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Implementation gaps are persistent phenomena in disaster risk management: A perspective developed after discussions at IDRiM 2022

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Abstract Outcomes of a project or a policy often differ from expectations. We call such discrepancies "implementation gaps". Reasons for these gaps and for their persistence are worth serious study; such study should be a good entry point for developing an implementation science. We wrote a concept paper for a special session at IDRiM 2022; five discussants led a discussion of the paper and of challenges in developing an implementation science. The present paper represents our updated perspective after further reflection and the special session discussions.

According to our perspective, the fundamental challenge in describing implementation gaps and then moving toward an adaptable and expansive implementation science is to account for the number and diversity of actors in implementation activities. Different actors have different roles, different capabilities, and powers; their knowledge about the situation is different, and their concerns and perspectives are also different.

We begin by considering innovative approaches to describing and characterizing implementation gaps. We construct a model implementation story "a furniture nailing story," based on real experience in Japan following lessons learned from the Great Hanshin-Awaji earthquake of 1995. We also offer a model implementation failure story "a snowstorm story." In providing detail, attention to the diversity of actors is key; further analysis begins with a deeper characterization of actors and their relationships, influences, and interactions with each other.

We proceed to discuss steps toward an implementation science. We consider three aspects of science: 1) description: characterizing gaps, classifying them, and making classifications useful; 2) designing and testing: finding models for implementation processes and seeing how

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they work; 3) prediction: anticipating and preparing for challenges and opportunities in implementation.

Finally, we consider possibilities for learning from experiences in other fields and recommend modest attempts to develop new dialogues with "prospective neighboring disciplinary communities."

Keywords: Implementation Gaps, Implementation Science, Disaster Risk Management, Planning, Narrative Approaches

1. INTRODUCTION

All our readers have had this experience: you saw the outcomes of a project or policy differ, often substantially, from expectations. We call such discrepancies "implementation gaps". When there is a gap that seems like a failure, people often look back, to find someone to blame, or to explain why that failure could not have been avoided. Sometimes, but not often enough, the look back can produce real learning, developing knowledge that can improve projects and policies and improve their implementation. Freeman, in his book *Hindsight*, discusses both the promise and perils in "looking back" (Freeman 2009). At the same time, it has been a persistent frustration for many of us that a significant portion of 'lessons' are not 'realized', leading to persistent implementation gaps that might otherwise be prevented.

Last spring, the four of us decided that frustration was an inadequate response and that it would be worth seeking underlying reasons for gaps and for failures to learn from them. We also considered this too large and complex a problem for us to tackle by ourselves, so we looked for ways to interest others. The Society for Integrated Disaster Risk Management (IDRiM) encourages work on implementation and was a natural place to start. We wrote a concept paper (Okada, Goble, Seo, and Han 2022) summarizing our initial thoughts. We sent copies to five distinguished discussants, Ortwin Renn[5], Miranda Dandoulaki[6], Ilan Chabay[7], Yoshiyuki Yama[8], and Yoko Matsuda[9]; and we organized a special session at the IDRiM 2022 annual meeting in which those discussants presented their thoughts on the concept paper and, more generally, on efforts to develop an implementation science. That discussion was followed by an open discussion involving other IDRiM 2022 participants. We continue our work on the topic and have in several important areas moved beyond our original presentation. In this paper we summarize our current perspective on implementation issues: that perspective draws heavily from our initial concept paper, from many helpful insights from our discussants, from the other participants in the IDRiM 2022 discussion, and from anonymous reviewers of an earlier version of the paper. Our mode of presentation is a narrative, storytelling, rather than analytic. This is a deliberate choice: we do not believe that we yet have an adequate analytic framework for addressing the complexity of the issues as we frame them; also, as we discuss later, we wish to encourage the use of narratives to convey the richness of complex implementation situations.

Our starting point last spring was three questions and a concept:

- Why do people fail to learn from experience when projects or policies do not go as expected? And furthermore, why do 'lessons learned' often fail to be applied and realized (e.g., National Research Council 2015)?
- What can be done about such repeated failures to learn, and more importantly, what can be done to apply what is learnt?
- How can IDRiM contribute to better learning and its realization in practice?
- Implementation gaps, and discrepancies between expectations and what happens, are a concept worth exploring in depth rather than just something to deplore. A systematic typology of implementation gaps may offer a conducive entry point for better understanding the underlying causes and also for finding more targeted and effective measures to improve planning and implementation.

