Effective research capacity strengthening

A quick guide for researchers

LSTM
CENTRE FOR CAPACITY RESEARCH

SCIENCE FOR AFRICA FOUNDATION

Where capacity gaps hinder the equitable uptake of research opportunities, researchers and research funders are increasingly integrating capacity-strengthening initiatives into their projects and programmes. This *Quick Guide for Researchers* provides access to the latest evidence and best practice in this field.

Having elicited the advice and expertise of researchers around the world, the authors offer a concise definition of research capacity strengthening and identify the central principles underpinning the concept.

They then indicate how research projects can be set up to ensure that capacity-enhancing activities are well designed, implemented and evaluated. Relevant case studies and a detailed checklist provide practical insights from existing and recent research projects.

This publication complements *Effective Research Capacity Strengthening: A Quick Guide for Funders*. Both publications encourage individuals and organisations involved in research to use, and contribute to, evidence-informed approaches to accelerating research capacity strengthening within and across national and international boundaries.

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For further information about CCR, please visit www.lstmed.ac.uk/ccr

For further information about SFA, please visit https://scienceforafrica.foundation/

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About this *Quick Guide*

This document was developed by the Centre for Capacity Research (CCR) at the Liverpool School of Tropical Medicine and the Science for Africa Foundation (SFA) in collaboration with a working group of research leaders from around the world.

CCR specialises in the *science of research capacity strengthening* and is widely acknowledged as a global leader in advancing evidence-informed capacity-strengthening practices in low- and middle-income countries; CCR:

- conducts implementation-focused capacity-strengthening research;
- supports a global community of capacity-strengthening scientists who are skilled at fostering equitable collaborations among researchers and institutions; and
- advocates for, and shares learning about, evidence-informed capacity-strengthening practices.

For further information about CCR, please visit www.lstmed.ac.uk/ccr.

SFA is a non-profit organisation established to support, strengthen and promote science and innovation in Africa. The Foundation designs, funds and oversees research and teaching programmes with an emphasis on: African-led priorities and solutions; the development of quality science environments; broad multi-stakeholder engagements; and the promotion of actionable scientific excellence in policy, knowledge and practice.

Recognising the power of collective effort, SFA also convenes partnerships and networks, and is intentional and proactive in the development, maintenance and growth of equitable strategic partnerships and networks.

For further information about SFA, please visit https://scienceforafrica.foundation/.

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Introduction

The ability of national research systems to generate, manage and utilise research is essential in equipping communities and nations to address local and regional priorities and challenges.[1] Yet, in much of the world, competition for state resources and a degree of distance between policymakers and academics prevent national research systems from flourishing. Infrastructure, job opportunities, skills levels and public perceptions about the value of research have all been affected.

At the same time, the world's leading research institutions and international funders acknowledge that working across national and regional barriers advances the quality, validity and uptake of new research. Consequently, many multinational research consortia and collaborations are funded with two core goals: the first is to carry out excellent research and contribute to knowledge production; the second is to strengthen and support research systems across the globe through research capacity strengthening (RCS).

This *Quick Guide* is an attempt by the authors and a group of international advisors and reviewers from different research disciplines to consolidate and share the current evidence on best practice in RCS. Our aim is to provide practical suggestions for planning, implementing, monitoring and evaluating RCS activities, projects and programmes that:

- have lasting impact;
- are owned by research teams and their institutions; and
- affirm the principles of equity, integrity and inclusivity.

Of course, the delivery of high-quality research usually requires a multi-disciplinary team of professionals that includes administrative and technical staff. The RCS approaches we describe aim to create a positive, inclusive and equitable research culture and working environment, thereby fostering the participation and wellbeing of all team members.

Recognising that the scale of RCS initiatives can vary and occur in very different contexts, our main focus is on RCS activities that are nested within wider research programmes or projects, as opposed to stand-alone projects. The document is therefore likely to be most useful for principal investigators, team leaders and research managers tasked with strengthening research capacity within a broader project or programme.

1 For the purposes of this guide, we define research systems as comprising people and institutions or organisations that are involved at any level in the production, dissemination and use of research. For more on how locally initiated and owned research can generate learning and knowledge that is systematically shared and addresses many local challenges, see Kasprowicz *et al*. (2020).

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UNDERSTANDING RESEARCH CAPACITY STRENGTHENING

Defining the concept

RCS is a complex concept; consensus on the definition of the term is still evolving and, in many contexts, knowledge about why RCS succeeds or fails is seldom made explicit. In a review of 172 publications on RCS, CCR found 25 different definitions of the term, none of which were cited by more than three of the papers. We decided to define the concept as follows:

> Research capacity strengthening is enhancing the capacity of individuals and organisations to conduct, manage, share and apply research, while enabling national and sub-national research systems to effectively support both research and the linkages between research and practice.

Through reviews and consultations, we identified three central principles underpinning RCS and three levels at which RCS can occur. We used these to inform the development of this guide.

Basic principles

1. RCS is an emergent, systemic and long-term process in which everyone involved has a responsibility to contribute and a right to benefit.
2. RCS occurs at and between three levels – the individual, the institutional and the inter(national) (see Figure 1).
3. At all three levels, RCS relies on sound institutional and programme strategies, resource allocations, leadership styles and systems, available infrastructure and facilities, as well as research cultures and knowledge sharing.

