

STRENGTHENING SCHOOL LEADERSHIP TOWARDS IMPROVING SCHOOL RESILIENCY FINAL TECHNICAL REPORT

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SCHOOL RESILIENCY*

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FINAL TECHNICAL REPORT

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Executive Summary

“Strengthening School Leadership Toward Improving School Resiliency” was a two-year interdisciplinary multi-country development research project exploring how the quality of school leadership could be strengthened as a means of improving education quality in under-resourced environments. The primary objective of the project was to understand whether use of a specific continuous improvement approach, Improvement Science (IS), supports sustainable change in the practices of school leaders. School leaders are acknowledged to have a critical role in improving the quality of teaching and learning within schools. Continuous improvement methods such as IS offer a set of ideas, tools and practices which empower practitioners such as school leaders to take an active role in improvement, crafting a narrative which explains the improvement initiative and helping to remove obstacles and blockages in the improvement initiative, and other actions which move the institution towards its goals.

This exploratory multi-country research adopted a realistic evaluation (RE) framework to explore the use of IS with groups of school leaders in three contrasting contexts. The multidisciplinary research team collaborated with in-country partners across three continents: Chile – SUMMA (Laboratory of Education Research and Innovation for Latin America and the Caribbean); Kenya – Worldreader; Philippines – FIT-ED (Foundation for Information Technology Education and Development). Despite the constraints of the Covid pandemic in each setting, school leaders were recruited and improvement communities established and guided to engage with the IS methodology through carrying out “Plan-Do-Study-Act” (PDSA) cycles on local challenges. Data was gathered on the experiences of the school leaders through their improvement science journeys using a range of qualitative research instruments including records of the PDSA activities.

The project offers a contribution to knowledge by offering emerging findings on how an amended IS methodology might be effectively utilized by school leaders working in under-resourced contexts. To date, there has been little utilization of the Improvement Science approach in low- or medium-income contexts; relevant prior research has all been undertaken in high income contexts. Our analysis revealed that there can be clear benefits for schools when school leaders engage with the IS approach: changes in institutional practices, attitudes and relationships are noted when conditions are favorable. The findings draw attention to the importance of the school leader improvement communities. They enable school leaders to develop a broader vision on their work and strengthen potential for further collaborations towards common goals. These are values and behaviors which support implementation of a continuous improvement approach.

Our recommendations identify a number of issues for consideration in further research and implementation of the IS approach. Specifically, it is important to encourage school leaders to embrace continuous improvement as a core part of their leadership role. This may require changes in how school leaders enact their role. Practices such as team working, more consideration of different forms of data, and active experimentation are required for successful use of the IS approach. In addition, the IS approach will only be useful with particular kinds of problems. It needs to be used for small-scale change and improvements; it is not appropriate for tackling large or complex problems. From a development perspective, the use of IS methodology in education appears to offer the potential to shift towards more equitable dialogue between education partners when problem solving. It supports movement away from implementation of external “what works” solutions in schools and towards a legitimizing of the use of locally driven small changes or adaptations that respond to highly specific local conditions and capabilities. It moves discussion from “this isn’t being implemented properly or with sufficient intensity” to “is this the most appropriate change for my institution?” The sharing of these local improvements with peers and other actors starts to point towards ways in which school leader collaboration could be harnessed for improvements in the quality

of local education provision, in particular pedagogic change.

This research was undertaken in the highly fluid and dynamic environments of the pandemic; rules and expectations were constantly shifting, and project partners (development practitioners, school leaders and researchers) were experiencing the impact of COVID-19 in different ways. This led to a number of challenges. For example, local authority stakeholders had reduced capacity to engage with the project and organizing meetings with the school leaders was difficult at times. This forced a number of changes. Most significantly, the research in Uganda was not taken forward after multiple delays. The nature of the project gave rise to a number of internal project challenges. For example, the IS approach required multiple team members to move outside their usual roles and to become more enabling and less solution-focused.

The Research Problem

Background

School leaders are central to this development research. Our focus is strengthening the quality of school leadership as a means of improving education quality in challenging school contexts. We define school leaders as those educators who are responsible for the management and instructional leadership of institutions within public education systems in low- and middle-income countries (LMICs).¹

International scholarship points to the critical role of school leaders in improving the quality of teaching and learning within schools - through motivating teachers and students, creating enabling school environments, understanding local conditions, and mediating with the communities they serve. (Bush and Glover 2014, Leithwood & Jantzi 2006, UNESCO 2015). Context is important for school leadership (Marfan & Pascual, 2018) and school leaders' impact can often be greatest in the most challenging school conditions (Branch et al., 2013).

But in many countries, there has been only very modest investment in the role of school leaders to date. School leaders frequently receive little preparation for their role and there are few targeted professional development opportunities for them (Bush, 2013). Multiple reports document how they regularly focus on managerial tasks rather than leadership of teaching and learning (UNESCO, 2015). Strengthening instructional school leadership is a key policy priority for improving the quality of teaching and learning and achieving the targets of Sustainable Development Goal 4.

Societies and organizations experiencing major challenges and changes, such as the Covid crisis often look to their leaders to make sense of what is happening and to offer solutions or at least to improve the situation (Hartley, 2023; Heifetz, 1995). The pandemic and associated school closures brought new demands on school leaders. They were responsible not only for the continuation of student learning, where this was possible, but also for supporting the well-being of their students and staff and attending to community needs. They needed to prioritize and balance these demands in a highly uncertain environment where government advice was constantly changing, and resources were limited. As schools have reopened, school leaders have had to manage the resumption of in-person teaching and learning in a safe manner, consider how students can catch up on learning loss, and ensure the return to school of vulnerable students (Harris & Jones, 2020). These demands have been more intense in under-served communities where infrastructures are weak and there are high levels

¹ The term "school leader" is used here to describe senior staff in schools and other education institutions – principals and headteachers.

of poverty.

The Covid pandemic foregrounded the need for education systems across the world to strengthen their resilience by building capacity at various levels, including at the level of education institutions such as schools, to cope with future shocks and stresses (OECD, 2020). Institutions, such as schools, colleges, and communities of practice, are patterns of stability in social and organizational practices which reflect and mediate the beliefs and power structures of the wider environment in which they are embedded. But institutions can also change, (Scott, 2013; Greenwood et al., 2011), taking different trajectories over time and space (Micelotta et al., 2017). Institutional stability and change can each contribute to resilience in different ways in different contexts.

Organizational and inter-organizational learning helps to create resilience in institutions by enabling adaptation to changing circumstances (Hartley and Rashman, 2018). The focus on institutional work as a way for actors to change current cultures, practices and institutions opens up space to consider the role of leadership in institutions (Geuijen et al., 2022). The school leader improvement communities used in this project were designed to speak to this idea of enhancing resilient agency—capacity to change positively in response to local problems through peer collaboration.

Research focus

Our central research problem is the need to strengthen the quality of school leadership as a means of improving education quality in challenging school contexts. The particular focus is school leaders' institutional work to change practices and cultures associated with the pedagogic use of information and communication technologies (ICTs).

This research set out to explore the extent to which use of a specific continuous improvement approach, Improvement Science (IS), supports sustainable change in the practices of school leaders and contributes to increased institutional resilience.

Our detailed research questions:

RQ1. How and to what extent does an IS intervention involving school leaders provide a methodology for pedagogic change involving ICTs in schools in different contexts?

RQ2. Which tools and instruments (and under what conditions) effectively build school leaders' capacity to a. understand and analyze problems within their school system, and b. organize collective action in their school around desired goals?

RQ3. What are the contextual barriers and constraints to implementing an effective IS approach with school leaders?

RQ4. What changes in knowledge and skills are observed in school leaders who engage in the IS approach in different contexts?

RQ5. What structures, partnerships and conditions beyond the school play a role in enabling school leaders to observe and learn from each other (i.e., in creating and sustaining a Networked Improvement Community)?

IS offers a continuous improvement approach to change. Participants—school leaders, are guided to use tools which enable them to engage in rigorous analysis of problems, look at these challenges in new ways, and experiment with small changes—potential solutions—in a structured data-rich process. IS seeks to discern what works for addressing a specific problem within a local context and with local actors. This use of IS at school level is undertaken within the framework of a Networked Improvement Community (NIC), an intentionally created social organization aimed at building practice-based evidence (Bryk et al., 2015). It offers a mechanism for organizing collective action to move forward.

Project approach

Our exploratory multi-country research adopted a realistic evaluation (RE) framework to explore the use of IS with groups of school leaders in three countries. The multidisciplinary research team, comprising international researchers from education, leadership, and management science, collaborated with in-country partners across three continents: Chile - SUMMA (Laboratory of Education Research and Innovation for Latin America and the Caribbean); Kenya - Worldreader; Philippines - FIT-ED (Foundation for Information Technology Education and Development). This work was undertaken in the highly fluid and dynamic environments of the pandemic; rules and expectations were constantly shifting, and project partners (development practitioners, school leaders and researchers) were experiencing the impact of Covid in different ways.

In each country, the in-country partner cooperated with local authorities to select a small group of school leaders to invite to participate in the project (see Methodology section for further details). These school leaders and other local education actors formed an improvement community under the guidance of the in-country partner. The improvement communities identified a local issue—a problem of practice, which they would like to improve. These problems were initially related to a project focus on improving the pedagogic use of information and communication technologies (ICTs) during the prolonged school closures. Members of the community analyzed the system (school and context) to understand how local conditions contributed to the problem, and developed and tested their hypothesis through Plan, Do, Study, Act (PDSA) cycles. The ambition was for the school leaders to develop a problem aim statement and measurements for success, thereby creating local ownership of the solutions to identified issues and collective responsibility for testing them and spreading successes through the improvement community. This complex structure is outlined in Figure 1.

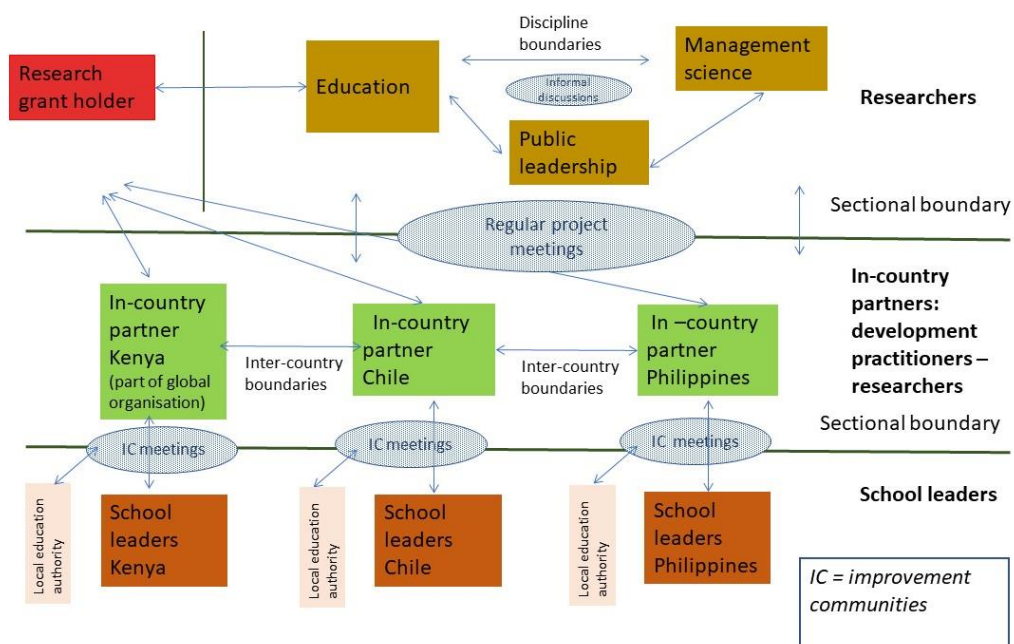


Figure 1. Project structure showing partners and their interactions

During the school closures of the pandemic much alternative educational provision harnessed the growing ubiquity of different forms of information and communication technologies (ICTs) even in LMIC countries. Hence pedagogical use of ICTs was originally agreed as the central theme of the institutional improvement work in line with the project objective: to contribute to improved quality and equity of the continued learning and well-being of girls and boys in the Global South during the

prolonged school closures of the Covid crisis and future emergencies.

In the Philippines, local authorities requested support with the use of 2-way radios to make remote learning available to pupils in the project district during the prolonged school closures. In Kenya, the in-country partner, Worldreader, proposed to support the school leaders to use the Worldreader digital app (Booksmart) to support parents and caregivers reading with their children. In Chile, it was agreed with the local authority, the Local Public Education Service (*Servicio Local de Educación Pública* - SLEP), that the improvement focus would be selected through discussion with the school leaders once the improvement community was established.

Project progress and contribution

The project was established in three diverse countries, school leaders were recruited, improvement communities established, and guided to engage with the IS methodology through carrying out PDSA cycles. Data was gathered on the experiences of the school leaders throughout their improvement science journeys using a range of qualitative research instruments. Analysis of this data has generated new knowledge on the usefulness of a continuous improvement approach in education. This was achieved despite the pandemic and multiple local challenges beyond the control of project members.

In the Philippines and Kenya, initial attempts with the IS methodology were somewhat sporadic and incomplete for various reasons: there was lack of clarity in the problem identification, or the problems were too complex or inappropriate for a process improvement approach; the IS tools were too complex; and lack of stability in the environment limited the use of this type of improvement approach. The tools were subsequently simplified, and school leaders encouraged to select their own improvement problem and measures. This stimulated many school leaders to deeper engagement with the methodology and successful enactment of PDSA cycles, with some school leaders moving away from the focus on the pedagogical use of ICTs. Measurable improvement in relation to these “micro-challenges”² was reported by a majority of school leaders in both countries. In Chile the participating school leaders were part of a new administrative infrastructure and it was agreed to spend time forming an inclusive improvement community in partnership with the new local authority, the SLEP. A form of IS methodology was deployed to support the design and establishment of the improvement community, named by participants as Advancing Together.”

We had initially planned to use the concept of the Networked Improvement Community (NIC) in which variation in the implementation of improvement across different settings (schools) enhances collective understanding of how innovations can be adaptively integrated with efficacy in different schools (Bryk et al., 2015). However, in the absence of in-country skilled researchers (or visits from the global researchers) and in the uncertain and difficult environment of the pandemic, it was not possible to implement the NIC model, and instead we attempted to build simpler less structured improvement communities in which school leaders each selected their own micro-challenge related to a shared challenge.

Undertaking research in the conditions of the pandemic was extremely difficult. Government guidance shifted frequently, and school leaders moved several times between school closure, partial school opening, and full opening, often with little notice. Local officials had reduced capacity for engagement, and this caused delays in securing the relevant permissions, including ethical clearance. Restrictions on travel, limits on gatherings, and health concerns all required highly flexible project working and multiple modifications to the research processes. Other contextual issues such as elections, administrative changes, and climate disasters—typhoons and droughts, contributed further to highly unstable environments at each research site. Collectively these conditions contributed to

² Examples of micro-challenges are given on pp. 37-39.

considerable delays in undertaking the field activity and consequently reduced the time available for working with the school leaders. Hence, we can only claim to have initial indicators of any sustained changes in their attitudes and practices. With a longer timeframe, it might have been possible to gather evidence on whether school leaders were drawing on the IS methodology when approaching new challenges and the extent to which the IS approach was shifting their behavior as institutional leaders.

Finally, we had initially planned to work in four different country contexts but delays in obtaining research permissions combined with lengthy school closures and strict lockdown procedures meant no research was undertaken in Uganda.

The project offers a **contribution to knowledge** on how an amended IS methodology might be successfully utilized by school leaders working in under-resourced contexts to support changes in institutional practices, attitudes, and relationships. It offers a comparative analysis across different geographies and systems of the conditions which support or hinder the use of the IS methodology, draws attention to the importance of partnerships (through improvement communities) and documents promising emerging changes when conditions are favorable. Many of these findings echo those of high-income contexts (e.g., Tichnor-Wagner et al., 2017) but are complemented by previously unreported insights on the importance of contextual factors, in spite of the relatively small scale of the research.