We still consider implementation gaps, the difference between plans or expectations and results, worth in-depth study, and a good entry point to the development of a suitably broad implementation science. However, we have found the realization of a systematic typology of gaps to be an ongoing challenge and one not likely to be realized before there has been considerably more progress in characterizing implementation situations.

Although the notion of an implementation gap, is simple and intuitive, much complexity lurks behind that notion. In talking about implementation, we are talking about complex human systems with multiple actors. There can be many different sorts of reasons that gaps arise: perhaps the implementers failed to do their job. Or perhaps unanticipated circumstances intervened. Could those circumstances have been anticipated? and should there have been contingency plans? Perhaps the plans lacked flexibility to deal with a range of unanticipated conditions. Or perhaps the plans were badly designed and were too difficult to implement. Or maybe there was scarcely any planning at all? Or perhaps some people had expectations that did not appear on the social agenda?

Accompanying those possible reasons come differences in perceptions of gaps: some might see missed opportunities, while others might think the final result was a success, as good as could be expected. Different people might consider different aspects of a project or policy as most significant and that could affect their view of the significance of a gap. We explore some complexities in the next section, section 2; in it we look at nuances in defining an implementation gap and consider how the framing of implementation situations can alter our view of them.

It is important to remember that not all gaps are bad. Things can turn out better than expected: perhaps there were unexpected opportunities that could be grasped; or the communities were more ready than people believed to use the project resources or to access policy change benefits; or there were unexpected circumstances that facilitated

implementation; or the implementation team found better approaches than had been envisioned. Such possibilities mean that applications of implementation science should not be limited to a simple goal "narrow the gap". Instead, we must seek ways to "improve outcomes".

All that variety in the reasons for gaps, in how people view gaps, and in what kinds of benefits might be achieved or lost, reflects the many ways in which implementation situations might be described. It is this richness of possibility that convinced us that an implementation science was worth developing and that implementation gaps would be a good entry point for developing such a science.

1.1 Structure of the Paper

As we discussed "implementation gaps" among ourselves, three kinds of questions came up repeatedly. On reflection these seemed to exemplify three kinds of roles that scientists might take and, therefore, three different aspects of an implementation science. It seems premature to call our hypothetical scientists, "implementation scientists" while we believe that much science still must be developed. But we might call these hypothetical people "implementation-concerned scientists" or "i-c scientists," a description we apply to ourselves.

1) Role 1: the i-c scientist observes: characterizing implementation gaps, classifying them, and making the classifications useful

2) Role 2: the i-c scientist designs and tests: identifying models for appropriate processes and seeing how they work

3) Role 3: the i-c scientist looks ahead: how can challenges and opportunities in implementation be anticipated and prepared for?

We discuss these three roles at the end of section 2, in the context of framing and entry points to an implementation science. Regarding the first role, after a considerable struggle that was exposed in our concept paper, we have concluded that finding "good descriptions" is both difficult and a prerequisite for a useful classification.

We began our concept paper with a (simplified story), the "furniture story". One of our discussants, Ilan Chabay, urged us, moving forward, to make fuller use of the power of narrative, of storytelling. We elaborate on the furniture story in section 3, using it as vehicle for considering how stories can contribute to richer and better characterizations of implementation situations and gaps.

In section 4 we consider a broad array of characteristics to be considered in characterizing implementation gaps and situations. We describe tools for identifying them and we discuss how they may usefully appear in stories of the sort considered in section 3.

In section 5 we return to the just mentioned 3 roles and describe our current thoughts on developing an implementation science centered around them.

Because implementation gaps are ubiquitous, i.e. appearing all-around and all-the-time, there is much experience available to learn from. There has, however, been insufficient attention to using that experience effectively. Effective learning involves unlearning the previously held beliefs that are barriers to change. Also we believe that some inattention comes from lack of care in the framing of implementation issues. In special situations a narrow framing of implementation issues has produced substantial successes; however, all too often the challenge in implementation is viewed as how to obtain a particular result; the nexus of relationships between planning and implementation is then ignored, as are many of the uncertainties in the implementation situation. In section 6 we review some issues in framing to present our view that while implementation in disaster risk management has distinct features, a general implementation science can embrace these. We then provide some examples to show that much can be learned from existing information in a variety of fields.

We end by returning to our original questions including "How can IDRiM contribute to better learning about implementation and its realization in practice?" We summarize **our perspective as of now** and offer some recommendations in section 7.

