsibility of the donor community to allow for transparent discussions with key actors in the digital / research ecosystem.	Implementers of social development projects in the digital sphere
Sustainability	IV. The political decision of the two governments to sustain the solution is yet uncertain and research projects cannot push for decisions. Yet, a thorough and **easily understandable evidence-base** can support this process.	1. A **thorough documentation** of the overall DYNAMIC project, key functionalities of the solution, as well as stakeholder and context analysis reports should be compiled, published and disseminated. 2. A sustainability / **exit strategy** should be compiled and discussed with public partners, outlining concrete options and **pathways to integrate the solution** within their given systems. 3. Support to **policy briefs**, thereby creating ground for evidence-based political decisions, can be provided.	Implementers of DYNAMIC
	If a political decision is taken in favor of the continued use: V. Sufficient clinical and IT capacities among governmental stakeholders to maintain and update the software (contents) are key requirements for long-term sustainability.	1. It could be considered **providing additional support** to IT personnel in the respective governmental institutions to support the reprogramming within their own systems. 2. A **contextualised capacity-development strategy** with relevant national actors (e.g. with RPA in Rwanda) should be elaborated to allow for long-term capacity building at **HF, district and national level**. These can include moodle-based approaches or the integration into curricula at national level. 3. Enable frugal solutions such as the provision of mobile solar panels for power generation.	Funders and implementers of DYNAMIC (1.) Governmental agency in charge (2.-5.)

	Context challenges at (rural) health facilities, such as limited power supply, limited access to the internet and lack of secure spaces to lock up tablets and chargers, were identified.	4. Set up structures and/or infrastructure to safely store tablets, such as lockers or personalized tablets. 5. Public-private partnerships with mobile companies could help address the challenge of a lack of internet access in some communities.	
	VI. The evaluation showed that the **linkage between research and implementation**, which is crucial to scale up social innovations, can be pro-actively supported by the actors involved. In Rwanda, the engagement of the SDC Kigali office ensured relevant discussions on integration / interoperability at a crictial point of time.	1. **Funding institutions** can bring in valuable **networks and connections to other actors and players**, as well as rapport with the government. They should be actively engaged in the **inception** of the project as well as during critical steps and in the **mainstreaming and scaling** of solutions. 2. Funders can proactively **support the diffusion of the solution by sharing learning experiences** across their network and/or identifying new contexts the solution could be effective in. 3. The digital solution as such represents a **repository of knowledge** created that can inform respective guidelines across countries (e.g. for WHO).	Funding institutions

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Annex 1: Evaluation Matrix

OECD-DAC criterion	Evaluation question	Assessment criteria	Indicators	Data source	Evaluation method
Relevance	To what extent did DYNAMIC respond to the respective countries' needs and priorities that are reflected in the national digital health, child health and antibiotic resistance strategies? To what extent is the project aligned with future strategic considerations?	Relevant national strategies/policy documents confirm the relevance of digital solutions in public health Relevant policy actors confirm the national interest in adopting digital solutions in public health National priorities informed the project and not vice versa.	Design phase: Digital health solutions and antimicrobial resistance were mentioned in past National health strategies Policy makers were identified, contacted and their expressed needs integrated into project design Implementation phase: The project identified and contacted new relevant policy makers (e.g. after elections) The project monitored changes in policy contexts and responded to future strategic considerations (as far as feasible) Digital health solutions and antimicrobial resistance are mentioned in current National health strategies	Secondary: National health strategies of respective countries Primary: ministry representatives (both countries), project team, RW biomedical center, PO-RALG, Resolve to Save Lives, WHO RW, Mbeya Medical Research Center, Ifakara Health Institute, The Pediatric Association of Tanzania and Rwanda	– Document analysis – Key informant interviews
	What measures were taken (and when) to foster respective policy dialogue to ensure the continued relevance of the DYNAMIC project in both contexts? What measures would be needed and at what level for a successful integration into the existing national structures?	Relevant policymakers were identified, approached and integrated in the project - The needs of the policymakers were identified, documented and taken into account - National structures that may influence the sustainability	Stakeholder mapping was conducted and continuously updated to identify relevant stakeholders at different policy levels Policymakers were engaged in key phases of the project (not only the dissemination phase but also the conception phase)	Secondary: Project documentation Primary: ministry representatives, Project team Primary: ministry representatives (both countries), project team, RW biomedical center,	– Document analysis – Key informant interviews

OECD-DAC criterion	Evaluation question	Assessment criteria	Indicators	Data source	Evaluation method
		of the project were identified, documented and taken into account by the project	through workshops, bilateral meetings etc. Number of bilateral meetings, workshops etc. with policymakers *Theoretical considerations: science-knowledge dynamics* There was a vivid exchange between scientific implementing staff and policymakers. Policymakers were integrated at various steps during project implementation	Resolve to Save Lives, WHO RW, Mbeya Medical Research Center, Ifakara Health Institute, The Pediatric Association of Tanzania, Swiss TPH, Kigali Office	
	In addition: What measures were taken to achieve the necessary social acceptance by the relevant stakeholders?	Through a systematic stakeholder-mapping the relevant stakeholders were identified The project made an effort to understand the perceptions and potential concerns of these stakeholders. Their perspectives were taken into account.	Number of consultations with stakeholders Quality of the stakeholder-consultations (i.e. face-to-face instead of online surveys) Informants with a good understanding of the local culture were consulted *SI Scaling:* Stakeholders were convinced of the added social value of the solution Stakeholders are willing to continue using the solution	Secondary: Document analysis Primary: Interviews project team, health centers, district representatives	
Coherence	*External coherence:* To what extent, and how, did DYNAMIC adapt the development and application of the algorithms and the support system to each context? What can we learn from the differences in the health system in Rwanda	Algorithms and support systems were adapted to the national context and different types of health facilities (health center vs. health post) – Lessons learned from different national contexts and types of	Dashboard adapted to the needs of the respective stakeholders Support system adapted to the needs of the different types of health facilities	Secondary: Project documentation Primary: Interviews project team, Ministry of Health Rwanda (Sylvere Mugumya), Resolve to Save Lives , Mbeya Medical Research	– Document analysis – Key informant interviews