From a **development perspective** the use of IS methodology in education appears to offer the potential to shift towards more equitable dialogue between education partners, moving away from the idea of problem-solving through implementation of external “what works” solutions in schools, and towards a legitimizing of the use of small changes or local adaptations that respond to highly specific local conditions and capabilities. It moves discussion from “this isn’t being implemented properly” or with “sufficient intensity” to “is this the most appropriate change for my institution— what works for my institution?” The sharing of these local improvements with peers and other actors starts to point towards ways in which school leader collaboration could be harnessed for improvements in the quality of local education provision, in particular pedagogic change.

Background Literature

Defining Improvement Science

Improvement Science is one manifestation of a series of practice innovations that have occurred in the context of system or continuous improvement (CI) over the last one hundred years (see Annex 1). Early methods of CI were developed mainly based around the work of W Edwards Deming. Improvement Science (IS) is an adaptation of CI specifically for healthcare, initially driven by the Institute for Healthcare Improvement (IHI) but then adopted by others such as the Health Foundation. As such, most of the definitions focus on applications in healthcare. For example: “Improvement science is about finding out how to improve and make changes in the most effective way. It is about systematically examining the methods and factors that best work to facilitate quality improvement” (Health Foundation, 2011).

It is from this work that Improvement Science in education largely derives (Carnegie Foundation, 2009). The origins of most of the underlying philosophy of how to implement improvement come from the work of Deming, utilizing his “System of Profound Knowledge” (McConnel, 1988; Evans, 1996). Deming’s idea was that improvement should be done differently, understanding four key elements of organization improvement and change:

1. *Appreciation of a system*: All production and service systems are made up of components that interact with each other. Many systems are complex and adaptive.
2. *Theory of knowledge*: You need an understanding of the issues you are focusing on and the limits of what can be known.
3. *Knowledge of variation*: You need an understanding of what causes variation in a system, e.g., why is performance worse this week than last week?
4. *Understanding psychology*: Generating a better picture of what motivates people in work, how to interact and how they react to change.

This resulted in a comprehensive set of principles—Deming’s 14 Points—about how organizations should be managed holistically.

The methods used by Improvement Science

The principal method used by Improvement Science is the Plan-Do-Study-Act cycle as defined by Deming (see Figure 2).

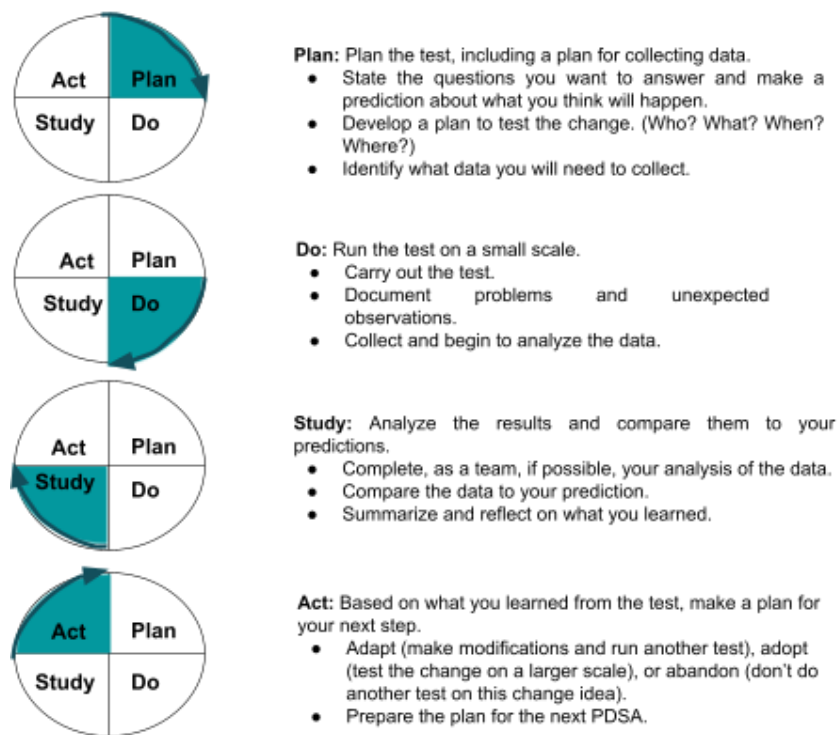


Figure 2. The PDSA cycle (adapted from Institute for Healthcare Improvement, 2017)

The method offers an essential discipline of how a problem is defined and analyzed, and how an improvement is derived and tested. Critically there is a very clear decision point at the end of an experiment to decide whether the change being tested should be kept (and possibly spread) or whether the change should be withdrawn, and another possible solution tested instead. Two points must be emphasized. First, PDSA is a very different way of systematically conducting experiments when compared with normal scientific approaches, as in the example in Table 1.

Whereas conventional scientific methods may take many years to yield statistically robust answers, IS uses systems theory to identify coincidental changes in a system performance when a change to a process is made. Statistical Process Control (SPC) measures can be used to assess the impact of a change in a consistent manner, but the underlying statistical theory being applied is very different. This

takes away the ideas of proof only being obtained in activities such as (clinical) trials that may take years to realize a definite answer.

Table 1. Scale up of knowledge: Contrasting paradigms (adapted from Lewis, 2015)

	Experimental Science Paradigm	Improvement Science Paradigm
Strategy	Implement the program as an addition to new sites' practices	Integrate the program with local knowledge-building systems
Nature of scale-up	<ul style="list-style-type: none"> • Implement relatively fixed model at new sites • Customize only if absolutely needed • Apply incentives to adopt the system 	Modify the implementation by: <ul style="list-style-type: none"> • Building consensus on how to measure improvement • Building understanding of variability • Using rapid PDSA cycles to enact and study program elements
Assumptions	<ul style="list-style-type: none"> • Knowledge is already present in the program. • Improvement occurs through accurate implementation. • Variation (deviation) is problematic. 	<ul style="list-style-type: none"> • Knowledge is in the people and systems that use the program. The program may need modifications. • Variation can be a source of ideas to improve the program.
Measurement	Use well-validated tools to measure impact.	<ul style="list-style-type: none"> • Use practical tools, e.g., statistical process control (SPC) measures, to test leading indicators. • Use balancing measures to check for adverse impacts.
Optimal Improvement Conditions	Success is likely if new sites do the same as existing sites.	New sites need not be the same. Success involves customization.

Secondly, historically most experiments in organization design have started with a plan that is expected to succeed, the assumption is that the proposed change is likely to work and needs to be “tweaked” to establish maximum effectiveness. In IS, PDSA experiments are conducted with an open mind about how effective a change may be, especially in a complex, adaptive system (e.g., teaching and learning). The result being measured is not just the outcome of the immediate change but the adaptation of the system as a whole to that change. Consequently, many experiments “fail,” that is, the change enacted does not lead to the desired outcome, and the Act stage of the PDSA cycle is an adaptation or removal of a change in such cases (not “more” or “bigger”). The initial mindset when a failure occurs is, “Did we find the root cause? Did we make the right change,” and not just “Did we do the change enough?” A final point is that reporting systems have to accept failure, and reward improvement activity, not just successful changes.

Implementation of Improvement Science in organizations

Critical success factors

In our study, one of the reasons why IS was proposed as a methodology is that it can be used as a method of improving problem solving capability (Kovach & Fredenhall, 2014). The notion is that a problem-solving capability in an organization can help build resilience to unplanned events or changes in the operating environment. This idea is grounded in theory. Strategy theorists refer to “dynamic capability” (Teece & Pisano, 1994) where organizations have a capability to adapt and change. Improvement activity is seen as a process of learning and innovation that takes considerable time to develop, sometimes up to 10 years for the approach to be established. For example, Bessant and Francis (1999) see the development of a strategic improvement capability encompassing a series of stages:

Table 2. Stages in the development of strategic improvement capability (Bessant & Francis, 1999)

Stage	Performance	Practice
0	No CI	Random problem-solving
1	Trying out ideas	Short-lived or local efforts
2	Structured CI	Formal attempts to sustain, e.g., through training
3	Strategic CI	Setting of goals, measurement of CI
4	Autonomous innovation	High levels of experimentation
5	The learning organization	CI as a way of life, everyone involved

Short-term approaches are often not successful, with such attempts focusing on the wrong types of practice. For example, IS comes with an extensive toolkit (Lemire et al., 2017). A common problem is to mistake the use of an improvement toolkit as evidence of an established CI system. Seddon (2009) bluntly warns to “watch out for the toolheads” where there is extensive reliance on improvement tools such as fishbone charts etc., but little understanding of the wider context.

A wide range of studies have looked at the critical success factors associated with CI. An early study (Kaye and Anderson, 1998) found factors including:

- Making the adoption of CI part of the strategy across the entire organization
- Establishing a culture for continuous improvement where improvement activity is seen as part of the behavioral norm
- Encouraging high involvement in innovation and learning. The results from CI activity can be a tremendous opportunity for learning how a system behaves and therefore how to make it perform better
- The automatic capturing and sharing of learning through collaborative engagement.

More recently Cano et al. (2017) place critical success factors in three broad categories: leadership factors, staff buy-in and operational issues. Take, for instance, schools. Like any other change process, teachers and other staff have to accept the need for change and also see that the changes proposed are the right type of change. Where processes are so dysfunctional there will always be a tension between staff dealing with current problems and finding time to improve the system.

Much research focuses on the participation and involvement of a workforce during CI. The relationship between employee and supervisor is critical and the ways in which this relationship is influenced impacts on success (Lam et al., 2015). Arguably the role of the middle manager, or in our terms, the school leader, is the most affected by the introduction of CI practices. It is recognized that “Command and Control” practices or purely top-down management approaches are unsuitable in this type of environment (Ryan, 2016; Seddon, 2005). CI needs “bottom-up” active involvement of staff to participate in improvement teams. As Ryan (2016) states, “the top-down approach assumes that the staff accept and implement senior management decisions without influencing those decisions ... It is the front-line staff, and their willingness to accept, embrace and adopt an improvement initiative that ultimately determine results” (p. 459).

Four key roles for the middle manager are identified in a CI context:

1. Communicator (acting as a knowledge broker)
2. Campaigner (acting as coach, facilitator, or team leader)
3. Coordinator (networking and influencing)
4. Conflict manager (addressing resistance, disagreement etc.)

The values possessed by managers involved in CI are also influential. CI requires managerial values of trust, openness, cooperation, empathy and humbleness (Jabnoun, 2001); in this project these points towards understanding how these might emerge or be strengthened within school management regimes in different contexts.

CI does not thrive in a command-and-control environment as this environment usually removes discretion of employees to make changes or decisions without referral to higher authority and requires compliance. It is essential that steps are taken to address the fundamental shift in behaviors and skills needed by those in managerial roles to change how they manage their staff, with a clear shift towards a more coaching and development approach to supervision rather than one of monitoring and control. This is particularly pertinent in the environment of schools where school leaders have not historically engaged in coaching of their staff. The change in management style also requires some adaptation of the use of performance measures and performance management (Bond, 1999). Literature on the public sector highlights problems where improvement behaviors are not encouraged in the presence of targets (Seddon, 2003). Furthermore, part of the point of a PDSA cycle is to experiment and learn through failure. Where failure has to be reported to seniors, this encourages manipulation of results or lack of effort.

Fryer et al. (2007) highlight that many success factors are influenced by the public or private nature of the organizations where it is implemented. They point out that public bodies and NGOs have three distinctive domains: the policy, the managerial and the professional. The complexity of “who is the customer?”, the conflicting aims and political whims all add to the difficulties of managing improvement.

Finally, one of the contextual factors more pertinent in our research is the relative stability of the environments in which the school leaders are operating. The literature has examples where the stability of a system is seen as an essential component of successful CI (Naidoo and Fields, 2019). This is where our work arguably takes CI into a very different set of circumstances. Balle and Regnier (2007) suggest that CI cannot be expected to work in environments which lack *basic stability*. They state:

In a chaotic environment, any “improvement” activity can easily shift the burden to another element of the system, which will then collapse, often cancelling the initial positive results. In lean, basic stability is absolutely essential to create the proper learning environment where

employees can see clearly the impact of their actions and then learn through the kaizen activities, not simply make the problems go away. (p. 35)

Continuous improvement in education

Use of IS in education is relatively new (Rohanna, 2017). Much of the work on IS in education has taken place in the USA, driven by the Carnegie Foundation (2009). Here it has been used to tackle issues as diverse as early literacy rates (Baron, 2017) and retention of college students (Spaulding & Hinnant-Crawford, 2019). However, this work has not been without difficulties: integrating continuous improvement processes into the everyday working of education institutions is not straightforward. CI, from which IS has emerged, has its origins in closed manufacturing systems. Education systems are embedded within communities—they constitute complex ecosystems with porous boundaries and multiple stakeholders whose aims are not always aligned. Studies on the use of CI in education have picked out some specific issues. Yurkovsky et al., (2020) focused on the need for four shared commitments:

1. Grounding improvement efforts in local problems or needs
2. Empowering practitioners to take an active role in research and improvement
3. Engaging in iteration, which involves a cyclical process of action, assessment, reflection, and adjustment
4. Striving to spur change across schools and systems, not just individual classrooms

They also point out a key difference in the nature of CI in education, namely that the problems being tackled have a number of common characteristics. They are seen as:

1. Ambiguous and wicked problems, involving competing goals and value systems
2. Variable and context-specific variation across schools or districts arising from diverse and changing teacher and pupil needs
3. Interdependent and nested, attempts to solve one problem can implicate other parts of the system.

This has the consequence that “PDSAs are a prominent protocol for iteration across CI methods, but educators have struggled to use PDSAs in certain contexts, particularly when problems are less well defined and data sources more problematic” (p. 424).

Their later research (Yurkovsky et al., 2021) highlights the difficulties of complex institutional and technical demands of CI. As such, this principle of matching CI approach to the complexity of the problems being addressed is pertinent. Furthermore, as they indicate, the use of data in education systems is very different; it is usually generated on a longer time frame, and structured use of data to support continuous learning is not embedded in institutional practices especially in many low-income countries. Hence what happens when we transfer IS tools into the education contexts with the added complication of low levels of resourcing, multiple system stresses, and weak system mechanisms is still very much unknown.

Issues with the PDSA methodology

McNicholas et al. (2019) suggest that false assumptions can be made that PDSA is easy to understand, teams are motivated and willing to use PDSA, and that it is easy to apply. In practice, support strategies need to be in place when teams have difficulties using the methods. Related to this, there is often a lack of compliance with the use of the PDSA cycle (Taylor et al., 2013). One study (Walley & Gowland, 2004) identified that many teams only complete the first two stages of the cycle—plan and do—without measuring results or acting on findings. Other teams jump to solutions where the PDSA is de facto replaced by an action to implement a preconceived idea without any further analysis of the problem or reflection on the validity of the proposed solution. One problem often seen is that evidence

generation as part of the improvement cycle does not always produce the results expected, resulting in the team learning from the experience.

Evidence from the US education sector shows other challenges. In one study (Tichnor-Wagner et al., 2017) participants did not necessarily have the motivation or desire to carry out a PDSA as they thought it removed from their daily work. This problem is exacerbated by a feeling that there is no spare time in which to carry out the PDSA.