1.2 Views from our Discussants

Our five discussants contributed substantially to the development of this paper, though they should not be blamed for any of its content. They encouraged our effort; they supported our belief that more systematic consideration of implementation was needed and that implementation gaps were a plausible entry point. They made substantial criticisms of the concept paper but accompanied these with helpful suggestions and observations. They raised some general questions that we only partly address in this paper. Much of the criticism was in the context of our initial foray at a classification system. We have concluded that more study is needed before a useful classification could be built. In that context, Ortwin Renn reminded us that we must think of people not as atoms but as participants in groups and organizations and in societies and cultures. He also encouraged our attention to systemic relationships. Miranda Dandoulaki urged attention to the concerns of practitioners and to their insights. Barriers to implementation are an important concern. She also raised a question about the generality of our efforts; how distinct are implementation issues for disaster risk management; how sensible is it to look for a general implementation science? Ilan Chabay urged us to pay more attention to the power of narrative. Yoshiyuki Yama stressed the importance of communication among all players and especially the inclusion of community voices in that communication. Yoko Matsuda made the very general observation that our approach was neither deductive or inductive, but rather abductive, teasing out the reasons behind surprises and puzzles. Following Miranda's observations, Yoko Matsuda put forward the notion of a "reflective practitioner" who must be a participant in any development of implementation science. More specifically she also challenged us to include consideration of inequities, racial, gender, and other biases.

1.3 IDRiM Experience

The issues we raise are not new to IDRiM. The 4th IIASA-DPRI conference was specifically on Integrated Disaster Risk Management and Implementation. In Okada's keynote (Okada 2004) he presented the concept of an implementation knowledge gap as a "valley between knowledge producers and end-users." Okada has continued to speak and write about implementation in many settings with many colleagues (samples: Matsuda and Okada 2006, Gopalakrishnan and Okada 2007, Okada, Fang, and Kilgour 2013, Okada 2018, Okada and Goble 2021). And he is not alone. The first issue of the IDRiM journal contains a paper on implementation by Katsuya Yamori (2011). Despite this long and influential history, we believe that IDRiM can and should do more to provide the support needed to develop the kind of implementation science that would improve disaster risk management. One reason for our belief is that the development of such a science will require close collaboration among academics, planners, policy makers and practitioners (Menoni et al. 2015, Clark et al. 2017). All of these groups with their differing perspectives are represented in the IDRiM community. Good communication among these groups with their differing perspectives will be important for collaboration; also, other perspectives from citizens, from legislators and authorities, from managers, must be included; that will require communicative outreach. We discuss functions of communication in section 5.2.

2. WHAT IS AN IMPLEMENTATION GAP? THE SIGNIFICANCE OF FRAMING. BARRIERS TO IMPLEMENTATION. IMPLEMENTATION SCIENCE AND HOW TO APPROACH IT.

We defined an implementation gap as "the discrepancy between what was planned or what was expected and what happened". That serves pretty well as a working definition: we understand what we mean and when we talk to others they understand, and they start thinking about such discrepancies that they have seen in their own experience. Nuances, however are important if we imagine looking ahead to an implementation science. Context matters (see, for instance, Suchman 2007). Much nuance stems from recognizing that different people can have different perspectives, on plans and on outcomes. The narrow framing of the definition is to assume that there was a detailed plan that specified the expectations for outcomes. It initially served as a model for what an implementation gap might be. But what might have been the expectations of the targeted beneficiaries? Or suppose the plan was not realistic and that was recognized by some but not others? Or suppose there was effectively no plan?

We had some spirited internal discussion over the last possibility. The model case was the recurring disasters of many-hour traffic jams when cars and trucks are immobilized by snow. These happen in Japan and the US and elsewhere, but nothing seems to get done to prepare for them. Is this a simple case of "no plan, therefore no expectations, therefore no gap"? Or should we consider a public perspective "these are familiar disasters; they are frequent enough that people should be prepared for them; why are there no preparations?" For the public this seems like a pretty big gap.

No definition can easily embrace differences in perspectives leading to differences in how gaps are viewed and simultaneously tightly define what is an implementation gap. At least we haven't found such a definition. But the example sheds light on important aspects of implementation. For a project or policy to be implemented, it must have made its way to some public or private agenda, so there is attention to it. Moreover, there must be some proponents who have some degree of commitment to making it happen. **The degree of commitment matters:** many examples of implementation gaps are of **under-resourced projects,** projects lacking sufficient financing and/or staffing and/or expertise. "Under-resourced" is an insufficient description. We should ask, "what are the reasons for the lack of resources?" If the answer is lack of commitment, then we ask "how much commitment was there among various parties?" Further follow up could be "what were reasons for a lack of full commitments?" These questions should lead us to investigate incentive structures, distractions caused by other issues, incomplete knowledge, and imperfect communication.