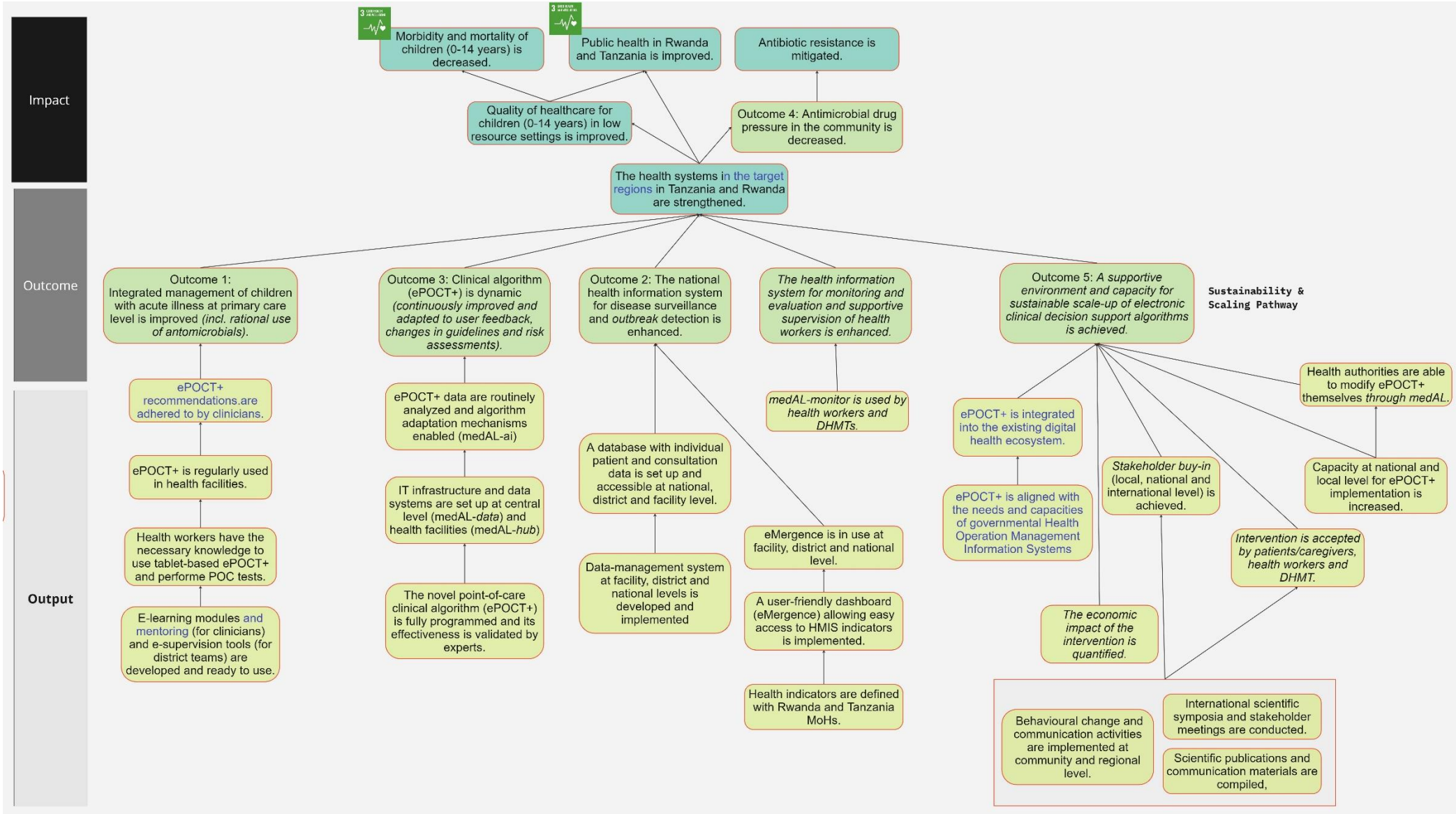
OECD-DAC criterion	Evaluation question	Assessment criteria	Indicators	Data source	Evaluation method
	and Tanzania? Did the support provided by the project vary by country?	health institutions have been identified	National stakeholders were integrated into the development of the algorithms – Lessons learned document available	Center (Peter Agrea), Ministry of Health Tanzania (Walter Ndesanjo, Sosthenes Elias Bagumhe, Silvanus Ilomo)	
	What is required to further reach full interoperability of DYNAMIC tool with the EMR?	Requirements and measures for interoperability have been identified and documented Consultations with national policymakers on HMIS Identification and development of capabilities that are necessary to ensure the long-term interoperability of the DYANMIC tool with the HMIS	The project monitored HMIS developments in both countries Project has consulted with policymakers and other stakeholders involved in HMIS development	Secondary: Project documentation Primary: Interviews project team, Ministry of Health Rwanda (Sylvere Mugumya), Resolve to Save Lives , Mbeya Medical Research Center (Peter Agrea), Ministry of Health Tanzania (Walter Ndesanjo, Sosthenes Elias Bagumhe, Silvanus Ilomo)	– Document analysis – Key informant interviews
	Which other partners played an important role for DYNAMIC so far, and what role might they have during scaling?	Stakeholder mapping was conducted to identify relevant stakeholders for scaling-up Alignment with other initiatives and leveraging of synergies	Stakeholder mapping specific to scaling up was completed The project identified potential opportunities to scale up in line with other initiatives *SI scaling*: The ecosystem is supportive of the solution	Secondary: Project documentation Primary: ministry representatives (both countries), project team, RW biomedical center, Resolve to Safe Lives, WHO RW, Mbeya Medical Research Center, Ifakara Health Institute, The Pediatric Association of Tanzania	– Document analysis – Key informant interviews