Improvement Teams and Networked Improvement Communities

In education, the use of CI approaches has been strongly associated with improvement teams or communities. For example:

A critical action step is that each school district must sign a cooperative agreement to establish Continuous Improvement Teams (CITs) at the district and school levels. These CITs represent a fundamental system capacity-building change in how decisions are made at the school and district levels—a change that is also fundamental to creating lasting improvements... (Blanton and Harmon, 2005, p. 1)

One relatively recent innovation is the use of PDSA cycles by Networked Improvement Communities (NICs). These are intentionally designed social clusters in which PDSA implementers from multiple organizations or institutions and levels within a sector come together to work on shared problems and in this process, build practice-based evidence (Bryk et al., 2015) and “learn from each other and with each other” (Milder & Lorr, 2018, p.2). As such, NICs bring the IS approach to life (Milder & Lorr, 2018). The notion of working toward a shared aim is a distinct feature of the NIC. For this, the NICs may develop and/or adapt practical tools to assess the impact of actions, ensuring that these tools are aligned to the specific context, actions, and outcomes (Bryk, 2015; Feygin et al., 2020). In the NICs, variation in outcomes and contexts are treated as learning opportunities rather than obstacles or barriers. NIC members develop expertise in the ways that interventions can work sustainably and reliably. The central aim of the NIC is to create innovative solutions to existing problems but the core of this work involves honing members’ experience, drive, and willingness to co-learn in light of the problems. By sharing and collaborating, “NIC members marry the improvement science problem-solving approach and the power of testing with learning across multiple [institutional] contexts” (Milder & Lorr, 2018, p. 2).

Leadership

An early definition came from Stogdill (1950: 3): “Leadership may be considered as the process (act) of influencing the activities of an organized group in its efforts towards goal setting and goal achievement.” This definition views leadership as a social and relational process, so it is not just about leader characteristics but what happens between people, and it links leadership to purpose. However, from a public leadership (including school leadership) perspective, the emphasis on an organized group is too limited—leadership may be with stakeholders and members of the public as well as those in organizations or formal partnerships. In schools this may include national and local governments, parents, community members and so on. Hartley (2018: p 203) suggested public leadership is “mobilizing individuals, organizations and networks to formulate and/or enact purposes, values and actions which aim or claim to create valued outcomes for the public sphere.”

In discussing school leadership, Bush and Glover (2014) describe it in activity terms as a process of influence towards desired purposes, involving the development of a vision and set of values, and that leaders articulate the vision to staff and other stakeholders. This articulates with the observed need for managers or leaders of IS activities to hold particular values and work in a collaborative open manner.

Leadership can be based on the person, the position and/or processes (Hartley and Benington, 2010). Leadership based on personal traits and qualities has some place in leadership but has been overrated in the past and is seen broadly to have low predictive validity in terms of organizational improvement. Leadership through position recognizes that hierarchical positions within organizations provide the authority and resources to influence others but on its own is insufficient as a means to exercise leadership. Head teachers are school leaders through virtue of their appointment in a school hierarchy and can then act to influence others towards various goals, including, where appropriate, school improvement. However, even those who are officeholders may not necessarily show leadership, even if they have scope to do so. Some focus more on managing and do not really lead. In fact, there is likely to be some overlap between management and leadership, the former being about the organizing needed to achieve performance on agreed goals and behaviors by others within organizational structures while the latter is about influencing others to achieve values and purposes including change and improvement. But some school leaders will exercise leadership beyond their management duties.

This brings us to the third approach to leadership, which is as a process of influence. Leaders are involved in mobilizing, influencing, motivating others, and providing a vision and sense-making to enable people to cohere around a project, plan, or goal (Hartley, 2023; Grint and Smolović-Jones, 2022). If we examine these processes in relation to school leadership they could include helping others understand the purposes and vision of the school; motivating and supporting teachers to engage in improvement of the teaching and learning environment and activities; shaping the improvement initiative of this project; engaging other stakeholders relevant to the initiative; crafting a narrative which explains what the improvement initiative is concerned with and what it aims to achieve; helping to remove obstacles and blockages for teachers in the improvement initiative; and other actions which move the institution towards its goals.

Leadership may sometimes be distributed or shared, not just located in a single individual (Spillane et al., 2001) and this is often true of school leadership, where some leadership responsibilities may be delegated or where individuals exercise leadership through their own roles.

This brief overview of leadership provides the framework for thinking about school leaders, both in their formal hierarchical positions, but also in terms of what they do in order to shape the improvement activities examined in this report.

Analytical Framework

From the literature review and drawing on previous work we have produced the framework shown in the figure below that identifies the potential aspects of the project where data needed to be captured and how this could be linked together. Our framework starts with an understanding of the aims of the project and how this might influence both the implementation of IS and the overall outcomes. The literature identifies that the context of our work is an important element which shapes how particular interventions (such as an improvement initiative) are perceived, understood, and reacted to. This understanding is also consistent with our realist evaluation approach (Pawson and Tilley, 1997).

But the continuous improvement activities are being imposed on an existing managerial system in each location, and the degree of fit between IS and existing management systems and practice is potentially key to the adoption of IS. However, this is a mutual process; implementation of IS will also likely influence management practices, in particular the ways in which improvement networks are created as an extension of management systems. Once this is understood we can interpret the implementation of IS, including the role of the improvement community, and the use of IS tools and techniques. A focus for us here is to see how methods and tools are accepted and adapted to suit the

context—given that our early discussion highlights that IS was originally designed for relatively closed systems (from a manufacturing origin) not the open systems evident in an educational setting.

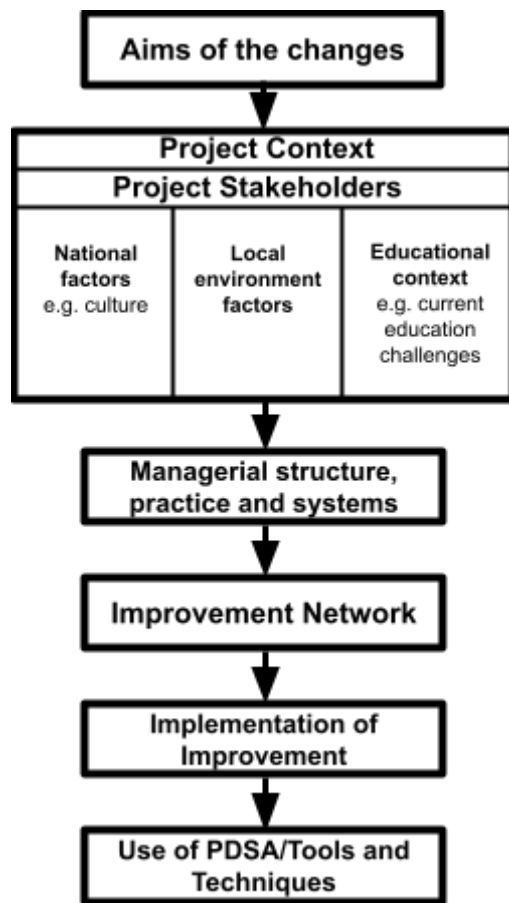


Figure 3. Analytical framework for the influences on successful adoption of IS

Methodology

The framework

In this project IS is introduced to school leader improvement communities with the aim of enabling them to take ownership of their identified school improvement focus and play an active role in dialogues about why things work as they do and how they can be improved. Study of how the improvement communities utilize the IS methodology is through a realist evaluation (RE) (Pawson & Tilley, 1997) approach. Realist evaluations are increasingly being used to explain and understand why social programs achieve intended or varied outcomes in specific social contexts. They can lead to “concrete policy recommendations... on social problems” (Fletcher, 2017, p. 191).

The realist evaluation approach acknowledges that social phenomena and programs (such as education) are inherently complex (Lewin, 1946) and that small shifts in social context can have significant impacts on program outcomes (Houston, 2010). It provides a framework for describing this complexity and to infer explanations of what is working “for whom, in what respects, to what extent, in what contexts, and how” (Pawson & Tilley, 1997, p. xvi) through the iterative use of empirical data and abstract theory. Institutional analysis encourages a focus not only on rational processes but

symbolic, legitimacy and reputational processes. We examine these processes through the analysis of context at three levels— wider national level, local district/province, and institutional/school level, and how they create constraints and opportunities for school leaders to undertake improvement actions.



Figure 4. Context analysis framework

National policies provide the cultural–historical origins of school leaders' goal directed activities but how these goals are constituted in practice (participation in activities) is shaped by situational factors at local level in the districts and school communities (Billet, 2008). School leaders' scope for acting agentively—their personal agency—will differ depending on circumstances, activities and collaborators and the possibilities that these afford them. Participation of school leaders in the improvement activities will also be mediated by each individual's personality and other characteristics such as gender, age and disability, and socially shaped in unique ways that arise from their own particular capabilities and personal professional histories (Mead, 1913)—each school leader's subjectivity and sense of self will be important in how they engage and value this work. Individual change (a sense of becoming more competent in their professional role) and the revising or remaking of work practices are intertwined (Leontyev, 1981) as school leaders negotiate between their immediate experiences and their previous experiences whilst using the PDSA cycles in the improvement community and their schools.

Method

The project was primarily characterized by a qualitative multi-layered case study design. The cases (in Chile, Kenya and the Philippines) were based on accessibility (essential during the Covid pandemic) rather than typicality—they were telling case studies (Mitchell, 1984), suitable for an exploratory study such as this which did not necessarily seek to investigate a representative sample leading to the generalizing of findings to the wider population in context.

Data generation

In line with the RE approach, a range of data generation methods and data (Mathison, 2005) were used including records from the Improvement/Plan-Do-Study-Act cycles and evidence of participants' experiences. In essence, the research design moved iteratively between qualitative data from the school leaders themselves on their experiences and changing practices with the PDSA cycles, and data on social interactions within the improvement communities and reflections during project workshops. Embedded in the design was diagnostic data collection undertaken at various points in the project to identify and collaboratively respond to important impactful features that shaped the implementation of the approach and the adaptation of design and methods across the project sites. Using individual or group semi-structured interviews, data on school leaders' backgrounds, experiences and practice changes were collected at three different times in the project (before, during and after the implementation of the PDSA cycles) in each country.

Planning data

In all three countries, initial planning data was gathered through a survey of all participating school leaders to establish participant profiles: their demographic characteristics, leadership backgrounds, current priorities, school sizes, levels of resourcing (including with regards to infrastructures, ICT, and other facilities) and so on.

Added to this was an evidence-based diagnosis carried out through participatory conversations with stakeholders to assess the local context, current initiatives, key levers for improvement, potential partnerships and possible barriers and observations and outputs from workshops with school leaders and local stakeholders. In the Philippines, an inception meeting and a workshop were organized with District and Division officials as well as the 19 participating school leaders for this purpose. Exploratory interviews were also held with the Division Education Program Supervisor and a Public Schools District Supervisor. In Kenya, this stakeholder engagement took the form of two consultation meetings with sub-county officials, including directors from the Teachers Service Commission (TSC). In addition to three virtual consultation meetings in Chile, four group interviews were conducted with Supporting Professionals in the local education service (SLEP). Additional useful contextual information generated through these encounters included school leaders' responsibilities, positioning, expectations, and the conditions of their role in each context, their day-to-day tasks and sources of support, their local professional networks, structures, and ways of working (including in terms of use of data or evidence-based planning and decision-making).

PDSA implementation data

Two sets of PDSA or improvement activities were implemented in each country site. In each PDSA phase record sheets and data from the cycle were shared with the research team so that we could see how the PDSAs were being managed and the ways in which the problems were structured and addressed. In Kenya, in Phase 1, nine separate PDSA reports were generated by the teams, although in one case there were multiple PDSA cycles summarized in the one report. In Phase 2, 12 cycles were generated. In the Philippines the PDSA activity was documented using locally adapted IS tools that were collaboratively developed by the in-country partner and research team. These tools included individual reflective journals. All 19 school leaders used a set of tools (to varying degrees) to complete a PDSA process for Phase 1 and Phase 2. Then eight school leaders completed PDSAs that they designed in Phase 3 (project extension). In Chile there was a narrative report on the two cycles of improvement activity undertaken with the emerging improvement community.

Improvement community meetings and workshops (minutes and observations)

During PDSA activity implementation in the project, the improvement community in Chile held five workshops while those in the Philippines and Kenya held three each. Alongside workshops, all the in-country partners organized meetings (improvement community meetings) for the school leaders in

their area: Chile (2), Kenya (6) and the Philippines (4). Observations and note-taking of interactions in the improvement communities were more difficult than planned because most of the meetings were virtual without cameras due to bandwidth restrictions. More useful was data from the workshops.

School leader experiences

As far as possible, semi-structured interviews were conducted with school leaders after each set of PDSA cycles as follows: Kenya, 24 interviews (2 with each participating school leader); Chile, 28 interviews from 15 school leaders (two leaders were not available for the second round of interviews); Philippines (19 school leaders), eight baseline individual interviews were conducted involving six school leaders. In this difficult context with strict lockdown rules, it was not always possible to schedule interviews with all the school leaders and there was some minor drop out as the project progressed—five midline and seven endline interviews were conducted (making a total of 20 interviews). These were complemented by individual reflective journals.

The interviews aimed to generate responses on school leaders' experiences of the activity; how they used the PDSA cycles; what they found helpful about them and what is difficult; and how these experiences are taken into wider practice, in particular problem-solving in relation to pupils' learning. Interviews encouraged school leaders to develop and articulate reflections on their participation in the IS process.

All research instruments were ethically and collaboratively developed by the global research team and in-country partners. Field activities were conducted in English, Spanish, Filipino and Maranao as appropriate and undertaken by the in-country partners except in Kenya where the global research team contributed in person to the final endline field activities including interviews.

Participants

In Kenya the following factors were considered in selection of school leaders: established relationships with Worldreader through previous engagements, school leaders' relative proximity to one another and their interest to participate in the project in addition to consultation with local authorities such as directors from the TSC. In the Philippines, the district for the study was recommended by the Philippines Department of Education District and Division supervisors. This recommendation also rested on DepEd's relationship with the in-country partner, FIT-ED, developed through prior engagement regarding the scale-up of an early language literacy and numeracy digital program. DepEd insisted that for equity all schools in the district be included in this project.

The choice of Chile's project site was informed by the administrative reorganization—the partner SLEP is one of the earlier established authorities. The SLEP strongly emphasized the integration of early childhood education centers and preschool leaders as a priority agenda for the new administrative service, leading to the inclusion of all 15 preschool centers in the SLEP for the project.

Extensive liaison with local authorities was critical both to facilitate project endorsement from the relevant authorities and to ensure that project activities were properly contextualized and responsive to the needs of the local education system.

Table 3. Research participants and their schools

		Chile	Kenya	Philippines
School leader participants		15 pre-school center principals	12 primary school leaders	19 primary school leaders ³
Gender		All female	11 females 1 male	All female
Qualifications		All have an Early Childhood professional degree and a Bachelor of Education academic degree. Seven have a postgraduate degree: five of these correspond to a Certificate in some specialty, and two, a Master's degree.	Nine have a professional qualification in leadership. Only three have a Bachelor's degree and one, a Master's degree. Seven have a Diploma and one has a P1 certificate which is obtained from teacher training colleges.	All have a Bachelor's degree—one has a Master's degree and six hold PhDs.
Years of experience as a school leader		Average of 18.2 years	Less than 5 years: 7 5-10 years: 2 11-20 years: 2 Over 20 years: 1	Less than 5 years: 2 5-10 years: 5 11-20 years: 9 Over 20 years: 3
Characteristics of school leaders' school	Pupil enrolment	60-208	600-3000	50-500
	Average class size	25	55	20
	Staff numbers	10-29	11 schools with over 30 staff 1 school with 13 staff (private school)	7-11

Differences in the qualifications and experience of the school leaders at each research site reflect national structures for school leadership.

Project working during Covid required online meetings and digital communications hence understanding participants' access to digital tools and levels of digital literacy was important in

³ Fourteen of the project school leaders were "Teachers in Charge" (TIC). These are senior teachers taking on the role of school leader but who have yet to meet the requirement to pass a qualifying exam for headship.

establishing the improvement communities.