Our discussant, Miranda Dandoulaki, brought a practitioners' perspective. She suggested that an alternative and potentially fruitful, entry point to implementation science would be to look systematically at **barriers to implementation.** She gave three examples of barriers that she and other practitioners encounter frequently: authorities and politicians and their ilk do not want to be associated with potential disasters; disasters are a disagreeable subject and perhaps they might not happen. Authorities also don't like uncertainty: they want to convey a clear and forceful message and "your chances will improve" doesn't do the job. Long times between events are a further barrier: "yes there is a problem, but why do we have to deal with it now?" These barriers apply of course to preparations for a disaster. When a disaster occurs, politicians are likely to rush in, find someone to blame, and politicize the event. That notoriety may, however, offer an opportunity for improving preparations for future disaster possibilities.

These barriers point to the issue of commitment and reinforce the claim that incentive structures and how they work for different parties are worth investigating. Incentive structures fit naturally in a practitioner's perspective or framing of implementation situations and implementation gaps: "I (or my colleagues) am expected to accomplish something, and I face difficulties". In contrast the "narrow definition of an implementation gap" represents a "planner's perspective or framing": the plan sets the expectations. We believe a broadly useful implementation science must accommodate the possibility of multiple and differing perspectives and framings, including those of planners and practitioners, but also those of other parties, authorities with responsibilities and the targeted public, etc. Therefore, we still recommend a focus on implementation gaps as an entry point, especially if the focus is not limited by the narrow definition; we acknowledge, however, that careful pursuit of the narrow definition or of the practitioner's perspective can lead to many useful insights.

Multiple and diverse framings will shape the development of the three aspects of implementation science we consider in this paper, observations, processes, and predictions. Observations are foundational; further consideration of processes and predictions will refer back to observations and their multiple framings. We have embraced Ilan Chabay's suggestion

that we rely more on narratives for organizing observations. Stories, however, usually come with a point of view, a framing. We illustrate our approach in section 3. There we revisit and refine the furniture story from our concept paper; we consider multiple points of view, thus giving us a bundle of versions of the story. We hope this approach can be developed into a useful tool for characterizing implementation gaps and implementation situations.

We are still far from creating a systematic typology of gaps and situations; however, we believe that taking the further step of making indexes, that is of identifying salient features of story bundles, will be progress toward that goal. Indexing will facilitate comparisons between story bundles, learning better how processes work, and the drawing of inferences for improving implementation.

3. THE FURNITURE STORY AS A MODEL

We opened our session at IDRiM2022 and the concept paper that accompanied the session with a story; we called it the "furniture nailing story." We did so, hoping to engage participants immediately in thinking about an implementation gap and its complexities. We were unconsciously relying on what Ilan Chabay calls the power of narrative both to engage and to add depth to people's understanding (Chabay et al. 2019, Chabay 2020, see also Georgakopoulou and Anna 2015). Here, somewhat updated, is the story we used.

3.1 Furniture Nailing Story

Here is a model implementation story constructed by us following lessons learned from the Japanese experience of the Great Hanshin-Awaji earthquake of 1995.

Project name: "Nail your furniture to the wall."

Project slogan: "It is easy and can save your life if you are home during an earthquake"

Result of implementation: Didn't take off nearly to the extent it was hoped for, but repeated attempts have shown modest but sound progress.

There were six different actors who were engaged in completing the project:

Actor 1: Engineer, the inventor of a useful device

Actor 2: NGO DRR promoter, who can organize and secure funding for a project

Actor 3: Carpenter, a volunteer who can do the nailing

Actor 4: Social worker, who speaks to the elderly people and helps them secure services

Actor 5: Researcher, who can take an active role by facilitating needed connections between actors, or simply a passive role by chronicling what happened

Actor 6: The elderly people living in high rise buildings who are concerned for their safety

What happened can be told in the (imagined) words of the Actors, as illustrated in the cartoon, Figure 1:

Three key interactions were made in the story. Actors 1,2,3 formed a team that planned to nail furniture to the wall and expected that doing so would be quick and easy. Actors 4,6 formed a team that articulated actor 6's broad concerns about safety both from earthquakes and from strangers. Finally, facilitated by the social worker and the researcher, all the actors came together as a team that could try to make the nailing happen.

The different teams saw different implementation gaps at different times in the story: the planners saw resistance to their "easy and cheap approach to safety"; the targeted elderly saw a lack of attention to their needs; for the whole team, the implementation gap was significantly narrowed: nailing furniture to the wall was now possible. This would lead to great improvements in earthquake safety, but it was not so quick or easy.