OECD-DAC criterion	Evaluation question	Assessment criteria	Indicators	Data source	Evaluation method
Sustainability	To what extent is the algorithm and its support system being accepted and applied by the national government? To what extent has the government at national and district level shown ownership ? And to what extent is the medical capability independently capable to understand, maintain and adapt the algorithm?	*SI scaling: Drivers and barriers* National governments show efforts to integrate the algorithm in their own HMIS National governments use data from DYNAMIC project, e.g. for disease prevention Health institutions are able to independently understand, maintain, (and adapt?) algorithm Actors to provide the necessary updates are put in place Financing is ensured Cost-analysis has been conducted, financing needs have been defined Experts with the authority to represent the medical profession have developed the capability to bring changes in the medical guidelines into the decision-support system. The usefulness of the tool is recognized by both governments. IT-capabilities are developed in health ministries to sustain the tool and integrate it in existing infrastructures (EMR). The dashboards are affordable to the ministries of health.	Relevant personnel has been identified and trained Strategy for integration into ERM exists	Secondary: Project documentation, national health strategies, dashboard Primary: Existing project survey, Interviews Ministry of Health Rwanda (Sylvere Mugumya), Resolve to Save Lives , Mbeya Medical Research Center (Peter Agrea), Ministry of Health Tanzania (Walter Ndesanjo, Sosthenes Elias Bagumhe, Silvanus Ilomo)	Document analysis Data analysis Survey
	Are there any research gaps that should be addressed to foster the DYNAMIC system's uptake and integration (pre-requisite for scaling)?	The project conducted a GAP analysis on research gaps	Document on research gaps	Secondary: Project documentation Primary: Primary: ministry representatives (both countries), project team, RW biomedical center,	– Document analysis – Key informant interviews

OECD-DAC criterion	Evaluation question	Assessment criteria	Indicators	Data source	Evaluation method
				Resolve to Safe Lives, WHO RW, Mbeya Medical Research Center, Ifakara Health Institute, The Pediatric Association of Tanzania	
	What are the socio-cultural, political, technical (including national infrastructures providing access to secured data centers, electricity and internet network), human resources, environmental or financial barriers to scaling elements of DYNAMIC nationwide?	*SI scaling: drivers and barriers* The project identified and documented barriers Mitigation strategies were developed The project adapted its scaling-up strategy based on new learnings throughout the project	Barriers are document in project documents Project team is able to name and reflect on barriers and is able to present mitigation strategies	Secondary: Project documentation Primary: interviews with all of the local stakeholders	– Document analysis – Key informant interviews
	To which extent, will the net benefits of DYNAMIC continue in the health facilities using ePOCT+?	*ToC results* Algorithm is continuously used in the health facilities after the project end	Usage in health facilities according to dashboard over time Planned usage in the future Maintenance of the devices	– Secondary: Dashboard Primary: Primary: ministry representatives (both countries), project team, RW biomedical center, Resolve to Safe Lives, WHO RW, Mbeya Medical Research Center, Ifakara Health Institute, The Pediatric Association of Tanzania	– Data analysis – Survey
	Is there sufficient information about economic and financial efficiency with regard to scale-up?	Did the project conduct a cost benefit analysis?	Cost benefit analysis exists Stakeholders state that they understand cost implications	– Secondary: Project documentation Primary: Primary: ministry representatives (both countries), project team, Belinda Mziray	– Document analysis – Key informant interviews
	Is there a pool of training-of-trainers at national and district level who are well positioned to continue supporting the users (nurses) at the	*ToC results*	Number of trainer-of-trainers able to continue supporting the users	– Secondary: Project documentation Primary: Project team	– Document analysis – Key informant interviews

OECD-DAC criterion	Evaluation question	Assessment criteria	Indicators	Data source	Evaluation method
	health centers after the end of the transition phase?	Pool of trainer-of-trainers exist at the national and district level			
	What IT capacity is required to sustain the DYNAMIC IT structure? What efforts are needed to further align the DYNAMIC IT infrastructure with the country specific IT infrastructure and is the available IT backbone system in both countries sufficient for a countrywide integration (taking into account remote rural areas) of some of the DYNAMIC components? What would be needed?	*ToC results* National IT infrastructure and efforts to develop digital health solutions have been identified Required IT capacity have been identified GAP analysis of national IT systems and digital health Exchange with relevant stakeholders on IT systems Development of IT capabilities	Number of training courses (webinars, in person training events etc.) Number of participants	Secondary: Project documentation, Document analysis Key informant interviews Primary: Interviews project team, Ministry of Health Rwanda (Sylvere Mugumya), Resolve to Save Lives , Mbeya Medical Research Center (Peter Agrea), Ministry of Health Tanzania (Walter Ndesanjo, Sosthenes Elias Bagumhe, Silvanus Ilomo)	
Other	What worked better/less well in each country and why? What are the main strategic lessons learned from the project which are relevant for scaling and integration into the national system?	– Lessons learned from different national contexts and types of health institutions have been identified	Lessons learned are identified and documented	Secondary: Project documentation Primary: Interviews with project team	– Document analysis – Key informant interviews
	How is the research evidence translated into policy and practice? What are the main challenges?	The research is presented in a non-technical way, specific to the respective audiences The project identified and involved key stakeholders and implementation partners in the design of its translation strategy The project identified the main challenges in the translation to policy and practice	Number of policy briefings Number of presentations to policymakers A dissemination strategy has been developed	Secondary: Project documentation	Secondary: Document analysis Primary: project team and the research organizations in the country

Annex 2: Reconstructed Theory of Change (ToC) of the DYNAMIC project



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Foreign Affairs FDFA
Swiss Agency for Development and Cooperation SDC
Analysis and Reserach section

Terms of Reference

For the external evaluation of the Dynamic Electronic decision trees to manage sick children (DYNAMIC) project 2019-2023

1. Background information and context: the SDC's and Fondation Botnar co-funding to the DYNAMIC project in Rwanda and Tanzania

The Swiss Agency for Development and Cooperation (SDC) is funding scientific research that contributes to reducing poverty and global risks, and to promoting sustainable development in the global South. Every year, the SDC invests approximately 50 Mio CHF in research initiatives contributing to finding innovative solutions and science-based approaches to reducing poverty and global risks in order to help achieving the SDGs in the global South. The SDC's Analysis and Research (A&R) section manages its portfolio with a specific focus on supporting research partnerships between Swiss academics and researchers in the global South. From 2012 to 2023, A&R has been co-funding the Swiss Programme for Research on Global Issues for Development (r4d programme) together with the Swiss National Science Foundation (SNSF). In 2019, A&R reoriented its research portfolio towards further closing the gap between research and practice. The goal of the new program "TRANSFORM" is to foster impactful research for transformative societal change by the compulsory inclusion of practitioners in the North-South research partnerships. During the transition phase SDC was open to support other promising initiatives. One of these initiatives is the DYNAMIC project.