Table 4. School leaders' ICT use

Chile	Kenya	Philippines
<p>All use smartphones and social media platforms. Leaders were less familiar with online meeting platforms prior to Covid but during the closures they have developed their skills with these tools.</p>	<p>All own a smartphone and use this every day. Leaders frequently use desktop computers at work for statutory data entry but none expressed a high level of confidence in the use of ICT—most expressed an average level of confidence.</p>	<p>Most frequently use mobile phones and laptops but not online meeting platforms such as Zoom or Google Meet. They almost all had previous experience of using the two-way radio before Covid-related school closures and do use Facebook but not other social media such as Twitter.</p>

Ethics

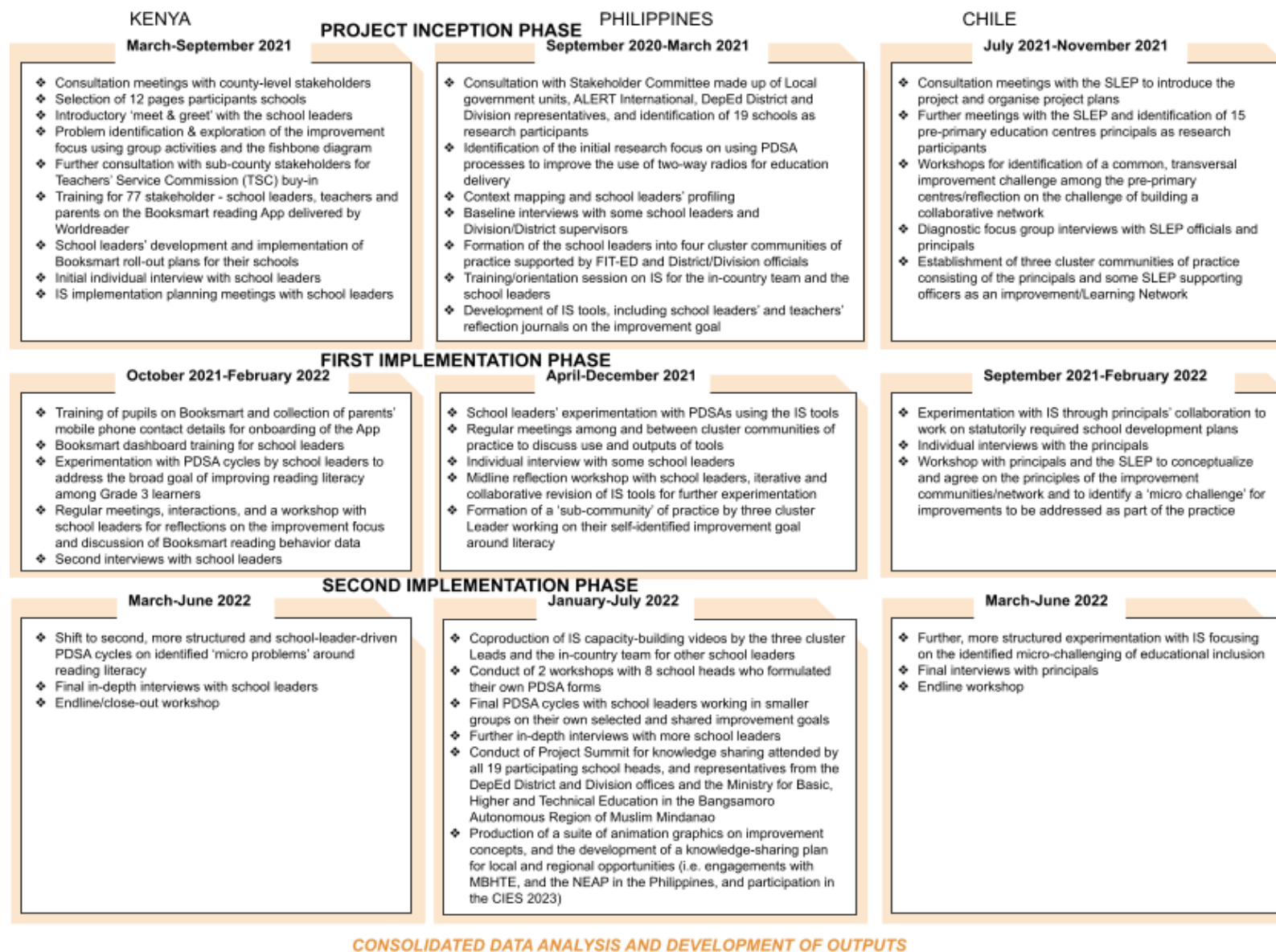
Ethical clearance was obtained from a local ethics board in each country—Strathmore University Institutional Ethics Review Committee (Kenya), the Department of Education Division Office of Lanao Del Sur II (Philippines) and the SUMMA Ethical Review Committee guided by the National Research and Development Agency (Chile). In-country teams provided all prospective participants with a project brief clearly stating the purpose of the study and how data collected will be used. Participating school leaders all signed a consent form with the understanding that participation in the study will be on a strictly voluntary basis and that they may withdraw from the study at any point. Every effort has been made to protect the confidentiality of their private data; direct quotations and other individual responses of a private or sensitive nature are anonymized. Where possible and when appropriate, participants were given the opportunity to validate data—in Kenya, for example, a validation workshop was held with the school leaders to, among other things, “play back” and confirm their responses about ongoing challenges captured in a fishbone diagram. Country partner staff were trained on methods for generating, recording, and storing data.

Analysis

The analytical framework was used to understand how the contextual features and relationships that combine with school leaders' characteristics, backgrounds, and experience to produce specific types of outcomes.

Timelines

The core approach and design of the research were consistent across each of the three country sites. However, these were taken up differently in each country and adapted during implementation in response to unfolding contextual circumstances, including related to historical, political, practical/logistical, and other elements within both national and local landscapes. These contextual factors impacted, for example, the make-up of the improvement communities, the pace, frequency, and quality/substance of the PDSA activities, the number and focus of interviews and so on. Hence the timelines for each country were very different across the various phases of the project. The figure below presents an overview of the timelines.



CONSOLIDATED DATA ANALYSIS AND DEVELOPMENT OF OUTPUTS

Figure 5. Project timeline

Research Results and Development Outcomes

We discuss here a small selection of project results using our analytical framework (see Figure 3). We start by outlining the various contextual factors, at national, local, and school level which condition school leaders' capacity to be agentive with the IS approach and shape their engagement with it, in particular we highlight the relevant aspects of education policies and associated management structures. Education policies are part of the mechanisms through which the rationalities of the dominant discourse are put into practice (Ball, 2010) and work to contribute to the production of certain subjectivities in those working within the education system although the possibility of resistance to these discourses remains open for individuals.

We have attempted to summarize data in the tables and commentaries below; under each heading we have highlighted the factors which were most pertinent to project working in that context, hence the information does not always allow a direct comparison.

Project aims (at start)

At the start of the project the county teams shared the same general aim: to explore how use of an Improvement Science approach strengthens the capacity of educational leaders to solve problems and bring about positive change in their institutions. In Chile, the team moved away from the original project focus on improving the pedagogic use of information and communication technologies (ICTs) after much negotiation with the local partner, the SLEP.

Table 5. Country program project aims

Chile	Kenya	Philippines
To improve the educational leadership skills of preschool principals	To improve reading literacy among primary school learners using the Booksmart reading App developed by Worldreader	To improve the use of two-way radios for basic education delivery during the Covid pandemic (leveraging a wider initiative run by the national Department of Education—DepEd)

The research contexts

National context (including education)

The table below shows relevant observations in the period of the project relating to national responses to Covid, environmental conditions, key education structures and new policy initiatives relevant to education.

Table 6. National contexts

Chile	Kenya	Philippines
<ul style="list-style-type: none"> • Chile closed schools for 259 days (excluding vacations, bank holidays and weekends). • Ongoing transition to a new administrative structure from 2020 through the creation of an institutional framework for Public Education whereby the management of all educational institutions in 345 municipalities are being transferred to 70 Local Public Education Services (SLEP: <i>Servicio Local de Educación Pública</i>) in a period of 10 years – each SLEP typically covers around three municipalities. • Inclusion of pre-primary institutions into this new structure • The provision of early childhood education is quite diverse in terms of the size of the centers, the ages of children, the type of financing and the type of education they provide • In terms of financing, three categories of pre-primary institutions exist—those run by the National Board of Early Childhood Education (an autonomous body dependent on the Ministry of Education), those run by Integra Foundation (a non-profit law institution which is part of the Presidency Foundation 	<ul style="list-style-type: none"> • The Covid pandemic resulted in almost a year of national lockdown including school closures and strict restrictions on movement and gatherings • Introduction of a relatively new national competence-based curriculum which emphasizes digital technology and parents’ involvement in children’s learning (January 2018) • Introduction of a new education structure (2-3-3-4) and a gradual phasing out of the old one (8-4-4), starting September 2022 • Considerable number of out-of-school children nationwide: 1.13M, (UNESCO 2021) due to poverty, insecurity and school-related costs • Significant teacher shortages and absenteeism across the country, 99,200 (TSC, 2021) <p>Inadequate/little preparation and training for school leadership role; appointment to the role is by promotion in public school. Some school leaders have access to continuous professional</p>	<ul style="list-style-type: none"> • One of the world’s longest Covid lockdowns and school closures (lasting almost two years) and among the strictest restrictions across the world • Poor weather conditions—including several typhoons every year which peak between July and October • Recent national elections (May 2022) causing some disruptions including school closures, school use as polling units, violence etc. • The introduction of the National Policy Framework on Learners and Schools as Zones of Peace in 2019 • The promulgation of the Enhanced Basic Education Act of 2013 leading to increased funding, staffing and learning resource needs as well as the expansion of basic education to include mandatory kindergarten and two additional years of secondary school. • Recent DepEd discussions to use English and Filipino as the main medium of instruction in pre- and primary schools rather than the mother tongue as stated in previous law <p>Prospective school leaders are required to sit and pass a qualifying examination before appointment—heads remain ‘Teachers in Charge’ (TICs) until they pass this examination.</p> <ul style="list-style-type: none"> • Lack of adequate professional development opportunities

<p>Network) and those privately run. No specific training for school leadership of Early Childhood Centers; usually leadership is a component of the Early Childhood Education Career syllabus.</p>	<p>development (CDP) programs for their roles—there is often no legally protected time for this, however, and they usually have to juggle their work with attending a program.</p> <ul style="list-style-type: none"> • Legacy of inadequate education government funding although it has recently been increased to 29% of the national budget (KSH 497B) but the existence of different school types (private, community, mission and government-aided) has implications not only for administration but also for unequal access to limited funding. 	<p>for school leaders is widely reported.</p>
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In all three countries there are relatively recent or ongoing major education improvement programs which impact on the work of school leaders. However, in Kenya and the Philippines, Covid and its aftermath which substantially disrupted education systems, were arguably the largest motivators to improve processes at school level.

Local context factors with impact on education delivery at the research sites

All the countries in the study undertook the research in areas with populations of low socio-economic status and multiple other relevant factors such as conflict, poor infrastructure, and limited access to the internet. All these conditions can constrain access to education and lead to poor teacher and student attendance, high drop-out rates, and low educational completion rates for students.

Table 7. Local context factors impacting education delivery

Chile	Kenya	Philippines
<ul style="list-style-type: none"> • The research sites are sited in a local education service area (SLEP) covering three urban municipalities or districts with a population that is mostly of low socio-economic status. • The metropolitan region where these districts are located has the country's highest rate of international immigrants (reaching 61.9%) comprising mostly Venezuelans (34.2%), Peruvians (19.8%), Haitians (12.5%) and Colombians (10.5%) (INE,2018). • Parents reluctant to reintegrate their children into the center following the Covid closures, leading to lower enrolment data. 	<ul style="list-style-type: none"> • The research sites are in areas with high levels of household poverty and child labor – one of the project sites is an industrial settlement (in Nairobi) with a population largely comprising low-income workers in the informal sector, petty traders and job seekers; the other site is a semi-rural area that is home to mostly casual laborers working on tea plantations or the only factory in the area. • Unstable power supply, lack of electricity in most homes and poor internet access. • The levels of education and digital literacy among parents are generally low 	<ul style="list-style-type: none"> • The research sites are in a semi-autonomous region created for the Muslim community which is in the process of transition to a new and complex governance structure (with transition period extended from 2022 to 2025 as in Republic Act No11593) • The region has a history of protracted conflict and displacements which has had an enduring impact—the specific project area has been affected by multiple armed conflicts and <i>Rido</i> or Clan conflict—a state of recurring hostilities between families and kinship groups characterized by a series of retaliatory acts of violence carried out to avenge a perceived affront or injustice. This disrupts access to education and causes displacement of pupils and teachers. • There are high and rising poverty levels in the area—a three-fold increase over the last two decades and the highest in the province/Division. • Poor health indicators. (PSA, 2016) • It is a predominantly mountainous and highly remote area with difficult transportation, very poor to no mobile phone signal and internet connectivity. A number of households possess 2-way radios.

Table 8. Characteristics of the research site schools

Chile (15 Pre-School Centers)	Kenya (12 primary schools)	Philippines (19 primary schools)
<ul style="list-style-type: none"> • New administrative structure, the SLEP which started to operate during the Covid pandemic. • Enrolment of students from immigrant populations reached around 18% (2019), above the national rate of 5%, and is the highest among SLEPs nationwide. • Similarly, around 18% of the general SLEP enrolment has special educational needs—between permanent and transitory, and above the national percentages of 11% in both categories. • All school leaders indicated that they have participated in independent courses on a specific topic. 	<ul style="list-style-type: none"> • High enrolments, large class sizes and overcrowded classrooms, high repetition rates and high number of over-aged pupils especially in the lower primary grades in most schools • High rate of school drop-out especially in higher primary grades/classes (44%) due to poverty and child labor • Predominantly poor school infrastructure and facilities—weak or absent electricity and/or internet, unsanitary latrines, insufficient and poor buildings (some built with tin sheets), an absent or under-resourced library in the project schools • Community schools, public schools (including government-aided Catholic mission schools) and low-cost private schools • Several project schools have government-donated tablets but no internet and little expertise to use them. 	<ul style="list-style-type: none"> • Poor enrolment in public schools in the region due to competition from private schools (which offer more schooling strategies including limited face-to-face contacts) and Madrasah (Muslim religious schools) • Inadequate capacity (and reluctance) within communities to adapt the national curriculum in response to local priorities/needs—the curriculum and associated learning materials are not fully inclusive and contextualized and schools find these difficult to use because they do not fit the learners’ context • Highest drop-out rate and percentage of out-of-school children nationwide; low completion rates—only one in four students in the region complete primary school • High rate of overage enrolments/students across school levels, with around 30% of learners not starting secondary school on time in the region • Lowest literacy rate and lowest level of educational performance nationwide (Cardno, 2015, 2016, 2017; DFAT, 2012; EBEIS, 2019; San Buenaventura, 2019; DepEd, 2020) • School buildings generally in a poor state with limited facilities • The transition of management from DepEd to the Ministry of Basic, Higher and Technical

		Education in BARMM means Butig school leaders cannot easily access the PD program/ entitlements provided by the National Educators Academy of the Philippines (DepEd agency with the mandate over CPD for teachers and instructional leaders in DepEd).
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Educational managerial structures, systems and practice across the research sites

In Chile, the recently introduced SLEP structure—an intermediate level agency in the school system—is designed to enable variation in education provision to meet locally identified needs. In Kenya, there is a centralized education system, with four levels of education managed by Principal Secretaries. In the Philippines, the DepEd has been working towards a more decentralized structure since 2015 and put in place a number of initiatives to support greater agency at school level.

Although all systems had performance monitoring in place, the system in Kenya was arguably the most established and influential. It was noticed during the work that the reporting system was one of the main drivers of managerial behavior for these school leaders. School leaders are mandated to collect, collate, and report information on students’ and teachers’ attendance and performance to county offices which are then typically escalated to the national level for general decision-making.

In Chile, the reporting was organized in a top-down manner but with some devolution of measures to local managers and adjustment of measures where this is thought appropriate. The SLEP professional support comes into play in an informational role, and a more horizontal and participatory leadership style was observed from the SLEP supporting professionals.