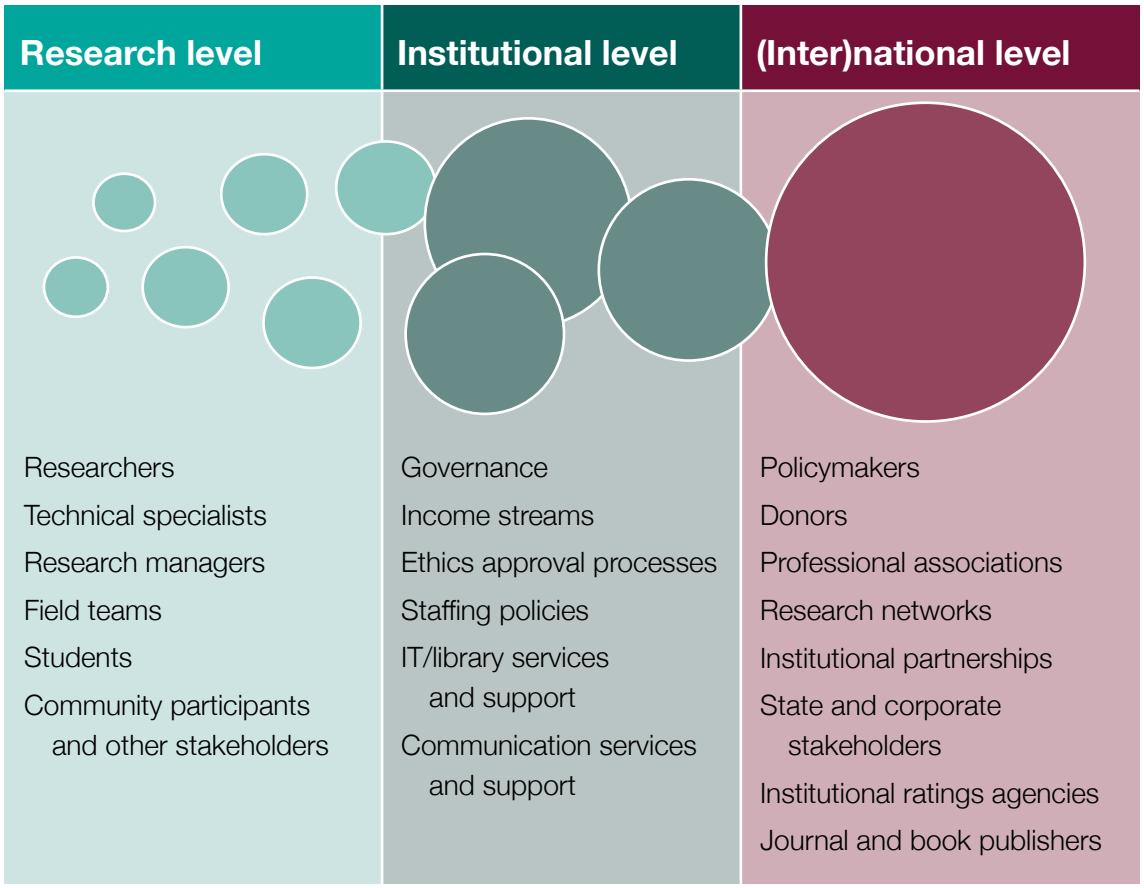

Figure 1. The three levels at which RCS activities occur and typical arenas in which its presence or absence is felt.

RCS as a primary or secondary goal

This guide is aimed at research teams who have made RCS an explicit objective, and are developing or documenting related activities. For some, RCS will be the primary objective of a programme or project but, typically, RCS is nested within, and secondary to, a larger research effort. Often, it is funders who decide whether RCS will be the primary or secondary objective by specifying the proportion of effort and funding that can be spent on RCS in their funding calls.

Suggestions to consider

- The expertise required for embedded RCS projects is often different from what is needed to achieve a research goal, and consideration should be given to employing a specialist RCS team whenever possible.
- Irrespective of whether a particular RCS initiative is a primary or secondary goal, or part of a long- or short-term process, every RCS initiative should have specific objectives, activities and systems for monitoring and evaluation, as described in the rest of this guide.

CASE 1 Using funding calls to promote collaborative learning about RCS

The Global Development Network (GDN) is an international organisation headquartered in New Delhi, India, with a mandate to support RCS efforts in the social sciences within low- and middle-income countries. Accordingly, GDN provides grants for early-career researchers that include world-class scientific mentoring, opportunities for South–South networking and training in project management.

While guiding grant applicants through the steps of their selection processes, GDN found some useful ways of encouraging researchers to improve the ways in which they conceive of and plan their research projects. For example, during both the selection and implementation phases, they invited researchers from different institutions to debate aspects of their projects with one another. Besides empowering researchers to develop their skills as peer reviewers, this also helped them forge new, collaborative, interdisciplinary and cross-regional research partnerships.

In addition, GDN's Doing Research initiative has collected data on the historical and policy contexts in low- and middle-income countries where the social sciences flourish. Researchers in several countries draw on this data to develop and deepen national and international debates on RCS and how it works.

Lessons learned

- By collaborating with colleagues and peers to debate the merits of their projects, researchers can use grant applications processes as a mechanism for RCS and as a means of improving the quality of their grant applications.
- Peer-to-peer mentorship is an effective means of advancing RCS and improving the monitoring and evaluation of RCS initiatives.
- Researchers can contribute to improving RCS policy and practice by collecting, synthesising and sharing data on what does and does not work in their own RCS projects.

For more information about GDN, see https://www.gdn.int/; for more about their Doing Research initiative, see https://www.gdn.int/doingresearch/about.

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DESIGNING ROBUST RCS INITIATIVES

Think strategically

When nested within a larger research project, RCS components should be woven throughout the project design and structure in ways that are both clear and specific. To achieve this, all members of the research team should be included in identifying RCS priorities and capacity gaps, and encouraged to think strategically about how best to address these.

As part of the planning process, valuable insights can be obtained by inviting team members to consider their own perceptions of different kinds of research strengths and weaknesses, as well as the power dynamics that tend to play out around the formation of these perceptions.

Suggestions for facilitating successful strategy planning

- Recognise that the transfer of knowledge is always multi-directional – that is, South–North, North–South, South–South and North–North.
- Find language and contexts that enable team members to discuss research capacity gaps without reinforcing power imbalances.
- Ensure equitable representation in the selection and design of RCS initiatives.
- Consider the long-term needs of the institutions involved, beyond the direct activities of RCS initiatives that are specific to particular research projects. Ensuring that research is financially, culturally and institutionally supported beyond any external funding cycle can be challenging but it must be considered when planning for RCS initiatives that have the potential for lasting impact (see Section 3).

Of course, the available human, financial and infrastructural resources, as well as contextual constraints, have to be factored into RCS strategies, along with available evidence about what does and doesn't work in practice (see the References and additional resources).

Useful resource

The paper 'Guidance and conceptual tools to inform the design, selection and evaluation of research capacity strengthening interventions' (Pulford *et al*. 2021) offers a set of conceptual tools that multiple RCS stakeholders will find useful for the design, selection and evaluation of RCS interventions, irrespective of the intervention's scale and underlying aims.

Try the 5-step approach to RCS project design

Bates *et al*. (2014) developed a useful 5-step approach to designing RCS initiatives that is summarised in Figure 2.[2] An example of how the five steps have been applied in practice is outlined in Case 2.

Figure 2. The 5-step approach to research capacity strengthening.

2 See also CCR's video, *RCS 5 Steps*.

CASE 2 Using the 5-step approach

From 2008 to 2015, four African research institutions within the Malaria Capacity Development Consortium focused on expanding their research management capacities. Located in Anglophone and Francophone countries, two of the institutions were in West Africa, one in East Africa and one in southern Africa; all had active malaria research programmes and offered postgraduate training. They applied the 5-step approach as follows:

1. Defining a clear goal for the RCS project

Staff at the four institutions recognised that they had to enhance their research management systems in order to improve their international competitiveness.

2. Working out the 'optimal' capacity needed to achieve the goal

Based on data and analyses in peer-reviewed and grey literature, as well as consultations with specialists, the consortium's RCS team worked out what levels of capacity would be optimal in enabling them to achieve their goal. They transformed this information into a benchmark against which they could compare the existing research management systems available to researchers in the relevant departments at each institution.