Fondation Botnar is a Swiss-based philanthropic foundation working with and for young people to contribute to a world that is supportive of their wellbeing. The foundation focuses on addressing wellbeing challenges and opportunities in the urban and digital spaces where young people live, learn, work, connect and play. One priority theme is a human rights-based digital transformation for young people, including in health. Advocating for the inclusion of youth voices and the equitable and responsible use of AI and digital technology, the foundation invests in and supports innovative programs and research, and brings together actors from across sectors to create dialogue and partnerships.

Children are a vulnerable population group that suffers most of acute illnesses. Every year, more than five million children die before the age of five due to preventable or treatable causes, most of them in low and middle-income countries (LMICs). In most LMICs significant improvements in healthcare and health outcomes have been achieved in the last decades, especially for children under five years of age. However, the diagnosis and management of sick children at primary care level often remains inadequate. Health professionals have limited skills, diagnostic tools are missing, and practical guidelines are inconsistent and quickly outdated. Digital decision-making tools for primary health care workers are promising instruments that could probably greatly improve care for sick children, rationalize antibiotic use, and strengthen referral decisions. The safety of a novel electronic point-of-care clinical algorithm (ePOCT) was validated through a first clinical trial conducted in Tanzania and supported by SDC's r4d programme. After the conclusion of the r4d project it was clear that further validation studies were needed to improve and extend the scope of the ePOCT tool. SDC decided to co-fund, together with Fondation Botnar, the project for an initial duration of three years (2019-2022). Because of the COVID-19 pandemic, the contract has been subject to an 18 months extension.

The DYNAMIC project is carried out by the *Centre for primary care and public health (Unisanté), University of Lausanne* and the SwissTPH. The ultimate goal of the project, implemented in Tanzania and Rwanda, is to decrease the morbidity and mortality of children aged 0-14 years in low resource settings by validating and implementing a novel electronic point-of-care clinical algorithm (ePOCT+) that guides and trains health workers in the diagnosis and management of sick children. The main objective of the implementation of ePOCT+ is to reduce unnecessary antibiotic prescriptions without compromising the clinical outcome of sick children in Tanzania and Rwanda as well as

(i) Ensuring an integrated management of children with acute illnesses at primary care level;
(i) Enhancing the national health information system for disease surveillance and early epidemic detection;
(ii) Adapting clinical algorithms to geographical and seasonal variations using machine-learning analyses of the data;
(iii) Decreasing antibiotic drug pressure in the community (objective unique to Tanzania and funded by SNSF) and
(iv) Developing an environment for sustainability of electronic clinical decision support algorithms and framework for larger-scale implementation.

In order to achieve the above objectives, the project tested an innovative health system strengthening approach, whereby various players in the health system were supported in a first instance on the supply side[1]. Project implementation consisted of installation of the digital tool in the health facilities, training, monitoring and mentorship of health workers and district staff by the research teams, and supplementation of basic supplies and commodities, including the point-of-care tests. Implementation research activities helped to understand the enabling factors for this project, to better prepare for future scale-up in Tanzania and Rwanda, as well as other LMICs. As such, the DYNAMIC research project investigated if the use of ePOCT+ could reduce the prescription of antibiotics while not worsening clinical outcomes. Additionally, the project investigated the overall quality and efficiency of primary care services for children under 15 years of age through improved diagnosis and management. This was achieved through the assessment of the impact of electronic clinical decision support algorithms (ePOCT+) across several domains: (i) community/caregiver sensitization and engagement; (ii) healthcare worker knowledge and skill development; (iii) integration of tools into the health system and (iv) commitment by international, national and sub-national stakeholders.

Based on an open-source software, in which the clinical content can be adapted to new guidelines by health authorities themselves (without IT support), and modified at any time to take into account health system constraints such as stock-outs. The data system can be interfaced with digital monitoring platforms, such as to enable monitoring of clinical performance and disease trends to identify epidemics, to provide the Rwandan and Tanzanian national governments with the necessary tools for further national scale-up.

2. Objective, scope and focus of the evaluation

As the study carried out by the DYNAMIC team since the beginning of the project provides sufficient substantive elements to understand how to address *the morbidity and mortality of children aged 0-14 years in low resource settings by validating and implementing a novel electronic point-of-care clinical algorithm (ePOCT+) that guides and trains health workers in the diagnosis and management of sick children* no ex-post evaluation is needed per se. **Therefore, the present evaluation will provide space to address some remaining questions but will mainly focus on ex-ante elements that help to scope how the scaling of DYNAMIC findings can be realized in the future.**

The objectives of this evaluation therefore consist of a sound analysis of the **remaining challenges and future opportunities** with regard to the DYNAMIC project in both Tanzania and Rwanda. Taking into consideration (i) quality of research outputs; (ii) effects of digital / medical intervention on use of antibiotics, clinical outcomes of children as well as health system, healthcare providers and children's caregivers behavior and acceptance of the project; (iv) digital and IT backbone infrastructure and possible pathways towards its interoperability and integration into both local and national IT ecosystems **it will focus on (v)**

[1] Primary health care providers and health managers both at local, regional and national level but also to some extent on the demand side (current and potential users of PHC services).

national uptake and policy/guidelines etc. integration with a strong focus on scaling and making this project sustainable through the integration into both national systems.

This evaluation has three general objectives:

I. Taking into consideration the DYNAMIC achievements on the basis of the above-mentioned specific objectives (outcomes) of the SDC's and Foundation Botnar's support to the initiative, as well as of the strengths, weaknesses, opportunities, risks and lessons learnt of the initiative;

II. (i) Assess the necessary prerequisites for the scale up and possible scenarios for the realistic integration of DYNAMIC research findings into the national strategies e.g. (digital) health strategy or new national health sector strategy and (ii) assess the feasibility for the scale up of DYNAMIC model at national level, while considering the different realities in Rwanda and Tanzania.