Table 9. Educational managerial structures, systems and practice

Chile	Kenya	Philippines
<ul style="list-style-type: none"> The new SLEP structure aims to be more decentralized: it entails articulating management tools with strategic purposes aligned with the Directorate of Public Education (DEP) policy while attending to the territories’ needs, and the educational goals which are themselves in a continuous state of adjustment are still in the process of development are not similar across all SLEPS. 	<ul style="list-style-type: none"> In Kenya, there is a centralized educational management structure headed by the Cabinet Secretary of the national Ministry of Education, who is assisted by four Principal Secretaries assigned to the different departments of education. Pre-primary, primary, secondary and teacher education are in the administrative domain of the State Department for Early Learning and Basic Education. 	<ul style="list-style-type: none"> Education management is centralized but a restructured administrative arrangement of the DepEd aims to encourage delegation and to support further devolution of governance to schools and Strengthen School-Based Management (SBM)
<ul style="list-style-type: none"> Preschool principals and supporting professionals 	<ul style="list-style-type: none"> School Board of Management (BOMs)— consisting of elected 	<ul style="list-style-type: none"> An ongoing Enhanced School Improvement Plan

<p>perceive an adjustment in their practice and the relationship established with the new education administration.</p> <ul style="list-style-type: none"> • Administrative and pedagogical support from the SLEP has been adjusted over time, entailing a change in educational institutions' management. As a result, the school leaders are more open to anew type of pedagogical support from the SLEP (horizontal peer exchanges rather than the previous supervision model) and they are more interrelated with other early childhood education centers. 	<p>school staff and community members—are mandated for every school by law to bring administration closer to the bottom (mainly by delivering national policy objectives), but they are widely reported to be mostly non-functional or and/or non-influential across the country, including in many of the project schools.</p>	<p>(ES-IP) is aimed at strengthening SBM across the country and attempts are being made to encourage schools to improve their data usage and management, make decisions and take agentive actions.</p>
<ul style="list-style-type: none"> • Educational centers are accountable to the SLEP in a top-down manner, albeit in a local context. Reports and administrative documents are given to the SLEP and not the central administration, because the SLEP has autonomy in their territory. • The SLEP professional support appears to be focused on the orientation requested by the DEP and other administration units such as the Preschool Education Undersecretary. 	<ul style="list-style-type: none"> • School leaders are accountable to the MoE's Department for Early Learning Basic Education as well as to different independent and semi-independent government agencies that work with the department such as the TSC which regulates Kenya's teaching service at the basic education level. Some school leaders themselves also undergo some form of efficiency-monitoring carried out by the TSC through Performance Contracting. • School leaders' performance is evaluated on student attendance, exam results and efficient management of school finances. • Instructional leadership and decision-making are explicitly a national policy expectation or emphasis for head teachers, and the school leadership role is more administration-heavy in practice. • The TSC monitors teachers' and school performance 	<ul style="list-style-type: none"> • Education governance remains top-down in the Philippines—the policies are centralized and are reported as often not explicitly recognizing and raising the potential of local structures to support educational participation. • School leaders are mandated to report to District and Division authorities—while recent policy aspirations particular as part of the continued learning strategy during the pandemic point to the affordance of greater autonomy for innovation and decision-making among school leaders, these are not often evidenced in practice.

	through a process called Teachers Performance Appraisal and Development (TPAD). Performance ratings on the TPAD are important as they are expected to cumulatively inform TSC’s decisions on promotions to the school leadership position.	
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Prior experience of using an improvement science approach

There was prior experience of Improvement Science at only one location in the study. All participants in the Philippines were familiar with the 3-year PDSA cycle implemented by the Philippines Department of Education described in the Enhanced School Improvement Plan Guidebook. In addition, the in-country team (FIT-ED) was highly familiar with the PDSA approach. They had used it to build a tool for schools and divisions to chart improvement as they scaled ELLN Digital—a TPD program (Department of Education, 2020). But here experimentation was limited/focused on solving problems related to running the course and ensuring the quality learning experience of the teachers. (Also, the aims of the TPD were pre-set for all schools by the national office).

Implementing the improvement networks

Following discussion with local authorities’—small informal improvement networks were initiated in each of the research sites by the in-country partner. The status of the improvement networks varied across the sites. In Kenya it was seen as part of the project infrastructure and, although it was taken into a further project with a different funder, it was not seen as becoming semi-permanent. In Chile the aspiration was for the network to become integrated into the local education ecosystem, offering a space for the voices of pre-primary center leaders to be heard and to explore issues unique to this phase of education. In the Philippines, the district, division, and ministry in Mindanao were keen to explore possibilities for scaling up the improvement communities across the region.

Table 10. Improvement networks and prior experience across sites

	Chile	Kenya	Philippines
Stakeholders involved in the improvement community network	<ul style="list-style-type: none"> • Pre-primary school leaders (15) • SLEP officials (supporting professionals who provide technical and pedagogical support to school leaders) <p>In-country partner (SUMMA) who facilitated the building of the improvement community and</p>	<ul style="list-style-type: none"> • Primary School leaders (12) <p>In-country partner (Worldreader) team members who set up and facilitated the community</p>	<ul style="list-style-type: none"> • Primary school leaders (19) • Local community (families and local government units) • District and Division Education Program Supervisors (DepEd) <p>In-country partner (FIT-ED) team members who set up and mobilized the network</p>

	implemented and researched the IS process.		
Structure of the community	<ul style="list-style-type: none"> • One large group of 15 pre-primary school leaders and 5 supporting professionals from the SLEP (reduced to 3 after a change in support strategy by the SLEP during the second implementation phase) 	<ul style="list-style-type: none"> • One large group of 12 school leaders with the two Worldreader facilitators 	<ul style="list-style-type: none"> • There are three separate clusters of school heads each consisting of 5- 7 members, and one group consisting of the division and district leads, the three cluster leads and the FIT-ED team.
Communication and collaboration	<ul style="list-style-type: none"> • Online and face-to-face workshops facilitated communication in the network • Monthly activity 	<ul style="list-style-type: none"> • Bi-weekly or monthly virtual meetings • A few in-person meetings when possible • WhatsApp group chats • Phone calls (mainly between facilitators and school leaders) 	<p>While communication and collaboration were relatively more difficult for this network mostly due to location-related problems, the network worked through</p> <ul style="list-style-type: none"> • Scheduled virtual meetings • A few in-person meetings when possible • Facebook group chats

<p>Expertise in the network</p>	<ul style="list-style-type: none"> • SUMMA had experience in delivering projects that involve digital technologies but had not been previously involved in implementing a project using the Improvement Science approach. 	<ul style="list-style-type: none"> • Worldreader has expertise in developing and using digital educational technology for research purposes and intervention projects but no previous experience of doing IS, working with PDSAs and facilitating communities. 	<p>FIT-ED had previous experience piloting DepEd’s Early Language, Literacy and Numeracy Digital (ELLN Digital) TPD program for K to 3 teachers.</p> <p>FIT-ED also supported the national implementation of the TPD by using Readiness and PDSA tools for continuous improvement.</p> <p>FIT-ED has also had previous experience with using radio for lesson delivery and training (2007).⁴</p>
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Working arrangements had become more fluid in the context of Covid but we envisaged that fully involving local stakeholders would foster a sense of agency and local ownership of the intervention as well as lay the groundwork for broader systems adoption. As such, these stakeholders were invited to participate in the improvement communities either as active co-learners or observers and to potentially become champions for the IS approach. This invitation was taken up differently across contexts due to (sometimes intersecting) reasons relating to the local aims of the network as shaped by contextual priorities, the practicalities of engagement, the impact/inhibitions of historically existing top-down professional relationships and so on.

There was little sustained systematic involvement with local stakeholders in Kenya although school leaders reported sharing their experiences with district inspectors and TSC officials. Previous meetings/collaborations were not unknown but had tended to be more random and tended to involve sharing of practice which others were expected to adopt with little focus on local innovation.

All improvement networks had a comparable mix of school leaders and facilitators but there was a clear difference in Chile where the local authority was heavily involved in all the interactions.

In the Philippines, leading up to and during the Inception Meeting in March 2021, the vice governor, mayor's office, barangay (local government unit), PTCA representatives, DepEd District and Division offices, and the 19 school leaders were very present in the engagement. At the Inception meeting, three clusters/NICs of school leaders were formed. Regular communication with the core group (3 cluster leads, district and division reps and FIT-ED) was difficult but sustained. Regular communication within each cluster/NIC was also reportedly sustained.

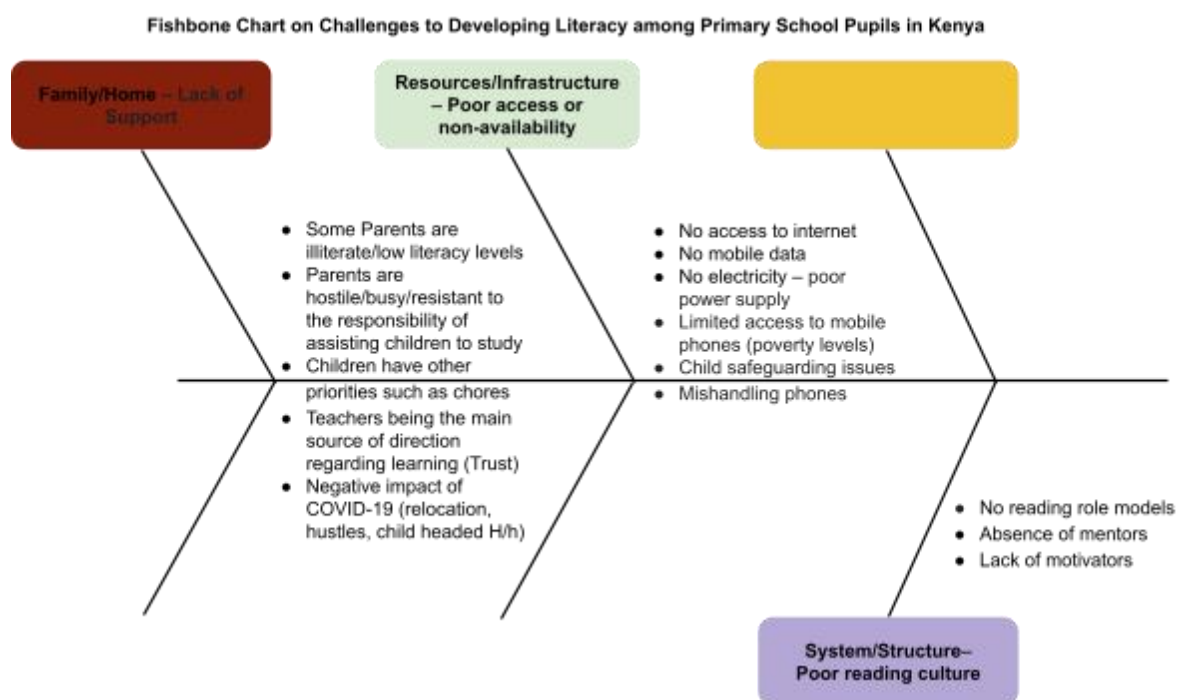
All the networks were supported indirectly by the in-country partners through regular monthly discussions and workshops and indirectly by the global researchers.

⁴ <http://fit-ed.org/portfolio/education-for-all-thru-radio-efar/>

Moving to implement improvement activity and use of the IS tools

Throughout the project, the aims of each improvement network adapted over time. In Kenya school leaders initially identified nine improvement areas relating to pupil literacy using a Fishbone analysis. The figure below shows the first fishbone diagram they produced. When the idea of a Fishbone diagram was first introduced to the team in Kenya it took time for this method of problem analysis to be adopted.

Figure 6. Fishbone diagram from the improvement community in Kenya



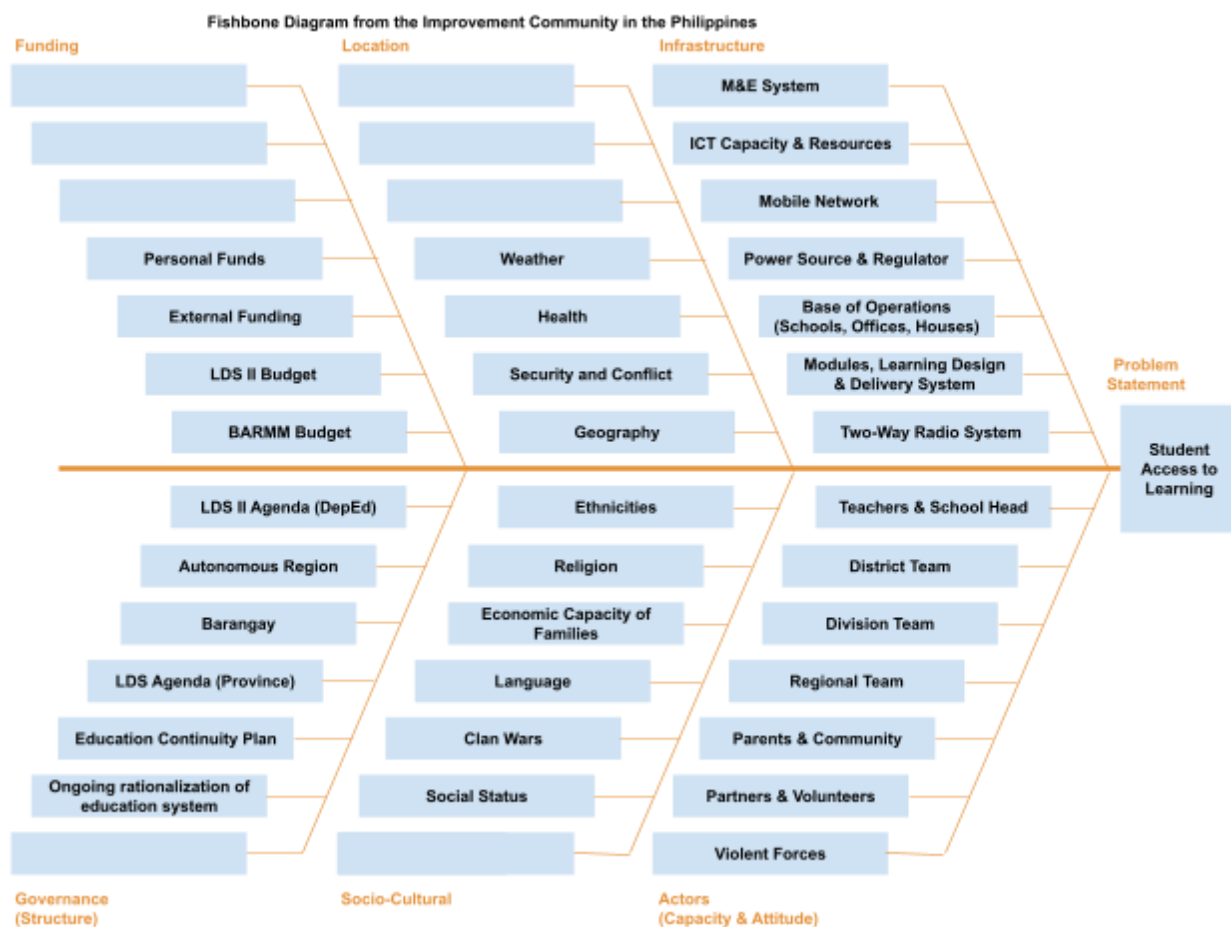
School Leaders then narrowed this analysis to three related areas of improvement to address in the project: low parental support regarding children’s learning, poor reading culture in the communities served by the school and changing the attitudes of parents and teachers on the value of spending time reading.

To address these issues school leaders were introduced to the Booksmart app by in-country partner World Reader. The initial focus was the use of Booksmart, a digital reading application, with the parents and caregivers of Grade 3 students. Worldreader curated a library of approximately 150 digital books, sourced from local publishers, including accompanying pre- and post-activities appropriate for Grade 3 students in the App. Families who had smartphones received data to facilitate their use of the Booksmart App and cost-free engagement use of Booksmart. Reading behaviors of readers were monitored through an insights dashboard developed by Worldreader. However, this proved problematic on several levels: firstly, far fewer parents/caregivers had access to mobile phones than originally envisaged and frequently the phone was not available during the day to support children’s reading. Secondly, the use of the standardized dashboard encouraged a “dash” to high usage figures with school leaders. This led to school leaders often trying to implement multiple strategies at once, making it difficult for them to assess the relative effectiveness of different strategies and to maintain usage figures for any sustained period. Lastly, as the process of using Booksmart was not embedded prior to the project start and there were tremendous challenges in getting going with Booksmart, many head teachers lacked deep understanding of the use of the App and hence ways in which its use could be improved. The Worldreader team took time to move from a position in which they

promoted “solutions” to school leaders to facilitating and coaching analysis of the situation and offering possible ways forward with Booksmart.