3. Using the benchmark to identify existing capacities and gaps

First, the RCS team collected information about each institution's research management system by:

- Interviewing representatives of *everyone* involved in managing any aspect of research – from researchers and laboratory technicians to librarians, IT managers, accountants and procurement officers.
- Reviewing institutional documents such as student handbooks, employment policies, etc.
- Observing facilities at each site, including laboratories, PhD study spaces, libraries, IT infrastructure, etc.

The team then presented their findings confidentially to each institution's departmental project team.

4. Jointly developing and implementing an action plan to remedy the gaps

Each institution developed its own action plan for filling capacity gaps. Actions that could be undertaken collaboratively, at little to no extra cost, included the development of employment policies, clarifying lines of accountability and sign-off processes, as well as providing regular financial updates to researchers. Other initiatives (such as purchasing software, training staff to track data collection or financial expenditure, and applying for laboratory accreditation) were more costly. However, the clear, goal-oriented action plans they had developed helped consortium members write strong grant proposals and secure additional funding.

5. Monitoring progress and refining action plans to sustain RCS

In the 15 months that followed the design phase, some institutions incorporated RCS actions into their annual planning and budgeting cycles.

Lessons learned

- Using the 5-step approach across all the institutions in the consortium helped the RCS team monitor progress and adjust their strategies where appropriate.
- All of the institutions reported that involving finance officers in proposal development helped all members of the team and in-house staff training was well received and effective.
- All of the institutions found it difficult to sustain certain kinds of project-related skills training, achieve laboratory accreditation and widen uptake of their research outputs. This knowledge was used to provide evidence that future RCS initiatives will require special attention in these areas.

For more information about the RCS initiative on which this case study is based, see Wallis *et al*. (2017).

Explain your theory of change

Although not always stated, virtually every research project is motivated by a theory of change (ToC). Articulating this theory can be an effective way for researchers to map the processes through which project activities (including those related to RCS) can be expected to deliver measurable outcomes and achieve longer-term goals. A robust ToC that is regularly reviewed and refined can help research teams assess the extent to which project impacts are being achieved, which are off-track, and whether any unanticipated impacts might occur.

Some research funders are also developing ToCs to explain the rationales behind their programmes, and using the degree of alignment with their ToC as a criterion against which to evaluate project proposals. Even if funders don't explicitly ask to see a ToC, the process of articulating a theory can help in clarifying and validating the project's aims and intentions. This kind of clarity is always useful when communicating with collaborators and stakeholders.

Suggestions for developing a ToC

- Work backwards and forwards between your goals and activities to make sure the path you plan to take towards the changes you want to generate is clear and logical.
- With project partners and/or stakeholders, identify the underlying assumptions you have made about the impact of your project, and decide how you will mitigate potential risks if any of these assumptions prove incorrect.
- Check how your ToC aligns with likely funders' programme goals and desired outcomes.

Useful resource

The UK's National Institute for Health and Care Research (NIHR) developed and published the ToC that underpins its approach to health research globally; a useful overview of this is available online at Global Health Research Portfolio: Theory of Change.

CASE 3 Taking a systems approach to change

CCR, based at the Liverpool School of Tropical Medicine, specialises in the science and practice of strengthening research capacities. From its inception, CCR acknowledged that research systems are complex and require a systems-based approach if research projects are to meet priority needs in impactful ways.

Initially, a ToC was developed through a series of workshops at which all CCR staff (researchers, managers and administrators) agreed on their long-term vision and mapped out how they expected their activities to lead to short-term outputs (annual), medium-term outcomes (within 3 to 5 years) and longer-term impacts (5 or more years). The team also consulted with the users of their research – mainly other researchers, research managers and research funders, particularly in lower-income countries. Inputs from these two processes were collated into a ToC that provides a visual description of three pathways leading from activities to impact (see Figure 3). The ToC is reviewed annually and revised as needed.

Accordingly, when planning research initiatives, CCR can base its activities on the ToC, in the knowledge that they have the potential to strengthen research capacity across all three levels of the research system – the individual, the institutional or organisational, and the (inter)national.

Lessons learned

- ToCs are most effective when developed collaboratively so that *everyone involved* understands, contributes to and owns the process.
- Any ToC benefits from being reviewed regularly (ideally annually) and revised in response to changing needs and contexts.
- A ToC is useful for assessing progress along the pathway to impact and can also be helpful for evaluating a project during and beyond its lifetime.
- Activities and outputs are generally under 'project' control whereas outcomes and impact are not. Anticipate and mitigate risks related to possible outcomes and impacts as part of project planning and throughout a project's lifetime.
- The pace and scope of progress depends on levels of stakeholder engagement and support – CCR's activities are insufficient if they occur in isolation.

For more information about CCR's work on theories of change, see the seminar presentation, How to Create and Use a Theory of Change/Pathway to Impact, available on YouTube.