III. Make actionable country-specific recommendations for (i) the DYNAMIC project as well as (ii) Tanzania and (iii) Rwanda governments on how to go about the scaling up and national integration, with a special regard to financial sustainability;

Objective (I) has an ex-post character, while objectives (II) and (III) are oriented ex-ante.

The evaluation should be guided by the **OECD/DAC Criteria**[2] relevance, coherence, effectiveness, efficiency, impact and sustainability The learnings and recommendations will feed into the final discussions and will be handed over to the national authorities.

The breadth and depth of the evaluation will be informed by the indicative evaluation questions that the evaluation seeks to answer (see chapter below). The evaluation will assess activities as outlined above carried out in both project implementing countries Rwanda and Tanzania, respectively those provinces where the DYNAMIC project is implemented (Western province in Rwanda; Morogoro and Mbeya regions in Tanzania). The period to be evaluated is (mid 2020 until 31st December 2023). The timeframe is limited to Q3/4 2024, from 1st June to early November 2024. The final report shall be available in early Q4 2024, allowing to inform possible future activities related to scaling of project findings.

3. Evaluation questions

The evaluation will be guided by the OECD/DAC evaluation criteria and will inform the national authorities and other relevant stakeholders, SDC, Fondation Botnar, Unisanté Lausanne and the SwissTPH on the key questions below. The focus will be discussed and defined during the preparation of the inception report. It is expected for the bidder to suggest a prioritization of the questions, taking into account that the main focus of this evaluation lies on sustainability and relevance. When possible and relevant, the evaluation shall also include a gender perspective.

During the inception phase[3], the evaluator(s), in consultation with the SDC and Fondation Botnar as well as the respective national authorities, will further refine and prioritize the questions.

Relevance

- To what extent did DYNAMIC respond to the respective countries' needs and priorities that are reflected in the national digital health, child health and antibiotic resistance strategies? How is it addressing future strategic orientation?

[2] OECD/DAC Network on Development Evaluation: Better Criteria for Better Evaluation. Revised Evaluation Criteria Definitions and Principles for Use (2019).
[3] As scaling-up requires different modalities in both countries Rwanda and Tanzania it will be needed that the consultants discuss specific requirements with both SCOs in an inception meeting and subsequently adjust the questions.

- What measures were taken (and when) to foster respective policy dialogue for sustainability / integration of the DYNAMIC project in both contexts? What measures would be needed and at what level for a successful integration into the existing national structures?
- What IT capacity is required to sustain the DYNAMIC IT structure? What efforts are needed to further align the DYNAMIC IT infrastructure with the country specific IT infrastructure and is the available IT backbone system in both countries sufficient for a countrywide integration (taking into account remote rural areas) of some of the DYNAMIC components? What would be needed?

Coherence

- To what extent, and how, did DYNAMIC adapt the development and application of the algorithms and the support system to each context? What can we learn from the differences in the health system in Rwanda and Tanzania? Did the support provided by the project vary by country?
- What is required to further reach full interoperability of DYNAMIC tool with the current Health Management Information System (HMIS)? What measures are key for scaling-up DYNAMIC findings?
- Which other partners played an important role for DYNAMIC so far, and what role might they have during scaling?

Sustainability

- To what extent is the algorithm and its support system being accepted and applied by the national government? And to what extent is the medical capability independently capable to understand, maintain and adapt the algorithm?
- What are the main strategic lessons learned from the project which are relevant for scaling and integration into the national system?
- How is the research evidence translated into policy and practice? What ownership can be expected from the national government? What are the main challenges?
- Are there any research gaps that should be addressed to foster the DYNAMIC system's uptake and integration (pre-requisite for scaling)?
- What are the socio-cultural, political, technical (including national infrastructures providing access to secured data centers, electricity and internet network), human resources, environmental or financial barriers to scaling elements of DYNAMIC nationwide?
- To which extent, will the net benefits of DYNAMIC continue in the health facilities using ePOCT+?
- Is there sufficient information about economic and financial efficiency with regard to scale-up?
- Is there a pool of training-of-trainers at national and district level who are well positioned to continue supporting the users (nurses) at the health centers after the end of the transition phase?

Other

- What worked better/less well in each country and why?

Good practices and lessons learned

Both national authorities in Rwanda and Tanzania should be addressed with the evaluation results. In addition, the consultants shall provide the SDC, Fondation Botnar as well as Unisanté Lausanne and the SwissTPH with the main lessons learned from the project as well as the most relevant good practices that could be identified.

4. Methodology and scope

The SDC and Fondation Botnar do not suggest any specific methodology. The evaluation team will need to make sure that the proposed methods answer the priority questions. The evaluation team will need to demonstrate where they may have used the proposed methods before and explain why the(se) method(s) versus alternatives have been suggested. It will suggest the evaluation plan including the evaluation methodology and tools, refine the evaluation questions, a work plan and timeline and describe it in detail in the inception report (see below).

Since the evaluation should shed light on the sustainability and scaling of the project results, the view of the local partners (i.e., the respective Ministry of Health as well as its technical agencies) and beneficiaries (i.e. nurses at the health facilities as well as patients / their care takers) is crucial. The evaluation team will suggest an appropriate methodology to collect these insights. In order to fully reflect the local realities, the international consultant (consortium lead) shall recruit local consultants in each country where the evaluation takes place. The international consultant is responsible for their salaries and that they pay social charges according to the national laws et all), international travels should be avoided whenever possible. The applicant shall list the names and contacts of local constant for each country in the proposal.