3.2 Knowledge Generation by Cartoons Displaying Animation Dynamics Among Actors

Cartoons communicate directly and give an immediate (and sometimes somewhat deceptive) sense of understanding. It is our view that a cartoon that depicts the various actors and aspects of their perspectives and interactions is a helpful tool for organizing and telling implementation stories. Of course, there is more to tell.

So far, we have presented the story from the "researcher's" perspective. The engineer would tell it differently: identifying the problem, overcoming the technical challenges, finding help to get his solution out into the world, unexpected complications, and receiving further help. The social worker would tell a story of listening to people's concerns and finding connections that can help. But once the larger team is formed and there is good communication among them, the stories begin to converge.

Figure 1: The furniture story

3.3 Further Comments and Observations on the Furniture Story

The furniture story is a simplified model story developed from the actual practices conducted in Nagoya Region of Japan under the initiative of NGO Rescue Stock Yard (RSY) (Matsuda 2010). It was not the only such effort; many other, similar "implementation-concerned" attempts were made after the trauma of the 1995 Great Hanshin-Awaji Earthquake disaster.

1) One simplification was that in the actual case there were other players, especially the media, but also government officials who played significant roles.

2) The identification of a need for securing furniture was sound and evidence-based, using evidence obtained from the 1995 Great Hanshin-Awaji Earthquake disaster. Although most deaths were not attributable to loose furniture, nearly 50% of serious injuries were.

3) The initiators of the project expected it to be easy, inexpensive, and quick to practice. That assumption was used to justify the project, but those expectations were not met.

4) For the creators of the project, it turned out be an example of "we thought we knew but we didn't."

5) An effective team process was needed to meet the implementation goal, getting people's furniture nailed to the wall. Additional people with their knowledge and perspectives were brought in and worked together with the original team. The users were listened to. The team found that communication among themselves was an essential part of their collaborative work.

6) The progression in the story is an example of adaptation both in planning and implementation. It shows the instrumental value of initiating and nurturing "communicative spaces" (Okada and Goble 2021).

7) Different situations and contexts will lead to different stories. The furniture story describes a particular type of risk to a particular population. In other settings the risks will likely be different, the needed interventions will be different, and the approaches to implementation will differ in particulars.

Two other earthquake examples: although it is too early for reliable data, in the very recent Turkey/Syria earthquake, few buildings were left standing and furniture movement was only a small portion of the disaster. The stories are likely to be about building codes. In the 2011 Eastern Japan Earthquake, more than 90% of deaths were from drowning in the Tsunami, The relevant stories were about "evacuation to the agreed safe place immediately by yourself," known as the "Tsunami Tendenko Story." (see Sekine 2011, Katada 2012, Yamori, 2014, Kodama, 2015, and Ridgeway 2020).

4. CHARACTERISTICS OF IMPLEMENTATION GAPS THAT APPEAR AS FEATURES OF STORIES

Story bundles provide a good beginning for learning from an implementation gap. But there is more to do. We will want more detail for understanding the stories and we will make comparisons between story bundles and learn from the comparisons. We will want to develop an indexing system that identifies key features of each story bundle and can be used to make a catalog of implementation gap stories and analyses.

There are very many kinds of details that might shed light on a story; these can provide many potential features for an index; some may change with time: The conceptual space these inhabit is very large and multidimensional, so it is daunting to imagine an approach that would apply to implementation gaps across the board. Here are some areas that are often pertinent:

- **Knowledge:** what do the various players know and not know and how does that affect their choices and actions?
- **The Hazard:** What is the nature of the hazard and its possible size and severity? These characteristics will strongly influence the possibilities for developing plans and implementing them.
- **Communication:** do the actors communicate well or poorly? Do they have shared understandings of the situation? And shared goals?
- **Uncertainty:** How certain are the players in what they know? Can flexibility be built into planning and implementation? Is overconfidence a concern? Does uncertainty make it less likely that people will act?

- **Reasons for a gap - barriers:** was it a lack of resources? Not enough time? Lack of external support? Inadequate participation?

- **Reasons behind the reasons:** why did the various insufficiencies happen? Unfavorable incentive structures? Lack of commitment? A lack of trust among participants

In the furniture story, the reasons for lack of participation were key: the reasons behind the reasons were a cultural resistance and fear combined with a lack of trust in the implementers. Only when the team understood the cultural concerns and found a way to address them, did the project move forward.

One possible generic reason behind the reasons – lack of commitment – is a reminder of our earlier discussion of implementation gaps when there isn't even a plan to be implemented. Our test case was the persistent failure of town and state officials to prepare for the huge traffic jams that can happen in a major snowstorm.