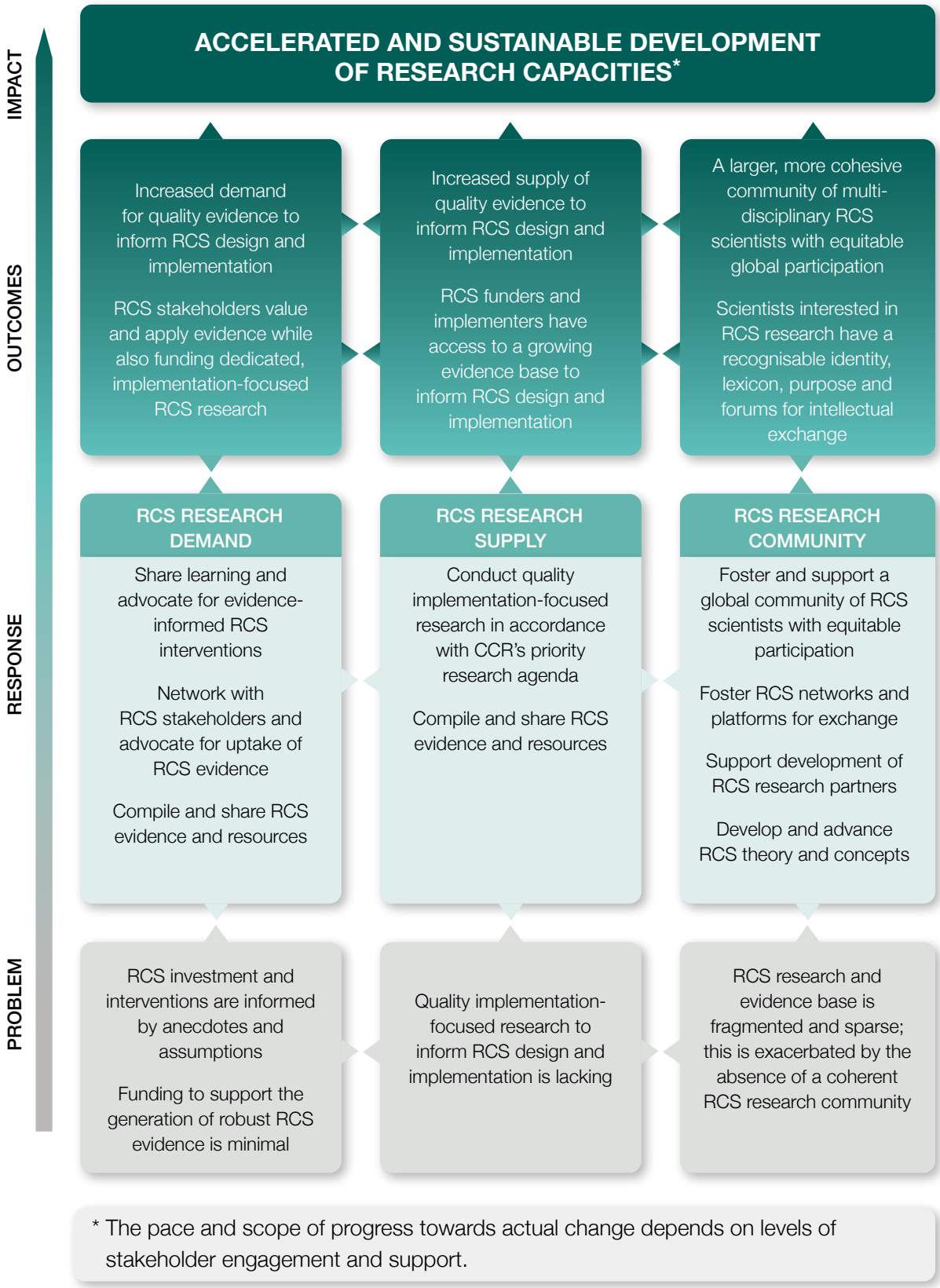

Figure 3. Advancing the science of RCS for sustainable development: CCR's ToC, 2023.

Design for equity

RCS initiatives often involve collaborations and partnerships with external organisations. These always function best when they are based on mutual trust, respect and reciprocity.

One of the keys to building trust and respect is to give everyone involved in RCS activities opportunities to identify research needs and priorities, shape programme or project goals, and develop a clear understanding of the role they and others can play in achieving the goal. Following this kind of broad engagement, partners tend to respect each other's disciplinary and other contributions, and research costs and benefits are more likely to be fairly allocated. In other words, effective collaborations become more likely.

Be aware that capacity gaps in the support that research institutions can provide (such as IT connectivity, administrative and financial systems and skills, funding for travel and professional development, etc.) can be a barrier to the equitable allocation of responsibilities and resources.

Suggestions for fostering equity

- Allocate time and resources to developing trust and respect between the partners from the start and for the full duration of the project – the aim is to encourage all participants to contribute to identifying and prioritising both the core research and RCS aims while helping to shape how the aims will be met and the gaps filled.
- Involve research users in setting these priorities and ensuring that they align with institutional and national needs.
- Budget equitably for direct and indirect costs, remembering that institutions and researchers will have differing needs depending on their access to infrastructure, facilities and funding.
- Allocate time throughout the project's lifespan for RCS activities.
- Acknowledge that under-resourced partners might lack the institutional support needed to carry out project-related activities as fast as those that are better resourced.

CASE 4 Catalysing accountability and responsiveness for health services in informal urban settlements

Established in 2019, ARISE (Accountability and Responsiveness in Informal Urban Settlements for Equity) uses participatory research and action to catalyse change in levels of accountability for the delivery of health services in informal urban settings. In other words, ARISE supports people who live and/or work in informal urban spaces to identify their priorities in relation to health and wellbeing and collaborate to secure more responsive services. This is achieved by making the living and working conditions in informal settlements more visible to health service providers (both governmental and non-governmental) and by finding ways to involve these providers in enhancing access to their services.

As of late 2023, ARISE consists of several partner organisations with diverse backgrounds and academic disciplines and is based in Bangladesh, India, Kenya and Sierra Leone,

Malawi, Nepal, Senegal and Zimbabwe. All ten partners have strong national, regional and global influence, including with informal urban dwellers, national and international NGOs and with national governments. ARISE is guided by the values of:

- Equity in voice, power and resource distribution.
- Transparency and accountability in priority-setting, decision-making, data and resource use.
- Continuous co-learning, based on respectful relationships, flexibility and reflexive practice.
- A commitment to safeguarding ethical interactions at all levels of the programme.

Given the differences within cities, and variations between settlements and their citizens, ARISE has chosen to work with communities through community-based partnerships and has always prioritised equity between all partners when setting priorities and action plans. Consequently, different partners lead on different projects, while funding calls offer all partners opportunities to propose smaller projects based on their own research needs.

For example, as part of a capacity-strengthening project led by the Kenyan-based team, individual and institutional capacity needs were identified, targeted and monitored, and members of the local informal settlements received training in data collection and analysis. Institutional capacity has also been strengthened through ARISE's policies and documented learnings on Safeguarding in Research and Action. Some partner institutions have not only adopted these policies but also established a safeguarding committee, developed a training manual on safeguarding and appointed a focal person with responsibility for safeguarding.

All activities are documented and new knowledge is disseminated to maximise the potential for wider learning about strategies and policies that work to improve and extend urban health services in sustainable ways. Wherever possible, programme-based RCS is leveraged across partner institutions; for example, processes by Slum Dwellers International in India is being adopted by their counterpart federations in Kenya.

Lessons learned

- Community-led participatory approaches strengthen local capacity, including, for example, the capacity of community members to analyse their own health needs, set priorities and identify avenues through which to approach key state actors and demand access to better services and accountability.
- Participatory processes enhance local understandings of realities, challenges and strengths, making RCS initiatives more targeted and sustainable.
- Designing for equity develops commitment and trust in alliances between key actors that extend beyond RCS programmes, ensuring ongoing impact and benefits.
- Approaches that work can be scaled up and shared nationally and globally.

ARISE is funded by UK Research and Innovation; for more information about ARISE, see: https://www.ariseconsortium.org/. See also, Aktar *et al*. (2020), ARISE (2021; 2022), Mansaray *et al*. (2022) and Snijder *et al*. (2023).

Maximise training opportunities

The skills of many different professionals (and not just researchers) are necessary for successful research. Consequently, when designing the training components of RCS, it is helpful to consider the career and professional development needs of all involved (regardless of career stage), as well as the capacity gaps in their institutions. Similarly, opportunities for engaging in the research process, and benefitting from activities such as training, mentoring and attending conferences, should be extended equitably to everyone.

Suggestions for allocating opportunities

- Include administrative, financial staff, technical and other staff in training-needs assessments and allocate training opportunities equitably.
- Where research partnerships are multilingual, budget for translation and writing support so that everyone can engage with and contribute fully to research and dissemination processes.