5. Deliverables

The deliverables consist of an (i) inception report before starting any work, (ii) a capitalization workshop, (iii) a draft evaluation report, (iv) final evaluation report following the SDC's Grid for DAC Assessments, and a power point presentation for the SDC's use.

i. The inception report (draft and final version)

After an initial stock taking and review of documentation, as well as after the kick-off with SDC, the Fondation Botnar as well as Unisanté Lausanne and the SwissTPH, the evaluation team will prepare an inception report. The report will be the basis for a shared understanding between the SDC and the evaluation team of the mandate in general and of the methodology of the evaluation in particular. The inception report will contain the following elements:

- Introduction, country context and objectives
- Proof of understanding of assigned task
- Proposed Evaluation methodology to be used (including its strengths and limitations) as well as information on data sources and collection, sampling and key indicators
- Detailed questionnaires and interview guides for Key Informant Interview (KII) and Group Discussions (if applicable)
- Bibliography or Summary of reviewed documents
- Work plan and Timeline for the evaluation process
- Tentative structure of the evaluation report.

The inception report shall not exceed 12 pages, excluding annexes. A draft inception report will be presented to the SDC and the Fondation Botnar and shared with Unisanté Lausanne and the SwissTPH. The final inception report will be adjusted to the SDCs, the Fondation Botnar as well as UniSanté Lausanne's and the Swiss TPH's feedback and will be the basis for the evaluation.

ii. The capitalisation workshop

Right after having concluded the evaluation work and before writing the evaluation report, the consultants will hold a capitalization workshop. The consultants will present their findings, their conclusions, their les-

sons learnt and share their recommendations. The SDC / the Fondation Botnar as well as Unisanté Lausanne and the SwissTPH will provide inputs and - through discussion and exchange - reach a deeper understanding of the evaluation results and the options to further improve their initiatives, funding and cooperation models. The results of the workshop will inform the evaluation report.

iii. The evaluation report (draft and final version)

The evaluation report consists of a draft and a final and ready-to-print version. The evaluation report shall not exceed 20 pages, including an executive summary, but excluding annexes. The structure of the report should include:

- Executive summary
- Introduction, country context and objectives
- Evaluation methodology
- Findings
- Lessons learnt
- Conclusions
- Recommendations

iv. The SDC's Assessment Grid for the DAC Criteria

The SDC's Assessment Grid for the DAC Criteria (see annex) must be completed by the consultants and attached to the final evaluation report. All applicable sub-criteria should be scored and a short explanation should be provided.

v. Presentation of the evaluation results

The consultants will present the final evaluation results to the SDC, the Fondation Botnar as well as Uni-Santé Lausanne and the SwissTPH in a meeting or virtual session. For that purpose, the consultants will prepare a PowerPoint presentation, which will serve the SDC for further dissemination purposes.

6. Composition, Profiles and Responsibilities of the Evaluators

Since the evaluation should shed light on bridging the gap between research and practice, the view of the local partners and beneficiaries is crucial. The team for this evaluation shall consist of at least two people with complementary profiles and as a team assure the below qualifications. A lead evaluator (overall coordination of evaluation and contact person for SDC/Foundation Botnar) will be mandated by SDC/Foundation Botnar and subcontractors contributing country specific expertise and contacts. It is mandatory to include a consultant providing local knowledge about Rwanda and Tanzania. Sound IT knowledge is a strong benefit. A gender-diverse team is welcomed.

- At least 5 years of experience and skills in evaluation of programs;
- Holder of Master's Degree; having a background of general human medicine or public health will be an added value;
- Experience in evaluating digital health initiatives will be an advantage;
- Strong analytical and editorial skills, ability to synthesizes;
- Sensitivity and skills in enhancing policy influencing and learning processes;
- Competency with gender issues is an advantage;
- Familiarity with the health system in Rwanda and Tanzania;
- Experience in fostering learning processes within innovative initiatives will be an added value;
- Excellent English language skills (written and oral) as well as knowledge in French (for the international consultant) and Kinyarwanda and Swahili (for the local subcontractors).

The consultants are organized and work together as a team. One of them is the single-person of contact for the SDC and the Fondation Botnar and will have the overall responsibility of the evaluation in the capacity of the team leader. In case of a team composed by two independent consultants or by two different consulting companies, the team leader will be contracted by the SDC and the Fondation Botnar and will be responsible for subcontracting other team members.

7. Duration, Time Frame and Work Plan

The evaluation will require an estimated 50 working days in total.

The tentative work plan suggested below:

June 2024	Briefing conference call	SDC / Botnar; consultants
June 2024	Kick-off meeting with SDC, Foundation Botnar, Unisanté Lausanne and SwissTPH	consultants
June / early July 2024	Desk study, review of documents, interviews with key stakeholders, writing of inception report	consultants
14 July 2024	Submission of draft inception report	consultants
21 July 2024	SDC's, Foundation Botnar's, Unisanté Lausanne's and SwissTPH's feedback on the draft inception report	SDC / Botnar
28 July 2024	Submission of final inception report	Consultants
August 2024	Evaluation work, including preparation, data collection, evaluation workshops etc.	Consultants
6 September 2024	Capitalization workshop (with SDC, Foundation Botnar, Unisanté Lausanne and SwissTPH)	Consultants
9 September 2024	Submission of draft evaluation report	Consultants
16 September 2024	SDC's, Foundation Botnar's, Unisanté Lausanne's and SwissTPH's feedback on draft evaluation report	SDC / Botnar
11 October 2024	Submission of the final evaluation report	Consultants
November 2024	SDC / Foundation Botnar Management response and presentation of the evaluation report	Consultants, SDC, Botnar, UniSanté Lausanne and SwissTPH

8. Documentation and contact persons at the SDC, Botnar, UniSanté Lausanne and SwissTPH

The SDC / Botnar Foundation and the partners at UniSanté Lausanne and SwissTPH will support the evaluation team through making various documents, data and contacts available, such as listed in the noncomprehensive list below:

- Switzerland's Strategy for International Cooperation 2021-2024;
- Swiss Research Concept for the Policy Sector on Development and Cooperation 2021-2024;
- Contracts and project documents of the DYNAMIC project in Rwanda and Tanzania;
- Annual reports ;
- Minutes of Advisory Board and Steering Committee Meetings;

- Contacts to key stakeholders and partners;
- Contacts to researchers and professors;

Contact person at the SDC and evaluation manager is Martina Schmidt, the Foundation Botnar's contact person is Nicolas Vetterli.