There are many players: people who for various reasons find themselves trapped in the traffic jam, other people who don't notice the problem, weather forecasters, town and state workers who respond once the emergency happens, officials whose snow budgets are limited, politicians who promise action, but not till next year, NGOs who deplore, and researchers trying to understand why the situation persists and trying to figure out what could be done to catalyze action. Characteristically there is very little effective communication among all of these and certainly no effective commitment to doing something.

This situation can be portrayed in a cartoon, Figure 2. It makes the point that agenda-setting and commitment are important features of an implementation situation. It also provides a vivid display showing many key players whose interactions are not productive.

The diversity of actors is a key detail in stories, and we recommend that further analysis begin by a deeper characterization of each actor and their relationships, influences, and interactions with each other. An analytic and visualization tool for doing so is the so-called "decision landscape" (Webler et al. 2015). The actors appear as nodes in a network; their relationships and their interactions appear as connecting lines with arrows indicating direction of influence or impact. A cartoon can serve for an initial draft of the network; the figures (actors) are shrunk to nodes and lines are added to show interactions.

Decision landscapes may change over time. In the furniture story, there was a profound change in the interactions when the six actors came together to form a team. So far, the snow traffic emergency story has shown little systemic change, just recurring incidents.

Figure 2. A snowstorm story

After creating a "decision landscape" that assembles some important details relating to the actors and their relationships to each other, additional details can be filled in later. The "landscape" can be imagined as having layers of information, analogous to the layers in a geographical Information system (GIS). The result should provide a rich and informative background to the initial story bundles.

For comparative purposes we will want identifying labels that suggest important ways in which story bundles are similar and different. Generic labels may be most useful in efforts to find and compare information gaps in a variety of settings.

A tentative label for the furniture story might mention:

- evidence-supported approach to a specific earthquake hazard
- A small team had an initial failure to understand public responses to that approach
- formation of larger team that listened to the public's concerns and observed its lack of trust
- the larger team acted to meet those concerns and to rebuild trust

A tentative label for the snow traffic emergency story might mention:

- well-understood hazard
- many actors with ineffective communication among them

- lack of commitment by any group
- no plan and no action

We hope to encourage the collection of implementation gap story bundles supported by analytic details. With the application of suitable labels that can be indexed, the collection then would become an indexed catalog.

5. STEPS TOWARD AN IMPLEMENTATION SCIENCE

In our view the fundamental challenge in developing a suitably adaptable and expansive implementation science is to frame appropriate questions that account for the number and diversity of actors in implementation activities. That challenge has implications for each of the three roles of i-c scientists and, importantly, for connections between them.

5.1 Role 1: The I-C Scientist Observes: Characterizes Implementation Gaps, Classifies them, and Makes the Classifications Usable

Observations are the foundation for any science. The diversity of participants in implementation, their differing roles, concerns, and knowledge all mean that the observations are of complex human systems. Useful observations should reflect that complexity. In section 3 we described and illustrated our current approach. The first step is to develop narratives (stories) about the implementation situation and what happens or has happened within it. In each case, several stories – we can imagine bundles of stories - will be needed to reflect the different perspectives of different participants. When the goals of the players are mostly aligned, when there is good communication among them, and when they have shared views of the situation, differences between their stories will be nuanced but will still reveal differences in their situation and perspectives. Much larger differences will appear when there is poor communication, when goals are not well aligned, and when common understandings are limited. In extreme cases there will be hidden or overt conflicts in the stories, producing an effect like that in the great movie director Kurasawa's film *Rashomon*.

Our initial plan for a second step was to categorize observations into a typology. We made a preliminary try at developing such a typology in our initial concept paper. We describe that below. However, from our own experience and the response of our discussants, it became clear that we were too ambitious: instead, we believe we need an intermediary second step that further characterizes the story bundles, as we described in section 4. As we noted in that discussion, there is a bewildering array of features and dimensions that could be of concern in particular cases. To attempt a classification that is based on all these possibilities seems foolhardy. Instead, in sections 3 and 4 we propose a descriptive effort followed by a labeling and cataloging effort as the next step toward a typology. That effort would collect implementation gap story bundles in a catalog; labels emphasizing key features of the stories

would be input to an index for the catalog. Such a catalog would facilitate comparisons among stories. We are experimenting with the use of visual aids, conceptual maps, as an aid to the indexing: this could facilitate comparisons, but we have not yet found useful formats.