CASE 5 Including technical staff in RCS activities

The African Capacity Building Initiative (ACBI) was a large ten-year programme that aimed to strengthen the research and training capacity of higher education institutions in the UK and sub-Saharan Africa while supporting the development of individual scientists. ACBI funded ten consortia involved in research related to water and sanitation, renewable energy and soil science.

At the start of the programme, a survey conducted among consortia members helped them identify their research capacity priorities. They found that, although laboratories were essential for the majority of projects, the training of laboratory technicians had been overlooked in the initial project plans. The technicians were then asked to participate in a survey to assess their skills and indicate what training they needed most. All technicians across the ACBI were subsequently invited to a training session focused on the needs they had prioritised – namely, quality-management systems and educational skills.

After this, the technicians began to design and implement small quality-improvement projects in their own laboratories. The technicians were encouraged to share their progress and discuss what they had learned via a series of online workshops. The workshops helped the technicians realise that they faced similar challenges. They discussed ways of sustaining contact so that they could continue to consult and support one another.

To help the technicians obtain laboratory certification, the ACBI management team purchased copies of the ISO/IEC 17025 standard. This specifies the requirements for competence in laboratory testing, calibration and management. Obtaining certification had the potential to help the technicians charge a fee for certain services, thus contributing to their income and enabling them to sustain the laboratory after the ACBI had ended. The management team also supported ACBI's African partner institutions to develop strategies for housing, sharing, running and maintaining the project equipment after the projects had ended.

Lessons learned

- Laboratories are crucial for many types of research, yet they are neglected in some African research institutions where technicians are also often required to work unpaid overtime to meet their research and teaching responsibilities.
- Many laboratory technicians feel unrecognised and undervalued; they can be motivated and upskilled by being included in training opportunities wherever possible. Such opportunities should include the updating of technical skills, 'softer skills' such as management and teacher training as well as recruitment for postgraduate study.
- Technicians must be consulted early in project design so that necessary skills training and equipment upgrades can be included in project plans and budgets.
- Every research project that relies on laboratories should actively contribute to their sustainability. This means planning for equipment maintenance and international accreditation, as well as considering the potential for supplying income-generating services.

The ACBI was funded by the UK's Foreign, Commonwealth and Development Office (FCDO) through the Royal Society. For more information, see Royal Society and FCDO (n.d.).

Encourage multi-disciplinarity

Multi-disciplinary research provides many opportunities for RCS but nurturing successful multi-disciplinary research relationships takes effort and active engagement. It is vital to allocate sufficient time and resources to activities that enable project members to perceive, understand and navigate disciplinary barriers while also acknowledging professional hierarchies in mutually respectful ways.

Suggestions for promoting multi-disciplinarity

- Foster support networks and mentorships that are intentionally cross-disciplinary and cross-regional.
- Create opportunities for research teams to learn about each other's methodologies through, for example, shared writing tasks and seminar presentations.
- Negotiate agreements to deliver cross-disciplinary outputs and outcomes. Then track progress using mutually agreed indicators and review outcomes regularly at a senior level.
- Nominate a person or team to collate and share information across the research partnership about how multi-disciplinary collaborations are enriching the research and contributing to RCS.

Useful resource

The Belmont Forum is a partnership of funding organisations, science councils and regional research consortia that support and facilitate international transdisciplinary research, providing knowledge for understanding, mitigating and adapting to global environmental change. The consortia they fund typically include researchers from different disciplines and institutions who have varying levels of capacity. The Forum challenges the researchers they support to be truly transdisciplinary – that is, to involve researchers from a range of academic disciplines, as well as from industry and civil society, in participatory, co-designed, co-developed and co-implemented research and action. For more information, see https://www.belmontforum.org/.

CASE 6 When multi-disciplinarity works

The CEPHaS Consortium* is a network of researchers from Zimbabwe, Zambia, Malawi and the UK working to strengthen the capacity of local researchers to fill knowledge gaps about the impacts of conservation agriculture on the water cycle in cultivated soils.

At the project's inception, the team leaders designed a workshop with the aim of engaging each researcher in identifying research needs and drawing up the project plan. Interesting and thought-provoking group activities encouraged team members to participate and share their perspectives, regardless of their career status or discipline. As a result, levels of respect grew between team members and fuelled their interactions throughout and beyond their work on the project.

Lessons learned

- When the views and contributions of research participants are acknowledged and valued, regardless of career status or discipline, mutual respect and trust are likely to grow.
- Providing a research environment and forums in which all partners can shape the research priorities creates a sense of equity that is often lacking in research environments.
- When leaders set an example by being open to engagement and inclusive of different voices, team members generally feel inspired, motivated and empowered.

* CEPHaS stands for 'strengthening capacity in environmental physics, hydrogeology and statistics'. The CEPHaS Consortium is funded by UK Research and Innovation as part of its Global Challenges Research Fund.
For more information about CEPHaS, see https://www2.bgs.ac.uk/CEPHaS/; for an evaluation of its capacity-strengthening efforts, see Duda *et al*. (2023).

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SUSTAINING RCS TO FORTIFY INSTITUTIONS

Participative leadership is key

RCS is integral to the success of any research project, regardless of whether or not it is stated as a goal or listed among project activities. Similarly, inclusive research cultures and working environments that support the wellbeing of everyone in the research process are critical to the realisation of RCS. These kinds of cultures and work environments rely heavily on research leaders who understand the value of nurturing future academics, and place RCS at the heart of institutional management structures and processes.

A clear grasp of the capacities, limitations and responsibilities that influence project delivery often helps research leaders to develop a management style that encourages members of a research team to be aware of their limits and participate in RCS initiatives.

Suggestions for creating work environments conducive to RCS

- Cascade good leadership practices beyond senior project leaders.
- Ensure that responsibilities are equitably allocated within the team, such that all research partners can take ownership of aspects of project management while retaining the freedom to manage their own resources.
- Create written agreements on how the benefits of research grants (such as new equipment, intellectual property rights, lead-author status, training opportunities, etc.) will be shared among project partners.
- Invest in developing grant and research management systems and skills.
- Set up mechanisms that enable partners with access to useful skills or resources to support those without; this applies particularly to specialised laboratory techniques and data analysis or grant and financial management.
- Adopt (or develop) and implement policies and training on institutional values such as respect, fairness and equity, while also providing safeguarding tools that aim to prevent harassment, discrimination and intimidation.
- Create clear channels of communication for participants to raise methodological concerns or the need for psychosocial or personal support and ensure that responses to such communications are quick and appropriate.
- Signal the value of every participant in successful research planning and implementation by, for example, rotating the chairing of meetings between different disciplines.
- Establish communication channels (including internet connectivity, email systems, cloud data storage and uninterrupted power supply units) so that team members who might be disadvantaged by childcare needs and/or mobility restrictions can potentially work off site and from home at times.
- Provide regular progress and news updates to all participants that build trust and transparency.
- Secure buy-in from institutional management by ensuring that RCS design and activities align well with wider departmental and institutional needs and priorities.