Contact person at the SwissTPH is Alexandra Kulinkina.

9. Proposal

A technical and financial proposal has to be submitted to researchdesk@eda.admin.ch by 15 May 2024.

The technical proposal should not exceed 10 pages and should outline the consultants':

I. Understanding of the mandate ;
II. Approach and proposed methodology;
III. Proof of Experience with similar assignments (incl. CV of Key members of the Consulting Team) ;
IV. Proposed evaluation work plan ;
V. Draft report outline ;
VI. Financial proposal ;

The financial proposal should be no more than one page and should clearly outline the daily rates in Swiss Francs.

10. Suitability and award criteria

The required suitability and award criteria give priority to the technical proposal (75%) while the financial proposal counts around one forth (25%). One important suitability criterium is that the evaluator(s) are independent[4] of the FDFA and, in particular, the SDC and were not involved in activities covered by this evaluation.

Annexes:

1) SDC's Assessment Grid for the DAC Criteria

[4] 'Independent' means that the members of the evaluation team must not have worked for the FDFA and, in particular, the SDC, in the past five years (except in the capacity of conducting other external evaluation mandates) or have any other strong links or dependencies on the FDFA.

Management response to the External Evaluation of the Dynamic Electronic Decision Trees to Manage Sick Children (DYNAMIC) Project, 2019 - 2024

Management Response

The Management Response (MR) states the position of the Swiss Agency for Development and Cooperation (SDC) on the recommendations of the External Evaluation of the Dynamic Electronic Decision Trees to Manage Sick Children (DYNAMIC) Project, 2019 – 2024.

The evaluation, conducted at the conclusion of the project, confirms its relevance and convincingly demonstrates that the proof of concept developed through the research holds significant potential for uptake by the governments of Rwanda and Tanzania.

As the project has formally ended with no immediate continuation planned, the evaluation's findings and conclusions serve as a valuable source of inspiration for SDC's research for development portfolio (entitled TRANSFORM program) and potentially other ongoing research initiatives. However, SDC does not define concrete or actionable measures for implementing the recommendations at this stage, even though it agrees with all six recommendations.

SDC will share the evaluation results with the respective governments and, by publishing the evaluation report, aims to contribute to inform donors, implementing partners as well as other stakeholders engaged in similar transformative research efforts.

Assessment of the evaluation

The evaluation was conducted by a team of independent experts of *Mainlevel Consulting AG* and *BSS Volkswirschaftliche Beratung* in accordance with international standards. The evaluation process was well managed and included close involvement of the SDC's reference group.

The evaluation was designed as a learning-oriented, ex-post assessment of the DYNAMIC project. It was guided by selected OECD DAC criteria - relevance, coherence, and sustainability - with particular emphasis on sustainability strategies and the project's potential for scalability.

The objectives have been fully met by the evaluators. The SDC appreciates the comprehensiveness of the evaluation report and thanks the evaluators for this professional and inspiring process.

Main findings

The ex-post external evaluation of the DYNAMIC project, designed as a single-phase project, fully responds to the evaluation questions and the findings and conclusions of the evaluation have the potential to shape SDC's TRANSFORM portfolio. The evaluation confirmed the effectiveness and relevance of the ePOCT+ tool in addressing antimicrobial resistance and, during the project implementation, improving health outcomes in target districts of the project. The tool's ability to reduce antibiotic prescriptions is well-supported by empirical evidence, including findings from a study published in Nature Medicine, and has received substantial endorsement from the healthcare community. The project team initiated important steps to support the translation of research into practice, but the technical sophistication of the tool appears to be a challenging factor for direct up take. The sustainability and scaling of ePOCT+ depends now on the commitment of the governments of Rwanda and Tanzania to continue its use and

integrate it into their national healthcare frameworks. More detailed findings on relevance, coherence and sustainability:

I. Relevance: The DYNAMIC project proved to be highly relevant in both country contexts. It aligned with each country's national health plans and commitments towards antimicrobial resistance, improved child health and digital health strategies. In Rwanda, the project could build on a momentum of an emerging digital ecosystem. The project successfully ensured relevance by engaging stakeholders at an early stage and at different levels of the health system, including key government representatives, health workers at facilities and international partners. Social acceptance of the tool was high in both countries and health facility staff and patients/caregivers recognized its value added.

II. Coherence: the DYNAMIC project started before Rwanda and Tanzania had taken firm decisions on their universal digital health systems in primary health care. As a result, ePOCT+ was rather designed independently of any existing local digital health infrastructure, with the intention of ensuring interoperability at a later stage. However, it proved to be complex to integrate and interoperate with the national software systems developed during the DYNAMIC period, given that the ePOCT+ solution was technically demanding both from an IT and a clinical point of view. Technical coherence was therefore only partially achieved at the end of the project.

III. Sustainability: the proof-of-concept and the effectiveness of the DYNAMIC solution could be thoroughly validated in both countries, positively influencing the interest and engagement of public actors and underscoring the value of digital health solutions. While in Rwanda the government has shown commitment to continue using the tool and potentially integrate it into its upcoming digital healthcare framework the commitment of national governmental stakeholders in Tanzania could not be fully confirmed during the evaluation period. However, challenges remain regarding the complexity of the solution, coupled with a general lack of IT expertise within public institutions, as well as challenges regarding the maintenance of the tablets and application. In addition, potential barriers to sustainability include inadequate infrastructure both at central and local level and limited skills and confidence to effectively manage and maintain the Android-based solution.

Since SDC is not planning any immediate continuation of the project, it acknowledges the evaluation's findings and conclusions but does not outline any operational measures (for details, see table below).