We have not abandoned our quest for a typology of implementation gaps; however, it will take more time. Once achieved, a preliminary typology will have value. This was apparent in our very early discussions. Each of us immediately brought up the need for classification, for a typology. We shared three reasons. First, labels (i.e., categories) will help us and others pay attention and organize observations. Labels also help to facilitate communication – "this is what we have seen, what have you seen?". Second, classification can serve to begin building a scientific description and theory of implementation gaps. There are many different kinds of gaps, and they occur for many different kinds of reasons. A classification can link types of gaps to reasons for them, thus initiating a theoretical understanding. A shared structure that links descriptors to reasons will facilitate the communication and collaboration that makes developing a science possible. Third, each of the four of us wishes to contribute to improved planning, policymaking, and the implementation of plans and policies. Different types of implementation gaps will be best treated by different measures for improvement; a structure that links implementation situations with potential measures for improvement should facilitate communication between i-c scientists and practitioners, the planners, policymakers, and practitioners who do the work.

In our discussions we used those three reasons to suggest a 3-tier approach to creating a typology and applying it. We also used a medical analogy to describe the tiers.

The first tier would provide descriptors: the features that characterize and draw attention to the implementation gap. This tier is where bundles of stories and their placement in a catalog are found. The medical analogue would be the symptoms and history presented by a patient.

The second tier would focus on understanding; it would describe possible causes or reasons for observed gaps and seek to establish which apply to which particular situations. This will require further analyses including using the labels to identify and compare among nearby, parallel, and less close story bundles. The medical analogue would be the diagnosis of the disease or syndrome based on the symptoms and history, (and, possibly, further information such as test results). Okada and colleagues have used the diagnosis analogy for considering preparations for disaster (Okada et al. 2007, Matsuda and Okada 2006).

The third tier would focus on ensuring that the classification is usable in implementation; it would identify what can be done to improve implementation in relation to various implementation gap situations. Here again further analysis will be needed involving comparisons among story bundles. The medical analogue would be to develop a treatment plan for the patient based on the symptoms and diagnosis.

Clearly there is much work to be done and we have only begun to scratch the surface. We have sketched the notion of bundles of stories and cataloging them but have yet to address the analyses required in Tiers 2 and 3.

In our 2022 concept paper, we made a premature classification effort based on knowledge. The idea was appealing: our definition of an implementation gap – the difference between expectations and what happened - is based on knowledge and there are characteristic stories in the literature.

We considered 3 possibilities:

I. We knew what to do but we didn't do it

II. We thought we knew but it proved that either the knowledge was incomplete or incorrect

III. We simply didn't know

The first possibility has inspired considerable discussion in disaster risk management and many other fields. This literature often involves case studies; it has created such terms as "knowledge to action gaps" (e.g., Gaillard and Mercer 2012), "gaps between science and policy", or "from policy to practice", calls and guidelines for 'Words into Action' (e.g., UNDRR 2019), the "Know/Do gap" (University of Washington 2022), etc.

We abandoned that approach, however, because of the fundamental challenge already mentioned: there is no single "we". There are many different players; they have different states of knowledge; and the possible combinations are complex. Differences in knowledge among the different players and how that knowledge might change will be key aspects in bundles of stories, but they will not provide a determinative classification.

5.2 Role 2: The I-C Scientist Designs and Tests: Identifies Models for Appropriate Processes and Observes how they Work

In this role we ask ourselves how improvements can be made in the processes for planning a project or policy, in the processes for implementing it, and, especially, in the processes for maintaining the connection between planning and implementation? These are questions that must look to the Tier 2 and Tier 3 analyses of Role 1, as the answers will depend on the nature of the implementation situation. However, we can offer some preliminary considerations.

Two approaches might be taken to narrow implementation gaps where appropriate, and to improve outcomes: 1) make implementation conform better to plans and designs; 2) make plans and designs that better allow for the possibilities, the exigencies, and importantly, the opportunities that may arise in implementation. Both approaches merit attention; they can be fruitfully combined, thus emphasizing the importance of paying attention to the connection between planning and implementation.

Combining the approaches also suggests an important distinction in planning: 1) planning that prescribes implementation steps; 2) planning that encourages and supports flexible implementation processes. Finding an appropriate balance between these two aspects of planning is a critical challenge for planners. The challenge relates to framing. If implementation is viewed from a planner's perspective, it is easy to imagine that implementation only requires following instructions. However, if the planners look to understand the practitioner's perspective and if they acknowledge that uncertainties in disaster risk management are inevitable, they may achieve a better balance.