CASE 7 The knock-on effect of capable leadership

In 2014, the agricultural economics department at Haramaya University in Ethiopia received a grant of US$140,000 to strengthen research capacity over a 24-month period. The department's team leader consulted colleagues and students before developing a work plan and initiating a series of activities. These included running training modules on research methods, sourcing fieldwork grants for master's and PhD students, and organising an annual departmental symposium at which postgraduate students could present their research and receive feedback from their peers.

Project funds were allocated according to the department's requests, and based on the priorities and plans they identified. The final evaluation showed that the project enhanced the department's research culture. This was evident from the significant increase in the number of applications (by both faculty and students) for research funding and the sharp decrease in the number of research degrees that got delayed when compared with previous years.

By engaging the other departments and the university leadership at key points during the project, the implementing team also secured resources from the main university budget to support additional RCS activities for students and staff. Using this model, other departments and faculties on the campus began to implement similar RCS projects.

Lessons learned

- The allocation of RCS project funds in line with existing departmental plans and needs can improve the research culture and the effectiveness of research systems.
- Initiatives that are well planned and executed, inspire others, and can have significant long-term impact.

The project was funded by the International Development Research Centre and managed by the Global Development Network. For more information, see https://idrc-crdi.ca/en and https://www.gdn.int/.

Sustainability

RCS activities can catalyse institutional and societal change, but entrenching new research capacities in institutions can take years, even decades. A key characteristic of RCS interventions that have enduring impact is that they are designed to strengthen existing systems, rather than create new and parallel processes. Although sometimes more challenging and time-consuming to achieve, this approach to RCS often provides value for money well beyond its financial cost.

Suggestions for sustaining institutional ownership of RCS

- Use mentorship and delegation to expand the pool of people who take responsibility for, and ownership of, RCS and its associated benefits.

- Strengthen institutions' capacities by employing project staff on institutional rather than project-specific contracts.
- Ensure that project activities are needs driven and align with institutional priorities and try to work with existing structures and systems rather than create new ones.
- Provide regular updates and opportunities that enable relevant institutional and external stakeholders to engage with the project in ways that secure their ongoing support.
- Share the credit for RCS gains with institutional leaders to motivate them to continue investing in expanding, replicating and sharing such gains.
- Collaboratively develop sustainability plans related to, for example, maintaining and extending research partnerships, networks, skills retention, laboratory equipment etc. beyond the lifetime of your project.
- Budget for ongoing learning about your RCS initiative to understand what was, and was not, impactful and why.
- Consider whether any income-generating opportunities have arisen that could benefit institutions and bolster their research budgets; for example, achieving formal accreditation or certification for institutional courses or laboratories can help institutions to commercialise some of their services.

CASE 8 Facilitating the transition from PhD student to postdoctoral researcher

Evidence shows that a lack of support between completing a PhD and obtaining postdoctoral work is a major roadblock to graduates pursuing a research career. In this period, graduates are often expected to publish parts of their PhD while simultaneously applying for postdoctoral placements or research grants. For graduates who lack access to material support and mentorship, completing these tasks can be impossible.

Recognising these challenges, the Kenya Medical Research Institute (KEMRI) created a research-leadership development strategy for new PhD graduates. This enables graduates to take a 'career development year' during which they receive a small stipend, access to work space and IT facilities, as well as mentorship and opportunities to attend scientific conferences. Funding is supplied via dedicated capacity-building grants and as grants that are allocated to senior staff who support the programme as mentors.

Importantly, the career development year is not seen as a rest period. Graduates are strongly encouraged to use the time to plan for their future. Immediately after submission of their PhD thesis, fellows are expected to:

- Enhance their eligibility for grants or postdoctoral positions by writing journal articles arising from their thesis.
- Seek mentors within and outside of the programme who might be able to help with a postdoctoral placement.
- Seek placements in other institutions to gain wider research experience.
- Apply for grant funding.

For those planning to change disciplinary focus, the programme facilitates entry into unpaid internships in other fields. Since 2008, the programme has supported over 90 fellows; of these, 71 completed career-development fellowships at KEMRI, 11 at other Kenyan universities, 4 at Kenyan research institutions, 10 at research institutions outside Kenya, including one at the World Health Organisation. Of those supported, 90 per cent have secured postdoctoral positions or grants to pursue their own research, and most are employed in African research institutions.

Lessons learned

- The transition from PhD student to a postdoctoral position is one of the most difficult phases in a research career; it needs careful planning and a structured programme.
- It is important to plan and budget for postdoctoral researchers to be mentored to write publications and grant proposals as well as gain further work experience in the 12 to 18 months after completing their theses.
- With adequate support, more PhD graduates will transition into research careers and ultimately help to sustain the academic profession.

KEMRI's RCS efforts are funded by Wellcome; for more information, see https://kemri-wellcome.org/capacity-strengthening/.

Useful resource

In their paper, 'How international research consortia can strengthen organisations' research systems and promote a conducive environment and culture', Pulford *et al*. (2023) describe how enhanced research capacity can be sustained by strengthening organisations' research systems, research cultures and working environments, and by creating networks among organisations that can share expertise and resources beyond the lifetime of individual projects. Note that some funders will support such activities if they are included in project plans, budgets and evaluations.

4

MONITORING PROGRESS AND IMPACT PATHWAYS

Expect and plan for complexity

Plans for monitoring progress in RCS should be as robust as monitoring any other aspect of a research project, and must be included in the project design from the outset. However, even with the best forward planning, the process of tracking and demonstrating the impacts of RCS projects is complex and ripple effects can occur in unexpected ways.

Indicators become more challenging to design as they move from monitoring change at the *individual* level (where the number of people trained or new skills learned is important), through the *institutional* level (where changes in research policies, systems and cultures or increased funding are essential), to the *(inter)national* level (where enhancing the effectiveness of professional networks, the uptake of research and public awareness of the value of research are critical) (see Figure 1).

In addition, some of the most informative RCS indicators are qualitative rather than quantitative. It can be vital to include people with these skills in the team. Indicators capable of showing progress and impact should be developed for each RCS goal, and used to inform and adjust activities throughout the project's lifetime.[3] As capacity strengthens, the monitoring of indicators might need to be adapted.