In the Philippines, the project leveraged the national initiative by DepEd to use two-way radios to continue to deliver basic education during the pandemic in order to get initial buy-in. PDSA tools were developed at the initial stage of the project as part of this initiative. The tools were built to track this preset problem and strategy. Butig NICs/clusters of school leaders were focused on the problem and strategy pre-determined by higher management (DEPED and MBHTE). As in Kenya, a fishbone analysis was suggested to the school leaders to help them identify problems with the continuation of learning during the pandemic—but early attempts generated very high-level mapping of the situation as shown in the diagram below.

Figure 7. Fishbone diagram from the improvement community in the Philippines



Using the IS tools developed by the in-country partner and reviewed by the District and Division leadership, school leaders were encouraged to identify progress towards specified progress indicators relating to continuation of learning with the 2-way radios and challenges with their progress. The most commonly identified issues concerned resourcing—a need for more radios, poor radio signals, non-functioning printers, and so on. Many of these had to be labelled “just do it” issues or problems that the teams could immediately address as they were not appropriate for process improvement cycles. However, this activity was not without value, as it acted as a prompt for some school leaders to proactively look for solutions to issues without looking to others for permission. Typically, previous responses had involved raising the solution to the local government leaders for one-time solutions, e.g., “the problem is the printer is not working, therefore I cannot print the modules that I have to

send out to the students,” and their solution would be to raise this to the district office, so they can solve the problem or borrow a printer from the mayor's office.

A small number of pedagogic related improvement needs were identified (8 out of 99 issues): more guidance on learning activities for students, better assessment strategies, enhanced parental involvement and one leadership issue—better time management on the part of the school leader. What we observe to be the characteristics of the solutions and improvement ideas identified are that most of the objectives and action plans are not time-bound and specific—there are no specific measures for improvement, and resourcing solutions are not small and actionable by the school. Hence there was little movement on improving processes or systems and almost no experimentation.

These initial tools, with their emphasis on weekly reporting of multiple metrics linked to the use of the 2-way radios, were perceived by school leaders as something to be completed as part of accountability rather than tools which helped them to look at the issues in their school—their use quickly diminished despite changes in the tools as a result of consultations by the school heads with their teachers and amongst each other.

Consequently, activity in Phase 2 in both the Philippines and Kenya moved away from the technological developments envisaged in the initial proposal to local small problems (“micro-problems”) identified by individual school leaders. In the Philippines the aim of the improvement activity shifted from the more general attention to the use of two-way radios to learning related micro-problems, such as improving attendance through different strategies like home visits, better use of data, and greater parental involvement in their children’s learning. Each team (school leader and her school staff) was asked to complete at least one PDSA cycle as a means of solving a micro-problem. The in-country partners steered the school leaders towards smaller-scale change using this language to ensure that activities were of an appropriate scale. Seven teams conducted PDSAs in this way, with nine separate PDSAs reported. The aims of each one are listed below:

Table 11. Philippines phase 2 PDSA aims

Team	Aim
1	To decrease the number of students who are engaged in absenteeism from 20 to 8
2	To decrease the number of students from grade 3 who are engaged in slow readers from 4 to 0
3	To decrease the number of students who are engaging in absenteeism from 8 to 4
4	To decrease the number of students who are not answering their modules from 60/126
5	To decrease the number of students who are engaged in not answering their Modules/ALMs from 5 to 0
6	To decrease the number of students who are engaged in absenteeism from 30% to 5%
7	Increase the numbers of teachers who submitted complete and accurate data on time from 1 teacher out of 5 to 3 teachers
8	To decrease the number of pupils who are engaged in late returning and receiving of ALMs [modules] from 20 to 5
9	To increase reading per student to at least 45 minutes per day

Each school leader shared their PDSA details with their peers in the improvement community. The diagram below shows a typical example of a PDSA conducted by these groups.

Figure 8. An example of a Phase 2 PDSA cycle from the Philippines

<p>Plan</p> <p>Aim: To decrease the number of students who are not answering their modules from 60/126</p>	<p>Do</p> <ul style="list-style-type: none"> • Meet the parents to: • Greet the parents: “Kumustahan” • Understand reasons for absence • Address reasons for absence where possible <p>Stress the importance of attendance</p>
<p>Act</p> <ul style="list-style-type: none"> • Kumustahan for parents now to take place every week • Sustain with rewards (class points) for regular attendees 	<p>Study</p> <p>The lack of attendance is now 12 out of 126 students, an improvement of 48 more students in class each day</p>

A feature across most of the PDSA teams was the temptation to address the issues with multiple solutions at the same time (as seen in the example in Figure 8) rather than a sequenced approach that would enable identification of which interventions have the biggest. There was good discipline in finding a measure (or more than one) that identified whether an aim had been achieved, although there was often just one measurement point during the “study” phase. School leaders were generally aware, however, of the need to sustain changes and generally did put actions in place to maintain the improvements they had achieved. The above example is a good illustration in that attendance figures could be monitored beyond the study phase of the PDSA, and other actions put in place to sustain the change. The school leader and her team had learned that a one-off meeting with parents may improve attendance in the short term but the development of a deeper relationship with parents/ caregivers would possibly sustain it.

In Kenya, a similar shift toward “micro-challenges” was encouraged in Phase 2 and all 12 school leaders planned a PDSA cycle. The table below indicates the topics of each one.

Table 12. Kenya Phase 2 PDSA aims

School	PDSA topic/aim
1	Increase children sibling reading and partnerships grade 4 - + improve time and support.
2	Engaging older siblings to study or read with them online.
3	Increase children/learner confidence in telling stories
4	To encourage teachers to support pupils improve reading activity
5	Parental involvement in giving their children access to Booksmart app
6	Improve the general level of reading activity
7	Improve reading culture (use of a reading club)
8	Creating time for telling stories
9	Eradicate non-readers in the grade

10	Develop both spoken and written language of the learners
11	English speaking
12	Increase the number of pupils visiting/reading in the library

A typical example of a PDSA conducted by these school leaders is shown in the diagram below.

Figure 9. An example of a PDSA cycle from Kenya

<p>Plan</p> <p>Aim: To improve parental support for reading in the home</p>	<p>Do</p> <ul style="list-style-type: none"> • Form WhatsApp group of grade 3 and 4 parents and send link to the Booksmart application promoting reading • Promote Booksmart in the classroom and encourage read-alouds using the teacher’s phone and/or reading using the teacher’s phone
<p>Act</p> <p>The change had an effect, but more work needed:</p> <ul style="list-style-type: none"> • Upload the Booksmart app to tablets for offline reading in school • More effort and outreach needed to involve parents 	<p>Study</p> <ul style="list-style-type: none"> • Learners were having to share one phone which did not help enough pupils • Teachers were able to watch learners read on a one-to-one basis • English speaking improved in Grade 4

In general, the topics chosen by the Kenya teams did not lend themselves to quantitative measures of outcomes as easily as might have been expected. Although all PDSA reports included some content on whether changes had worked, the feedback was generally qualitative, e.g.,

“English speaking for grade four is awesome”

“I have seen it working well”

“Most learners have gained and built confidence”

Just as in the case of the Philippines there were also sometimes multiple interventions in a PDSA cycle, making tracking of the actual solution difficult to assess. However, it is clear that the PDSA way of working brought about a level of improvement activity that would not have otherwise occurred. Notably, local aims evolved towards what was possible with the time and resources available to the school leaders in Kenya and the Philippines. There was a clear learning process in how to use these types of approach appropriately.

While some of the reporting was data-rich, no-one used tools such as statistical process control (SPC) charts although the global research team did help compile an example run chart to show how it could be done with the data available.

The Chile team focused on the Network design and the improvement capability of the leaders in the team. Once the project had started and diagnostic data had been collected through interviews, the pre-school leaders made it clear that they were a group just getting to know one another; they had

never previously worked together as their SLEP had only recently been created. The local aim of the improvement activity became to develop the collaborative skills and capacity of these principals through designing and nurturing an improvement community. An ethos of team-based open discussion was adopted, but although the term PDSA was used to label two sets of improvement activity—the first was focused on building an Operational Plan for their centers still considering possible confinements and quarantine, while the second required principals to conduct an inquiry with their staff exploring the notions, measures and practices related to children’s special needs—and neither was a conventional process improvement. Hence, the Chile team did not report using any of the mainstream IS tools such as fishbone charts or process mapping etc., but were successful in socializing the approach with the improvement community.

Realized aims of the project

Completed detailed PDSA cycles were rarely observed across any of the research sites, and we discuss the reasons for this below. However qualitative data from interviews with school leaders and workshop observations indicates that participation in the IS process led to a number of changes in the practices of school leaders. A brief overview is given here, and these findings will be discussed in more detail in future research papers.

School leaders in all three contexts expressed value for new forms of collaboration with peers facilitated by the IS process in their improvement community. In Kenya school leaders contrasted this experience with that in their pre-established professional meeting structures, describing the improvement communities as an opportunity that has led them to benefit from mutual peer learning, to boost confidence in addressing shared problems, and an orientation towards more proactive community-facing problem-solving approaches and actions:

“We, the heads, only met in official programs when called [by the district] to discuss different matters. But now, this program, it has brought us together. We have been able to know what are other schools doing? - something that has not been there... It has created union. We have been able to learn from each other as teachers, as school heads... Something that we could not have done... It has been a humbling time that we have had together, and I wish this program could just continue and we work together, we collaborate together for the benefits of the learner, the teachers and the community at large.” – Head teacher, Kenya, February 2022

In Chile, through promoting spaces where there are professional interactions with common goals set by the school leaders themselves, a gradual willingness to interact with those who did not previously know each other was observed. School leaders in Chile expressed the impact on their practice as emerging from the development of a collective group identity and a diminishing sense of “loneliness” in their leadership role:

“Yes, I think we are now accompanied... The role of director [school leader] is very lonely, it is complicated, because one has to stick up for everything and in everything that happens in the center, one has to be there always. You are the visible face and must be responsible for everything that may happen. So, now that we are accompanied by 14 more companions, of course, it helps. And it is nice that if I have a doubt and as the [SLEP] supporting professional is not there and cannot give me the answer, together we get the answer.” – Preschool principal, Chile, June 2022

Membership of the improvement community led to a sense of belonging, a broader vision on their work and strengthened potential for further collaborations towards common goals. These are values and behaviors, which will support implementation of a continuous improvement approach and use of the IS methodology.

Data from interviews, workshop outputs and discussions indicate that the school leaders in Kenya and the Philippines valued the experience of undertaking PDSA cycles even though they found the data collection and other documentation difficult at times. The analysis reveals a number of common themes some of which could be argued to contribute to improved leadership for institutional resilience:

- Improved relationships with their staff and greater appreciation of the value of teamwork: school leaders commented on how the process has encouraged them to listen to their staff, to understand that good teamwork is needed to execute plans well, and to try more shared decision making with their staff which empowered their staff;
- Strengthened engagement with parents and the community: several school leaders reported how the IS work had enriched their collaboration with parents and the local community;
- Enhanced confidence and self-esteem;
- Increased ability to navigate challenges, be more flexible and adapt;
- A more proactive mindset, particularly around planning and executing improvements; and
- Greater openness to new ideas and experimentation.

This mixture of values, skills and behaviors are associated with more open ways of working which are helpful in developing leadership of planning and executing continuous improvements within their institutions as illustrated in the vignette below:

Vignette 1. School leader in Kenya

School Leader X in Kenya has a Diploma in educational management as her highest qualification and less than five years of experience in her role. She heads a school with a population of 47 teachers and nearly 2000 pupils. One of her first remarks was that participation in the project has increased her self-esteem by enabling her to take ownership of small problems that she could solve while also finding comfort in learning from and about others. Her school buildings were in a poor condition but there were relevant facilities, including a library, and considerable ICT resources (tablets, computers, and internet) mostly donated to the school. However, during the first implementation phase of the project, there was a very low level of engagement with the Booksmart App by learners in the targeted grade, and a WhatsApp group she had created for parents was joined by only around half the total number who were eligible, and most were inactive in the group chats. Following a couple of Improvement Community meetings and a reflective interview, she moved away from the initial high-level challenges related to parents' literacy which she had initially selected. She identified the micro-challenge of increasing the number of pupils visiting and reading in the library to address the reading problem during the second implementation phase. She acknowledged that pupils needed to be almost literally "dragged" to the library at the beginning but recounted that as she "owned" the challenge she continued to create awareness to pupils and to parents to encourage their children, offered reinforcements to readers, constantly drew on support from teachers and so on. According to her, exposure to shared experiences and different ideas in the Improvement Community meetings had enhanced her leadership style as she had become more learner-friendly, approaching learners with a greater level of patience and understanding having realized that the challenges she experienced with learners are also typical for other leaders. The PDSA activity had encouraged her to engage more closely with teachers and parents and in the process discard stereotypical notions that she had previously held about these groups such as that parents were generally uncooperative, ignorant, or incapable of making valuable contributions or giving useful support. In a follow-up interview, she reported ongoing success with her plan and actions as she enthusiastically described how pupils, including those outside the targeted grade, have developed a yearning for reading in the library so much that the librarian reports a full library even during break times. She had backed these reports with her own observations, photos, and videos - multiple sources of data which she had been motivated to collect and use for process monitoring and analysis unlike previously. Summarizing the changes in her leadership practice, she said, "I think I'm getting better by the day, and I'm learning to collaborate and accept people's ideas. I am a better listener now because when we go for these meetings you hear what other people are going through and from listening you can always do your analysis and come up with your own plan. You customize what you have heard and apply it where possible."

For school leaders in the Philippines, there was deep appreciation for the experimental dimension of the process that encouraged innovation with less competition and without fears of punitive measures or concern for negative professional consequences. Several leaders reflected on the ways that this way of working has enabled them to appreciate their own capacities, develop agency to take action, better understand and build a positive relationship with their staff as seen in the vignette below.

Vignette 2. School leader in the Philippines

School Leader Y in the Philippines held a doctoral degree and had over eight years of experience as a school head. She supervised eight full-time and three part-time teachers in a school which had about 233 pupils. For the first PDSA activity she worked with the locally developed IS tool including a self-reflective journal and her improvement tasks were located within the broad aim of facilitating continuous learning of the pupils using two-way radios. Her initial actions were heavily oriented towards “monitoring” teachers to ensure that they did “their job” - this derived from the predominant conception of the school leadership role in her country context and the embedded working relationship with her staff. However, she began to pick up teachers’ challenges more strongly and recognize their efforts through their reporting tools while also assessing her own support of them and the potential scope for this through her journaling. This reflection captures her experience: “For me, I feel I’ve become more empowered. The word empowered is a big word, but I mean it, because... I mean it’s been said before that not everyone gets an opportunity like this. Yeah, that’s given. But the effect of this project overall, on all the aspects of our school programs... That although the process is not dictated, but at the top of our mind, that we follow a format – where if something doesn’t work you can try another thing and then there’s no... sanction. I mean, you just try until you achieve what you want to achieve. So, there. I think that helped not just me, but my teachers too, because our conversations before were not as intimate. Although even when... even when our conversations were always face-to-face, through the journal I got to know them better. I saw the heart in teachers being teachers. So, that’s a big thing for me.” By the second PDSA phase, School Leader Y had not only identified reducing chronic absenteeism from 10% to 5% as her micro-challenge but had also expanded “absenteeism” to include the more qualitative aspect of participation in/engagement with lessons and had worked closely with teachers to introduce a new strategy to achieve her aim: explicit recognition of the most improved pupils through star awards. Teachers prepared a bulletin board where names of students who showed improvement in attending or participating in school activities are posted with stars. The number of stars beside their names depicted their level of improvement. They observed that this boosted pupils’ interest and made them excited to attend and participate in their two-way radio learning activities.