Overview of recommendations, management response and measures

RELEVANCE
Recommendation 1
The timing of a research project striving for transformative impact appears to be very decisive. Even though both countries had not yet taken a firm decision on the direction and technical set up of their digital health system, the research findings of the DYNAMIC project are highly relevant. Understanding the priorities, mandates and resources of actors involved appears to be crucial to ensure continued relevance and coherence throughout the project timeline. 1. Initiate digital projects like DYNAMIC in contexts where the political groundwork has been laid and projects can respond to decisions taken and capacities available. 2. Conduct thorough situation and feasibility analyses including the digital health eco-system, considering both the political direction and technical capacities available within the country. 3. Draw on learnings made within the global digital ecosystem, that has become more structured and aligned in recent years. 4. Involve relevant actors during this feasibility assessment to understand their mandates and interest.
To ensure that research projects achieve meaningful impact, it is crucial to conduct a thorough context analysis before the project starts. This enables teams to orient and fine-tune the project design to local realities. A clear understanding of national decision powers and prerequisites for success, such as the progress of digitalization in the health sector and the availability of supporting infrastructure, is essential. In the case of the DYNAMIC project, it was particularly important that both governments had committed to advancing their digital health systems. As such, the timing plays a critical role in its potential for impact. Throughout the project, continuous attention to stakeholders' priorities, mandates and resources is key to maintaining relevance and coherence.
Recommendation 2
The success of a transformative research project depends on an impact-oriented project design and its people involved, combining expertise from both implementation and research. The DYNAMIC project did well in this regard, especially in Rwanda. 1. The project design from the very beginning should reflect pathways of change to combine research with policy action. 2. Clarify clearly research and implementation goals in transformative research projects 3. The team composition of a transformative research project should reflect both research and implementation expertise, especially regarding stakeholder engagement.
As a research funder, SDC sets specific criteria for selecting impact-oriented projects. Once a project is selected, the responsibility for guiding and steering lays with the project implementers. It is a shared responsibility and can only be realized through ongoing dialogue between the researchers and the implementers.

COHERENCE
Recommendation 3
A (successful) integration of the solution of certain modules of the solution into national structures is yet dependent on the political willingness and the national health strategies in both countries. The evaluation showed that a mind shift on digital solutions and scaling is needed at donor level, as only elements of a solution might be scalable in certain cases.

1. Researchers should try to design more flexible solutions that are suitable to the respective (resource) context and allow for adaptation to changing conditions and pre-requisites.
2. To achieve integration or take-over, both donors and researchers should think more modularly, identifying key functionalities which can be integrated into the national systems. The entire solution cannot always be scaled up.
3. Governments might be sometimes overwhelmed by the amount of possible promising research initiatives. It is the responsibility of the donor community to allow for transparent discussions with key actors in the digital / research ecosystem.

This recommendation highlights the complex challenge of ensuring that research findings lead to societal impact. Experience has shown that successfully embedding new solutions into national systems depends on several factors, including political will, alignment with national strategies, existing infrastructure, and the broader ecosystem. Achieving such change takes time and requires engagement with the right stakeholder at the right time.

Scalability, therefore, must be approached with nuance and flexibility. Not every component of a solution will be suitable for large-scale implementation in every context. A modular approach may prove more effective, and it is important to acknowledge that some elements may need to be adapted, or even set aside, in favor of more practical alternatives.

SUSTAINABILITY

Recommendation 4

The political decision of the two governments to sustain the solution is yet uncertain and research projects cannot push for decisions. Yet, a thorough and easily understandable evidence-base can support this process.

1. A thorough documentation of the overall DYNAMIC project, key functionalities of the solution, as well as stakeholder and context analysis reports should be compiled, published and disseminated.
2. A sustainability / exit strategy should be compiled and discussed with public partners, outlining concrete options and pathways to integrate the solution within their given systems.
3. Support to policy briefs, thereby creating ground for evidence-based political decisions, can be provided.

Recognizing the distinct roles and responsibilities in political decision making, Recommendation 4 addresses the potential for successful solutions to be considered for long-term integration within national systems, while fully respecting the pace of political processes. Although influencing political structures and replacing existing solutions is inherently challenging, the adoption of innovative approaches can offer significant advantages, including improved efficiency, access, availability, and affordability. While such efforts often extend beyond the core mandate of research activities, they require strategic support from the entire project consortium. SDC also engages in dialogue with the implementing partners to facilitate this process.

Recommendation 5

If a political decision is taken in favor of the continued use:

Sufficient clinical and IT capacities among governmental stakeholders to maintain and update the software (contents) are key requirements for long-term sustainability. Context challenges at (rural) health facilities, such as limited power supply, limited access to the internet and lack of secure spaces to lock up tablets and chargers, were identified.

1. It could be considered providing additional support to IT personnel in the respective governmental institutions to support the reprogramming within their own systems.

2. A contextualized capacity-development strategy with relevant national actors (e.g. with RPA in Rwanda) should be elaborated to allow for long-term capacity building at HF, district and national level. These can include moodle-based approaches or the integration into curricula at national level.
3. Enable frugal solutions such as the provision of mobile solar panels for power generation.
4. Set up structures and/or infrastructure to safely store tablets, such as lockers or personalized tablets.
5. Public-private partnerships with mobile companies could help address the challenge of a lack of internet access in some communities.

As outlined in Recommendation 5, a key prerequisite for continuing the DYNAMIC process is a clear commitment by the Rwandan and/or Tanzanian government to integrate the proposed solution into their respective national systems. This goes beyond a research project and should be considered during the scaling by the relevant stakeholders.

Recommendation 6

The evaluation showed that the linkage between research and implementation, which is crucial to scale up social innovations, can be pro-actively supported by the actors involved. In Rwanda, the engagement of the SDC Kigali office ensured relevant discussions on integration / interoperability at a critical point of time.

1. Funding institutions can bring in valuable networks and connections to other actors and players, as well as rapport with the government. They should be actively engaged in the inception of the project as well as during critical steps and in the mainstreaming and scaling of solutions.
2. Funders can proactively support the diffusion of the solution by sharing learning experiences across their network and/or identifying new contexts the solution could be effective in.
3. The digital solution as such represents a repository of knowledge created that can inform respective guidelines across countries (e.g. for WHO).

Funders can act as connectors, knowledge brokers, and enabler of system level change. SDC is well positioned to do so, even though societal change depends on many factors. Operating at the crossroads between academic evidence and real-life impact, fully aligns with SDCs commitment to promote sustainable, evidence-based innovations that are contextually relevant and globally informed.

Odile Robert

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