Suggestions for monitoring RCS

- Develop a monitoring, evaluation and learning (MEL) framework with relevant quantitative and/or qualitative metrics to collect evidence about the impact of RCS activities from the outset, and consider how this information can help you improve your project within its lifetime.
- Engage project members, partners and stakeholders in the development, validation and implementation of the MEL framework to increase ownership of, and responsibility for, the project's RCS approach (try to include some short-term indicators of RCS success that will help reassure and motivate research teams and partners).
- Identify and map RCS participants and other beneficiaries to inform ongoing MEL.
- Try to capture any unanticipated effects of RCS through questionnaires, open-ended interview questions, focus-group discussions or other participatory methods.
- Consider including a specialist RCS researcher or a 'learning team' to focus on robust data collection and analysis. Besides enhancing the quality of the MEL process, this has the potential to generate knowledge that can be shared more broadly through journal articles, etc.

Useful resource

Taylor (2022) offers a critical reflection, and key take-away messages, relevant to MEL on complex, large-scale institutional RCS programmes. Although writing from a funder's perspective, Taylor offers observations and recommendations that are useful to research teams working on MEL design and delivery. For example, Taylor highlights the value of incremental and iterative evaluation approaches, as well as of intentional facilitation and design if MEL is to optimally support programmatic learning.

3 See Pulford, Price *et al*. (2020).

CASE 9 The ripple effects of effective RCS

An RCS project in Africa supported seven research institutions in their efforts to secure Good Laboratory Practice (GLP) certification, thus focusing RCS activities on promoting institutional change. However, since the individual, institutional and (inter)national levels are all interdependent, the project also collected RCS data from individuals involved in the project as well as from national and international partners.

From the start, a specialist researcher was employed to design and lead a quasi-independent assessment of the project's RCS processes and achievements, and to synthesise any lessons that could inform similar programmes. Ethical approval was obtained from each institution for this assessment, and to promote wide engagement with the process, information sheets and consent forms for the interviews were provided in local languages as well as French and English. Using data gathered from interviews, the project was able to identify ripple effects that extended beyond their institutional focus.

Lessons learned

- Methods of capturing RCS effects should be planned for from the outset, and cover all three levels of the research systems – individual, institutional and inter(national) – as well as interactions between the levels and any unanticipated benefits.
- In addition to improving the technical capabilities of each institution, investing in RCS enhances individuals' motivation and self-esteem; this, in turn, accelerates their career progression.
- Focusing not only on securing better equipment, but also on ensuring more transparent communication systems as well as formal procedures for appraisals and training, enhances the working environments within institutions.
- By sharing experiences, institutions gradually develop a network of (inter)national expertise.
- Individuals involved in the project reported that their increased skills in financial planning and time management benefitted their families and households too, while local businesses and residents were given opportunities to supply consumables and construction materials as well as services, such as building maintenance and mosquito sampling.
- To ensure a full understanding of and engagement with RCS-related impacts, translation services should be provided if needed.

This RCS project was supported by the Bill and Melinda Gates Foundation [OPP1148615] through the Innovative Vector Control Consortium; see also the video IVCC Good Laboratory Practice 2020.
For more information about the evaluation process, see Begg *et al*. (2021b).

5

KNOWLEDGE SHARING AND INFORMING FUTURE PRACTICE

Documenting what works, what doesn't work, and why

When monitoring, evaluation and learning are carried out rigorously for RCS initiatives, the data that is collected can be published. The opportunity to contribute to the dissemination of new knowledge can be an additional incentive for researchers to engage critically and actively with the RCS. However, effective knowledge sharing about RCS also requires careful planning and robust data collection.

Suggestions for knowledge sharing

- Ensure that the ethics approvals needed to publish on RCS activities are in place from the outset, and check if a separate ethics application has to be submitted in addition to that required for the main research project.
- Allocate time and funding to allow for the completion of any approval processes that might be necessary for collecting data on RCS; this is particularly important if multiple institutions and countries are involved.
- Ensure that adequate resources, time and training are allocated to the monitoring and optimising of capacity-strengthening opportunities for everyone involved in the research.
- Make time for the research team to regularly reflect together and consider how the project can be improved and what learnings could help inform future RCS endeavours.
- While reflecting on project progress, encourage team members to start preparing for various forms of scholarly and public engagement, while discerning which communication strategies and online platforms will be effective and appropriate. Skills audits and skills training on knowledge translation might be necessary to equip researchers to engage effectively with key dissemination platforms. If this is the case, clarify what time and resources will be needed, and consider employing a professional who can provide knowledge translation training for everyone involved, and also help develop the necessary communication protocols and quality assurance processes.
- Enlist the help of stakeholders and advisory boards with knowledge translation and dissemination – they can often provide insights on what information should be communicated, to whom and how. They might also be able to help the team to navigate any power imbalances and tensions around issues such as authorship, intellectual property, finances, etc. and assist in finding compromises and trade-offs.

CASE 10 How research informs practice and practice informs research

DELTAS Africa was launched in 2015 with the aim of substantially expanding excellence in science research and leadership across Africa. During the initiative's first five-year phase, approximately US$100 million was allocated to supporting the work of eleven research consortia, each with its own distinct focus in addressing the research needs and priorities of Africa's health sector.

Nested within the consortia was a complementary and semi-independent 'learning research programme' which sought to improve DELTAS Africa's outcomes by enabling consortia members to learn from each other's projects in real time. The learning research team comprised three PhD students who explored aspects of RCS in-depth across DELTAS Africa, plus two senior part-time researchers who collated and shared what was being learned within and beyond the programme. Thus, whenever good practices and clear evidence of effective RCS strategies were identified, these were immediately shared via personal communications, quarterly updates and consortia meetings.

Consortia members were then able to adapt or adjust their projects and practices as appropriate. At the same time, this evidence and analysis was communicated to the wider research sector (via peer-reviewed journals, seminars, conferences, reports, etc.) and beyond via Twitter and YouTube.

Lessons learned

- RCS initiatives create evidence-generating opportunities; investing in a dedicated learning programme can help ensure this evidence-generating opportunity is maximised.
- When RCS activities are nested in a larger research project, evidence on priority RCS topics must be made available to the larger project at timely and regular intervals.
- To maximise impact, the dissemination of evidence about what makes RCS successful requires multiple channels of communication, both formal and informal.
- Robust research methods must be employed if peer-reviewed publication is an objective.

The DELTAS Africa Learning Research Programme was supported by funding from Wellcome and the UK's Foreign, Commonwealth and Development Office, and was conducted in partnership with the African Academy of Sciences and the Alliance for Accelerating Excellence in Science in Africa, which was established by the Planning and Coordinating Agency of the New Partnership for Africa's Development. For more information, see The DELTAS Learning Research Programme.