Discussion of the Project Research Findings

Improvement Science has the potential to be an effective methodology when tackling certain types of process improvement challenges in education. It can yield benefits that go beyond simply solving an existing problem, leaving an additional legacy of improved problem-solving capabilities amongst leaders and front-line educators. In the case examples presented here there was also improvement in staff morale when they were able to tackle problems and issues, they had previously either been unable to confront or weren’t previously empowered to do so. However, IS and its associated toolkit do have some acknowledged limitations, both in terms of its inherent characteristics and also challenges of implementation as we draw out in the following discussion.

The appropriateness of IS for education improvement (RQ1)

Increased focus on improvement and change

Prior to our interventions it was clear that most management and measurement systems focused on maintaining the system through performance reporting. It could be argued that a request for improvement activity came as a result of a deviation in performance rather than a desire to continuously improve. The introduction of the PDSA approach did alter some attitudes towards change, with less of a negative connotation associated with being asked to put a lens on problems and experiment with change.

At all our research sites it took time to find the right match between the IS problem-solving tools available to school leaders and the problems to tackle. In two of our sites, we had to work hard to encourage teams to scale-down the size/complexity of the problems being addressed through IS methods. This was approached through the use of the micro-challenges. In this it was important that the move to smaller, more achievable problems did not destroy or limit school leaders' overall aspirations for education transformation in their schools. However, once such micro-problems were identified and school leaders began to see that changes could lead to positive results such as increased interactions with parents/caregivers or increased pupil confidence in reading aloud, they became more enthusiastic to experiment and share their innovations.

In our literature review we highlighted the US research that suggests many of the improvement challenges in education are ambiguous or wicked, interdependent or context-specific. In our work it became clear that all of our case sites often started by trying to tackle such wicked or interdependent problems. A significant proportion of what needed to be done to transform teaching and learning was too complex to apply the relatively simple process analysis and problem-solving tools within the IS toolkit. Higher-level systemic problems need a different approach where the complexity and interconnectedness are acknowledged and the adaptive nature of the system is anticipated when implementing change.

The influence of prior experience in using IS

Our case studies demonstrated very different levels of prior experience in using IS and the associated tools. Where IS has not previously been attempted, we saw that it does take at least several months through different phases of engagement for its adoption to become effective, even where extensive implementation advice is provided.

However, it must not be assumed that leaders with prior experience of using IS are in a better position, as in many cases previous exposure to the ideas does not necessarily mean that IS is understood and practiced well. In one of our case studies, IS adoption had only been partial, with limited empowerment of staff, a retained top-down approach and a focus still on project-based change rather than PDSA activity. Our observation is that there are possible advantages in having the limited prior knowledge of IS amongst the project team but there remains a major task in spreading this to the wider improvement community and to change the culture more towards small-scale continuous change. Additionally, it may be the case that in some instances, prior exposure to partial IS implementation creates more work as mindsets may need to be shifted even further than on green field sites.

The use of PDSA tools and techniques (RQ2)

In the early stages of the project all teams struggled with the IS toolkit. At a practical level early attempts to use fishbone and root cause analysis tended to identify the high-level systemic issues only, e.g., scarce resources, no supporting technology etc., rather than local process issues. This could be overwhelming for school leaders who felt they lacked capacity and agency to tackle the scale of these interconnected challenges. Additionally, some school leaders, particularly in Kenya, were keen to move to action rather than spend time on looking at what they perceived as all too familiar problems. It took a lot of work to redirect effort towards local, small-scale, process-based issues that could be tackled using the IS methodology.

Some teams did (suddenly) realize that there were small problems that could be tackled within their own span of control and that the approach was a useful way of giving them insight into particular issues. Then fishbone charts were used to identify root causes of low levels of reading activity and skills, for example. However, many of these were separate, qualitative issues such as the lack of access to books, lack of time set aside for reading etc., rather than process issues. Hence it was more difficult

to apply some analytical tools such as process mapping— it was not a deterministic process that was the problem here.

In the Philippines, the PDSA tools originally prepared by the in-country partner were found to be too time-consuming and difficult to use regularly as well as being understood by some school leaders as compliance tools rather than tools to support the development of agency in problem solving.

The team did attempt to use a more advanced way of supporting the Plan-Do-Study-Act cycle called A3 Planning (Shook, 2008). This derives from Toyota and structures improvement cycles more thoroughly, including elements such as embedded diagnostic diagrams, who is going to take actions and how improvement is going to be measured. Teams struggled to use this partly because it took more effort to complete but also because it used language that was not familiar. We did quickly rewrite the A3 plan using different terminology but the translation of this approach to an education context was not easy, and this was still felt to be too burdensome for school leaders.

Tools such as Statistical Process Control charts and other data presentation methods were more difficult to apply to these small-scale projects as often the data was qualitative or the quantity of numerical data was limited. Furthermore, teams had limited familiarity with the concept of performance variation and used automatic graphing techniques smoothed data instead of using control limits.

Across the countries one of the biggest challenges in the use of the IS approach concerns data. In many cases school leaders' capacity for data use and beliefs about data use were not connected in practice. All school leaders were reluctant to spend time on written evidence, relying extensively on oral evidence—this was particularly noticeable in Kenya. School leaders have little spare time for additional activities, such as making written records, but these could have been delegated. One plausible way to help school leaders differentiate the IS activity from performance management or compliance activities is to avoid the use of yet more forms.

Our conclusion is that all of the tools in the IS toolkit may need to be adapted for use in education and there will often be a different emphasis in which tools would be most useful in a particular context.

Contextual factors (RQ3)

Requirements of managerial and leadership structures, and systems (RQ3)

In our three cases (Chile, Kenya, the Philippines) we identified that the methodology is frequently not aligned with the prevailing management approach. School leaders who have worked for a long time with a top-down reporting system can be in a “comfort zone” where they get used to reporting standard measures that they are able to keep within acceptable boundaries. In this scenario they are rarely challenged to make process changes or experiment with new ideas or techniques other than as part of large-scale pilot projects or programs. The prevailing school culture is one in which data use is highly coupled with external accountability. A move to an IS approach puts school leaders outside their comfort zone as they are being challenged in new ways, having to report new measures that are out of their direct control and, through the use of PDSA cycles, might be seen to make changes that don't work. This is a considerable issue. Finally, if “failure” of a change has implications for their annual reviews or targets then IS is probably not appropriate.

Furthermore, in the development research reported here, the approach of the in-country partners was at times (particularly initially) in tension with the approach embedded in the IS methodology; they were accustomed to practicing a top-down, measures-driven performance management (often in response to donor/funder requirements) with associated embedded practices. Colleagues talked of

how initially they saw themselves as implementers of a project in which the school leaders were the recipients. This led to a number of issues associated with the support provided to participating schools and the ways in which their activity or performance was felt to need to be measured and managed.

One of our case sites, Chile, was fortunate that the project coincided with a reorganization of education structures and was able to rework the project to use IS methodology to focus on the establishment of the Improvement Network. We conclude this turned out to be an unexpectedly effective way of designing the improvement network as participants had to understand the IS approach and then match the Network design to these practices. In particular, the ethos of shared problem-solving and PDSA experimentation was identified by the team, and this has resulted in a system that is more adapted to IS than prior top-down management systems.

Changes in school leader practices (RQ4 and 5)

Improved problem-solving and resilience

In each country there was evidence of school leaders demonstrating improved ability to solve problems. One of the key barriers is problem identification of issues that school leaders or teams have the capacity to address.

Continuous improvement methodologies such as IS or *kaizen* move away from large, capital funded improvement projects (that are often high tech) towards small scale changes that are less impacted by budgetary constraints. The case studies demonstrated a switch towards smaller scale change as part of the process of adoption of IS. We were able to focus some teams on problems they could tackle, rather than give them unachievable aims. The idea of finding these small-scale “doable” changes is a considerable mindset change where improvement becomes feasible rather than an unattainable ambition. In this context budgets are always going to be constrained. We argue that IS opens the door to “frugal innovation” where intentional change meets the needs of people in resource-constrained situations and is the result of problem-solving activities rather than imposed policy ideas, plans and pressures (Hindocha et al., 2021). The “bottom-up” approach of IS ensures that those with needs contribute to the definition of problems and derivation of solutions. A key legacy of the project is some modest improved resilience through this problem-solving capacity: school leaders widened the lens on what they observed in their schools, the types of evidence that they considered and valued and began to ask questions about what had led them to a particular place with a process and how they might experiment with small changes, in so doing innovating through creating new practices or structures by means of events, this might be termed the action of a bricoleur (Fuglsang, 2010).

Improved team working & empowerment

In the country cases there was a significant change in school leaders’ openness to collaboration and new ideas through the use of Improvement Communities, school leaders were able to group together to share ideas and compare actions. Care had to be taken to avoid direct comparison of performance across schools, but where this could be achieved there was a clear difference in how individuals interacted. The use of these communities was also empowering for some, providing the opportunity to both tackle issues they had not previously been able to address but also communicate with others their challenges, failures, and successes. The groups, or communities, provide a resource for their members, the school leaders. This represents a shift in terms of the practices of the school leaders.

There were also multiple examples of school leaders moving towards more open practices within their schools, delegating and appreciating the value of teamwork as this head teacher from Kenya explains.

One thing that I have learned is that for anything to actually work you need, you know, you need teamwork. You can have very bright ideas; you can have very good plans but for the plans

to be executed well you need other people to support you. So, working alone, I am a leader. In the school there are other roles that are also assigned to me and this is another task that came on but at the beginning even when we were sharing with [country partner staff member] and all that, just like our parents, our question was, where do we get the time because we already have things that are running on, going on and this looks like another tedious activity, project that is coming on so where shall we get the time? But as time went by, I came to learn that time was not an issue, what was an issue is to get to understand how this works and delegate it to other people as well and it works so that support that you will give someone and the support that person will give you will enable you to actually achieve whatever. So, one thing I have very strongly learned is that for people to achieve their results, it is important that they work as a team. – School leader in Kenya, June 2022

This headteacher had been in post for over 10 years and, although nearing retirement, had a secure succession plan in place. But the value of delegation and team working was seen in very different situations in the same neighborhood: here the school leader had taken on the headship of a newly reopened school at the start of 2020 with 20 teachers and almost 4000 pupils. Following the post-Covid school reopening this school leader spends much of his day trying to secure funding to support additional teachers, water, and power for the school. He was enthusiastic about the project but immediately delegated the project to a trusted colleague, the first teacher who joined him at the school opening. He described how he was learning to support this teacher to take on authority “as a leader as now she is the leader, and you have to give her the authority.”

The benefits and legacy of the IS approach

In conclusion we suggest that IS has significant potential to improve education and it is important to capture some of these benefits. The three case studies in this project had such diverse project activities it is impossible to identify a single process change that all countries universally and successfully adopted using IS. They each used the approach in different ways for different aims. However, the organization development potential of IS is unequivocal. There were a number of clear benefits of engaging with teachers and administrators at all levels with the IS approach—relational change in action.

Amended Framework

Once the data was initially reviewed, we have seen that our own findings show slightly different links and content to that of the literature review. The revised framework is shown in Figure 10.

In our revised framework we show that the project aims need to be split into two parts. The initial aims set the intended outcomes for the project as a whole, but this is often done in advance of understanding the detail of the context and the constraints at that moment in the system. It is only when the context is understood that the actual local aims can be set. From the lean thinking school, the concept of *gemba* is useful here—meaning “the actual place”—where improvement should be done in sight of the issues. In our case studies the school leaders naturally adapted towards more achievable aims when encouraged and it would have been unproductive to force them towards aims that are unachievable in the context.

One of our most important relationships is between the context and the managerial structures and systems. Our research demonstrated firsthand how command and control styles of working across the groups of stakeholders clash with the collaborative nature of IS and an entire set of leader behaviors need to be adapted. At the school leader level this can be achieved and even welcomed once the appropriate style of working is understood. However, all the network of stakeholders needs to adopt this style otherwise there can be mixed messages about how performance is reported, and

problems analyzed. The network of relationships inside a multi-organization IS initiative is therefore influential in how IS can be implemented.

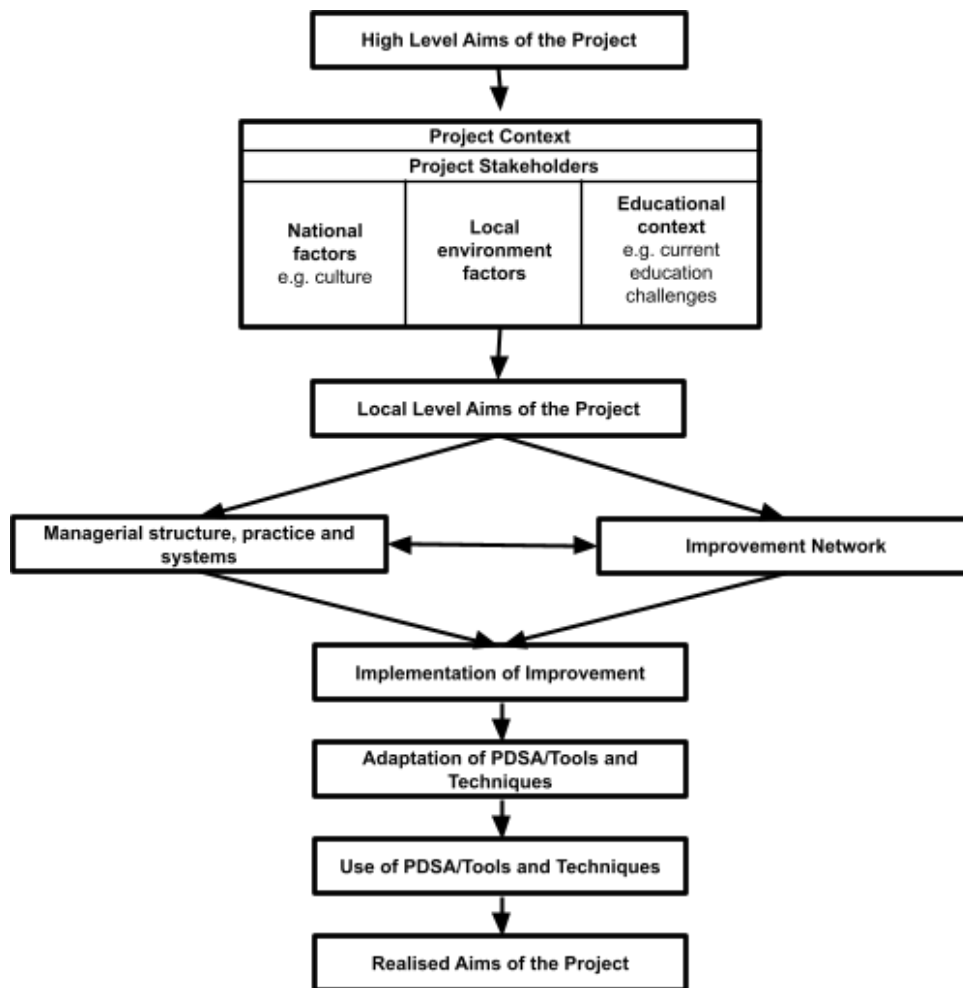


Figure 10. Revised framework of implementing IS

The implementation of IS is therefore heavily dictated by context and decisions about the design of the improvement network. The process of implementation has to address where stakeholders are at the start of the program, both in terms of the scale of challenges and any preexisting knowledge of improvement. The content of improvement can be tailored locally, and we regularly used the phrase “adapt not adopt” when discussing what type of improvement toolkit to use and how to organize PDSAs. The report contains a number of observations about how improvement tools were used and the challenges of making them effective.