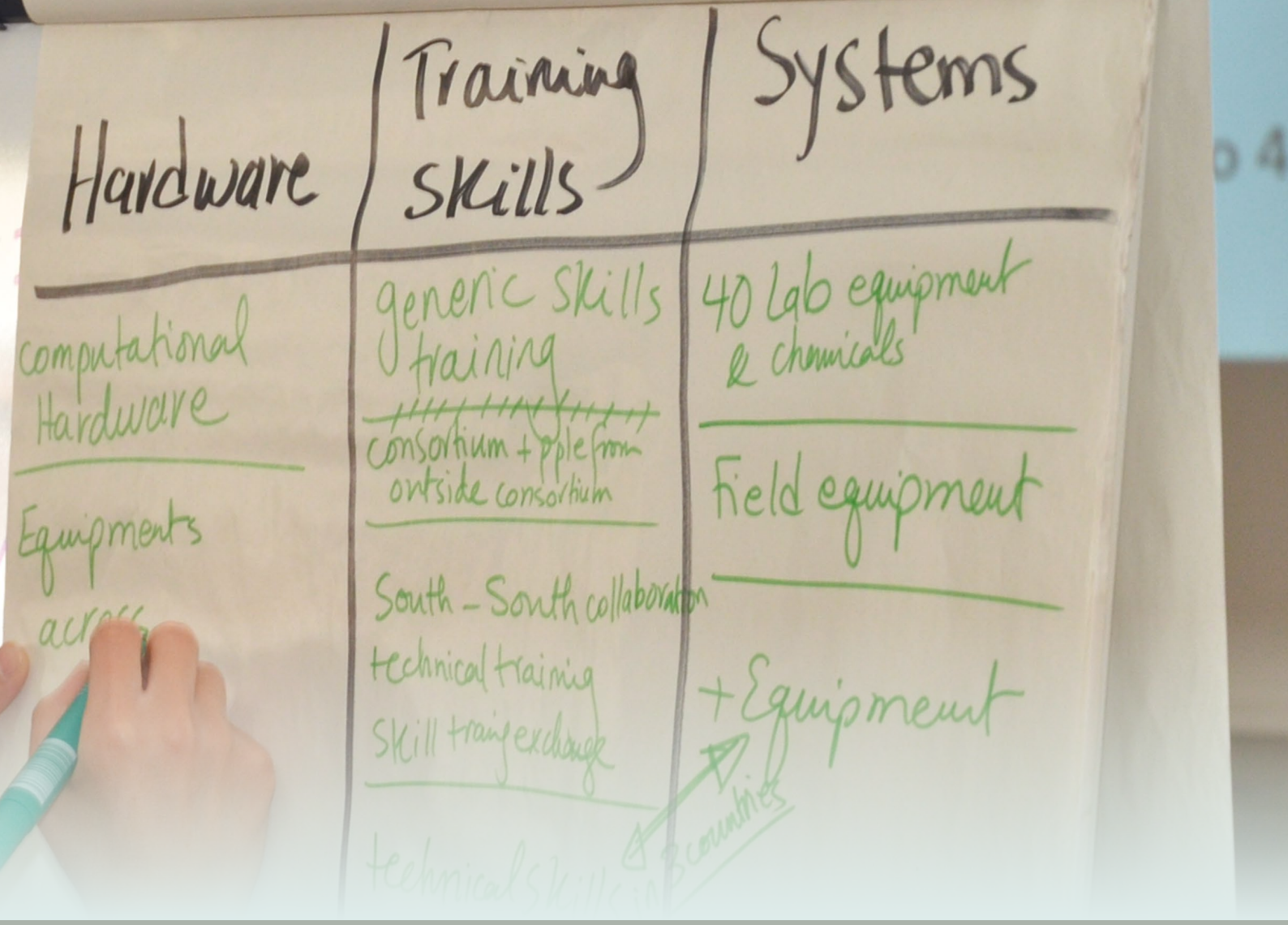
Effective research capacity strengthening: a checklist for researchers

Designing robust RCS initiatives
✓ Are the RCS goals and objectives clearly articulated and have you indicated the pathways by which you expect the goals to be achieved using a theory of change (ToC) or equivalent framework? If yes, have opportunities to review and refine the ToC been scheduled throughout the project duration?
✓ If RCS is embedded within a larger research project, have you clearly defined the activities, timing and resources for the RCS components?
✓ Are the RCS components based on evidence and have they been woven throughout the project design and structured in ways that are both clear and specific?
✓ Have you allowed for the additional time and resources needed for RCS activities, including the process of establishing understanding and trust across multiple disciplines?
✓ Bearing in mind that multiple institutions and countries may be involved, have you secured all the institutional and ethics approvals needed to collect data (through interviews, surveys, etc.) and report on RCS activities from the outset?
✓ Are all members of the research team included in identifying RCS priorities and capacity gaps?
✓ Have the development needs of everyone involved in the research process (not just the researchers) been considered and, where training is being provided, does this also meet the institutions' own needs and priorities?
✓ Have you incorporated strategies to enable potentially disadvantaged members of the research team (for example, people with caring responsibilities, different first languages, mobility restrictions) to contribute fully to the research process?

Sustaining RCS initiatives and fortifying institutions
✓ Are project responsibilities equitably allocated within the research team?
✓ Have mechanisms been set up that enable partners with access to useful skills or resources to support those without?
✓ Have you set up clear channels of communication that research participants and team members can use to raise methodological concerns or seek psychosocial or personal support? Are these channels equipped to ensure that responses to such messages are quick and appropriate?
✓ Have you established mechanisms and processes to ensure that regular progress and news updates are written and sent to everyone involved in the research as well as to relevant institutional and external stakeholders?
✓ Are the RCS activities designed with a view to ensuring local ownership and long-term sustainability while also aligning with the wider departmental and institutional needs and priorities of partners?
✓ Are the RCS interventions designed to strengthen existing systems rather than create new or parallel processes?
✓ Is there a process to collaboratively develop sustainability plans related to, for example, maintaining and extending research partnerships, networks, skills retention, laboratory equipment, etc. beyond the lifetime of your project?

Monitoring progress and impact pathways
✓ Have you developed a monitoring, evaluation and learning (MEL) framework with relevant quantitative and/or qualitative metrics to facilitate the collecting of evidence about the impact of RCS activities from the outset?
✓ Does your MEL framework include indicators at the individual, institutional and (inter) national levels as appropriate?
✓ Have you engaged project members, partners and stakeholders in the development, validation and implementation of the MEL framework to increase ownership of, and responsibility for, the project's RCS approach?
✓ Have you considered how MEL information can help you improve your project within its lifetime, and demonstrate that you are on a trajectory to achieve longer-term RCS goals beyond the project's lifetime?
✓ Have you considered how your MEL information could be used to support wider learning in good RCS practice, through publishing in peer-reviewed journals for example?
✓ Have you considered including a specialist researcher or a 'learning team' to focus on robust data collection and analysis to document progress and evaluate your RCS components?

Knowledge sharing and informing future practice
✓ Have you reflected on what learnings could help inform your own and others' future RCS endeavours?
✓ Have you considered running skills audits and skills training on knowledge translation to equip researchers to engage effectively with key dissemination platforms?
✓ Have you considered asking stakeholders and advisory boards to assist with knowledge translation and dissemination?



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