Our final link in this revised framework (Figure 10) identifies the realized aims as a product of what has gone before. However desirable it is to achieve the initial aims of a project such as this, there are too many factors outside of our span of control to determine the detailed, local achievements of the activities.

Problems and Challenges

This was a complex and ambitious project which involved multiple partners and stakeholders. Undertaking the project during Covid gave rise to multiple challenges in each sphere of project

working for everyone—the absence of any in-person meetings until the last months of the project made it difficult to develop deep knowledge of partners’ contexts, ways of working and constraints. For example, it was not easy for in-country partners or the global team to guide school leaders on the most appropriate timescale for implementation of PDSA. Differences in language, terminology, and approaches to issues such as research ethics across different partners could, at times, give rise to misunderstandings, feelings of pressure and competition. Such differences are not unusual in international interdisciplinary multi-partner projects, but the absence of in-person meetings tended to exacerbate these issues.

In addition, a number of contextual issues linked to climate change and elections complicated project working at each site as discussed earlier.

Working within a multidisciplinary global team offered opportunities to understand different approaches to the use of IS and comparison points. Reflecting on the project work colleagues commented on how they developed interpersonal skills, relationship building, became more open and patient in listening to school leaders’ stories and their aspirations, and standing back to give school leaders space to articulate their own suggested solutions and try them out. However, there were a number of challenges in project working along the journey to these positive outcomes:

- *Project focus*: developing a shared understanding across all partners and stakeholders on the purpose of the project was difficult. It took several months and experience of field work for partners to move to an understanding that this research was concerned with how to develop a culture of continuous improvement utilizing IS. More time for in-depth discussion of the detail of the approach, perhaps through modelling it, was needed along with greater discussion of the research questions and how these were changing.
- Keeping to the original project focus was made more difficult in Kenya and Chile for different reasons: in Kenya the lack of any prior experience with the Booksmart App lead school leaders to perceive initially that the project was about implementing and evaluating its use in their schools; in Chile the new structure and absence of any prior collaboration between the center Principals (school leaders) and the local authority meant that activity focused on establishing the conditions for use of IS although IS was deployed within the development of the improvement community. However, setting up and embedding the use of a collaborative space risked becoming the outcome rather than a step towards more widespread use of IS.
- *Expectations of the type of knowledge to be produced by the project*. In a related challenge there was initially confusion over the type of knowledge that would be generated by the project—participants and stakeholders were expecting models for scaling the approach and proven strategies for use of the App rather than learning about the use of the IS approach and any attendant outcomes.
- *Role expectations*: common practice in working with partners and schools is to focus on solutions and suggest that particular actions are undertaken. The IS approach with its initial focus on the problem and its analysis, before conceiving and implementing a small change is a very different framing for educators. Moving towards this approach took time both for the in-country partners and for the school leaders, many of whom initially expected to be given very clear plans for action and success measures by their in-country partners. Similarly, in-country partner team members’ expectations of their roles shifted considerably during the project as this colleague explains:

“My expectation was that I will be more like a coordinator who is responsible for helping oversee the overall project implementation. That includes ensuring that the school leaders are updated with all the processes and are able to submit their improvement science tools. Also, managing and establishing relationships with other partners and stakeholders on the ground. At the start, I didn’t really see or consider myself as part of the Networked Improvement

Communities (NICs) but more of an outsider who would implement a project and I saw the school leaders as the recipients of this project. My mind set before was to ensure that the school leaders could accomplish all the tools correctly and submit them on time.

My role changed when I started being involved in the school leaders' NICs. That's when I started to understand their context, their issues... my relationship with them changed because of our constant communication. Our interactions in the NICs changed how I previously perceived my role and I felt that I should act more as a facilitator responsible for helping to open opportunities for the school leaders to talk to each other and build their community and assist them in having an avenue where they can discuss their own problems and find solutions themselves and as the project implementation moved forward, I also realized that I should be someone who can motivate, encourage and enable the school leaders to trust their own capabilities so that they can take responsibility for their own improvement and to achieve the improvement that they collectively desire."

– In-country project coordinator, August 2022

It took time for in-country partners to achieve a balance of inputs to school leaders and the improvement communities (drawing on their prior knowledge and experiences) and supporting school leaders to explore their own solutions—identifying the right moment to put a suggestion on the table. For many colleagues this was working against the norms of their practice—movement away from a delivery and output driven approach towards creating space for collaborative conversations. But this opened up possibilities for learning as this colleague explains:

"This project did put us out of our comfort zone, we literally were fish out of water. But you know, in the process, learned a lot, which ties into my second key thing—using every opportunity as a learning opportunity. I think we get into projects, especially as we get into projects, having this notion that we understand the concepts) because we have been in this context for—or in this geography for a while. But with every interaction with the school leader, these different school leaders ended up landing different things that we really didn't think of or didn't take into consideration in our work programming for that in those communities so I think using that as a learning opportunity—being less sort of output driven but baking into how we work this opportunity to hear back from the communities, or from the schools, and to engage them as active participants in the development agenda."

– In-country project coordinator, August 2022

Recommendations

In our discussion, we have endorsed the use of Improvement Science as a methodology for improvement in education contexts. The following recommendations offer advice for further research and implementation of the methodology.

Implementation of Improvement Science for continuous improvement in educational institutions

1. *Network/community*: Establishing this is critical for providing technical and mentoring support and for offering a mechanism for sharing improvement activities and celebrating success.
2. *School leaders' perception of their role*: Encourage school leaders to see encouraging and supporting improvement as part of their leadership role rather than just maintaining stability and performance. This may require changes in how school leaders enact their role: practices

such as team working, and active experimentation are required for successful use of the IS approach. It may be helpful to conduct a training needs assessment and review of skills to understand the scale of changes needed. Furthermore, it may be necessary to adapt management reporting systems to ensure that metrics for improvement are used throughout.

3. *Time*: Allow time for discussions between partners and in the “improvement community” to develop a shared understanding of what a project using IS is trying to achieve. Time is needed for conversations to identify expectations, needs and ways of working in order to reduce uncertainties and to establish relationships and boundaries around what might be expected before starting to discuss the use of IS tools and identification of processes and practices for improvement. Additionally sufficient time needs to be allowed for implementation, for familiarity with the methodology and to allow participants time to engage in several cycles and develop the confidence to make adaptations both in the methodology for the context and when using the improvement cycles. We advise a minimum timescale of 18 months for ideas to be understood and partially adopted but it will be important to ensure that momentum is maintained throughout by setting improvement challenges with deadlines.
4. *Expectations*: Be realistic about what can be achieved in the circumstances, identifying where lack of “basic stability,” such as poor IT capability, limited capacity on the part of key actors such as the school leaders, inhibits progress or perhaps makes it inappropriate to use the methodology. Emphasize the experimental nature of PDSA improvement cycles, positively acknowledging early attempts at PSDAs even where these have limited success.
5. *Problem selection*: Match IS activity with process improvement and small-scale change. Don’t expect IS to tackle “wicked” or complex problems. Start with very simple, small-scale improvements—try for some quick wins to build experience and confidence in teams.
6. *Tools*: Don’t overload teams with too many improvement tools at the start. Select a few and adapt them in context, modifying the language used to gain acceptance and recognizing the multiple demands on the time and resources of school leaders, teachers, and community leaders in Global South contexts.

Given our findings we advise that the use of the IS approach should not be added as some kind of afterthought when thinking about a project methodology nor used in situations where there are other complex change activities. In situations where there is limited knowledge of IS, its implementation may constitute a major multi-agency undertaking that needs to be planned carefully before any benefits are realized.

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Annex 1: Continuous Improvement

The origins of some of the methods of performance measurement—in the context of process improvement—originated with Shewhart charts in the 1920s. These ideas were picked up by WE Deming in the 1950s, who trained many Japanese engineers in Statistical Process Control (SPC). It is difficult to overestimate the influence of WE Deming on the entire landscape of organization improvement from this point. His mantra of “improve constantly and forever” is still used today (see Knouse et al., 2009) in a wide variety of CI programs. The development of the Toyota Production System by Taiichi Ohno and Shigeo Shingo partly utilized Deming’s approach to continuous improvement and included “kaizen” or small-scale continuous improvement activities. When Deming drew the West’s attention to Japanese improvement methods (Deming, 1982) it sparked a series of new developments including Motorola’s use of “Six Sigma” quality control methods, total quality management, and just-in-time production methods. The seminal work, “The Machine that changed the World” (Womack et al., 1990) presented an authoritative study of how top-performing companies in manufacturing managed their process and systems differently, with the term “Lean thinking” used in their later book (Womack & Jones, 1995). It is at this time that Don Berwick, amongst others, championed continuous improvement in healthcare, starting with the Institute for Healthcare approach of collaborative improvement (e.g., see Sanchez and Blanco, 2014). Berwick codified the “science of improvement” the following decade (Berwick, 2008). It is this work that Improvement Science in education largely derives (Carnegie, 2009). The key point about this series of innovations is that an extensive body of literature on the challenges of implementation of CI exists across all of these manifestations of CI practice (e.g., see Bhuiyan and Bagel, 2005). There is no need to reinvent this research and hence this report includes references to literature across all of these areas of system improvement.

The figure below shows how many of these CI approaches evolved over time with some tentative links as one idea builds on others. The diagram faithfully represents Deming’s work in the 1950s as one common ancestor of everything that follows.

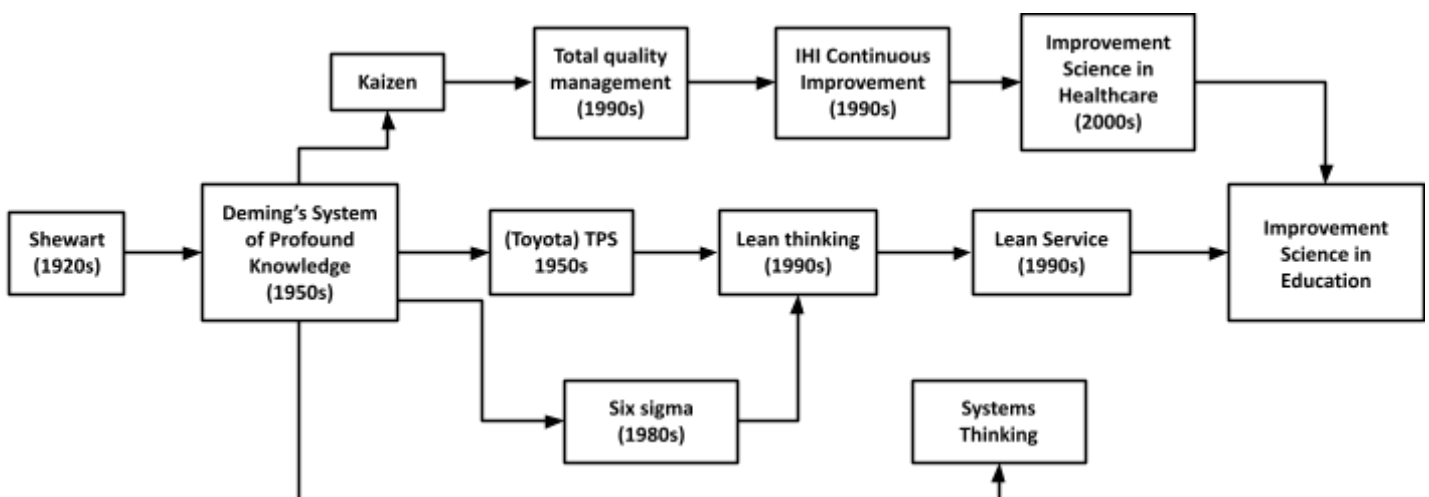


Figure 11. A representation of the origins of CI and Improvement Science

Annex 2: Knowledge Products

All outputs from the project comply with [IDRC's Open Access Policy](#). The in-country partners and research team ensured that project processes and implementation were participative, and all stakeholders were well informed in advance of the plans, strategies, and activities conducted throughout the project. All data collected through various methods were deposited in a shared cloud space accessible to all partners and the global research team (with ethics approval and project participants' consent). Data validation was conducted over several engagements among project participants to verify and substantiate the information gathered from various research tools. This was also done to avoid data misinterpretations.

Table 13. Knowledge products

Outputs	Focus	Authors/ Presenters	Status
Project reports (x3)	Overall project design, implementation, and outcomes	Country partners	Under review
Blog article	Improvement science approach https://tpdatSCALEcoalition.org/improvement-science-as-a-way-to-build-resilience-dr-paul-walley-the-open-university/	Paul Walley	Published
Blog article	Research approach and learnings	Worldreader - Kenya	In progress
Impact Stories (featuring school leaders in Kenya)	<ol style="list-style-type: none"> 1. Change in educational practice 2. Change in leadership practice 	Worldreader - Kenya	In final edit
Capacity-building videos	Using PDSA	FIT-ED - Philippines	Completed
International conference presentations (x5)	<p>UK Forum for International Education and Training (UKFIET) Conference, September 13-17, 2021. (Online) https://www.ukfiet.org/conference/archives/ukfiet-conference-2021/</p> <p>“Strengthening school leadership to improve school resilience.”</p>	Freda Wolfenden and Jennifer Agbaire (presenters)	Completed

	<p>Comparative and International Education Society Conference (CIES), Online April 18-22, 2022. https://cies2022.org/</p> <p>School leaders' professional collaboration to address problems of practice using improvement cycles, what are they (and we) learning? Case studies from Chile, Kenya and the Philippines</p> <p>Strengthening Collaboration among Chilean Early Childhood School Leaders: Piloting an Improvement Science Approach in a Local Public Education Service (SLEP)</p>	<p>Freda Wolfenden and Jennifer Agbaire</p> <p>Dante Castillo, Alejandra Canales and Andrea Mancilla</p>	<p>Completed</p> <p>Completed</p>
	<p>British Association of Comparative and International Education (BAICE) Conference, Edinburgh, September 13-15, 2022. https://baice.ac.uk/baice-conference-2022/</p> <p>'Winging it" or developing new forms of practice? Exploring the boundary work in an international education endeavor</p>	<p>Freda Wolfenden and Jennifer Agbaire</p>	<p>Completed</p>
	<p>Comparative and International Education Society Conference (CIES), Online, February 14-22, 2023. https://cies2023.org/</p> <p>Group Panel Submission (4 presentations) Improving school leadership post Covid-19 using through an</p>	<p>Freda Wolfenden, Paul Walley, Wanjiku Gathoni, Sylvia Garde, Dante Castillo and Alejandra Canales</p>	<p>Accepted</p>

	improvement science approach across three countries: Kenya, Philippines, and Chile		
Regional conference presentation	8th Annual conference on Education and Lifelong Learning, Kenyatta University, 6-7 October 2022 Knowledge Management to Strengthen School Leadership Towards Improving School Resiliency	Joan Mwachi & Wanjiku Gathoni	Completed
Peer-reviewed journal articles (x3)	Cross-country synthesis of the research findings	Global research team/ SUMMA	In progress
Local public engagement events	Chile Event to share findings with school principals and stakeholders (November 2022) Academic seminar for discussion with other researchers working on the field of School Leadership and improvement science (December 2022) Kenya Roundtable discussion with NGOs in the education space, Research entities and Government bodies including the Teachers Service Commission (October 11, 2022) Philippines Project Summit: Participants shared experiences with the	 SUMMA SUMMA Worldreader, Kenya FIT-ED	 In progress In progress Completed Completed

	<p>Schools Division Superintendent (SDS), and Asst. SDS of Lanao del Sur II Division and representatives from the Ministry of Basic, Higher and Technical Education-Bangsamoro Autonomous Region of Muslim Mindanao. Cagayan de Oro, July 28, 2022</p> <p>Shared project learnings with the National Educators' Academy of the Philippines (NEAP), October 2022</p> <p>FIT-ED to share learnings and project resources with NEAP Central Office Team and 16 NEAP Regional Office Teams, March 2023</p>	<p>FIT-ED</p> <p>FIT-ED</p>	<p>Completed</p> <p>In progress</p>
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