Finding that balance has the further, and by now familiar, complication that many different parties will be involved and affected by a project or policy: they may have differing goals and are likely to have different perceptions of how planning and implementation proceeds. One of our discussants, Yoshiyuki Yama, encouraged us to pay close attention to communication between all parties in implementation. Okada and Goble in earlier presentations at IDRiM meetings have stressed the central importance of communications in creating and putting into effect projects and policies (Goble and Okada 2021, Okada and Goble 2021). They have also noted the multiple purposes effective communication can serve. These purposes can provide guidance for a structured look at the processes through which the many players interact.

Getting acquainted: In the acute situation of an unfolding disaster, it is really important for people to know who is involved in doing what, who has what responsibilities, where there are vulnerable people, and what their needs might be. The time of the disaster is rather late for making such discoveries. The most basic communicative function is ensuring that people know each other and know what to expect of them. This is a key aspect of any endeavor at planning and putting in practice, not just in emergencies. Meetings that facilitate initial and recurring interaction (situations and participants will change) are essential contributions to an implementation process. These may be considered a basic "participatory platform".

Achieving better collaboration and coordination: Implementation is rarely the responsibility of an individual. Possibilities for failures in coordination and collaboration provide fundamental challenges in designing processes for planning linked to implementation. Responding to these challenges requires more attention to the ways in which people communicate and the shared knowledge, perceptions, and goals they have. First of all, people need to meet together in person, online or hybrid, or even adding conventional communication tools such as exchanging letters or written documents. Repetitive practices for meeting together can have an instrumental role, enabling people to identify opportunities and then work together. The objective must be to create and nurture a more elaborated but perhaps less inclusive "participatory platform", what Okada and Goble have called "communicative spaces"; environments in which people communicate while sharing knowledge, perceptions, and goals and in which they work together constructively to achieve shared goals.

Maintaining greater flexibility and adaptability: Most projects and policy interventions are made in complex circumstances; there is insufficient knowledge; implementation must cope

with much uncertainty. Working together constructively in these circumstances will require flexibility and the ability to adapt to new information and changing circumstances. Learning while doing is the key and good communication is necessary. Implementation would begin with agreement among the participants on what appears to be the most workable approach, but there will provisions for observing what happens and for making adjustments based on those observations. The cycle can be entered at any point but it is critical for adaptation that it be repeated. Okada (2018) has called such adaptive processes "dynamic spiral processes of Plan-Do-Check-Action (PDCA) cycles." In a unit of the PDCA cyclic process, there are two "Implementation-intended Do's", one is "to do" based on "to plan," and another is "action " back to "plan" based on "to "check." "Implementation-intended Do's" should operate in both directions, plan to do, and act to plan.

We suggest that a similar adaptive approach may be taken to learn how to design better processes for integrating planning and implementation. In selected situations, plausible practices may be tried. These practices can be observed and tested; potential refinements then can be identified and tested in other settings. Taking this approach will, however, require a commitment that a broader learning agenda be part of implementation science.

Securing Legitimacy: "Buy in" by the participants and other affected parties is an essential part of successful implementation. A participatory platform is also key for achieving "buy-in". However, the nature of the participatory platform is different: stakeholder representation is needed rather than shared understandings and shared efforts. Also, stability and established rules and procedures are prime attributes. If such a platform has been already established by the institutions responsible for the project or policy, then effective engagement with it and adherence to its rules and procedures will be part of implementation. If there is no existing platform, creation and nurturing one is a further challenge for implementation.

Some implementation experience with tested model processes: Over several decades, in his work with a variety of communities, Okada has developed some frameworks for observing and putting into practice collaborative forms of community communication and action. These frameworks, among the many tried and reported by others, could serve as models for developing planning and implementation processes in different settings. In the adaptive spirit discussed earlier, the processes could be tested and refined. One such framework is the spiral dynamics of PDCA mentioned above. Other frameworks begin at earlier stages of project development, the placing of a project on a public agenda, the development of shared understandings and shared goals, and securing commitment to the project effort. These earlier stages are addressed in two frameworks developed and tested by Okada in collaboration with communities he has worked with; SMART governance (Small and Solid, Modest and Multiple, Anticipatory and Adaptive, Responsive and Risk concerned, Transforming) (Okada 2018) illustrated in Figure 3, and the Yonmengaiki system framework (Okada et al. 2013) for a working and constructive community meeting, illustrated in Figure 4.

The Yonmenkaigi system goes beyond the visualization of decision landscapes by providing an opportunity for participants to experience the systemic complexity of multiple players with diverse perceptions and values. Through that experience they develop alternative narratives of change. Crossroads Gaming (Yamori 2008) is another tested tool providing similar opportunities.

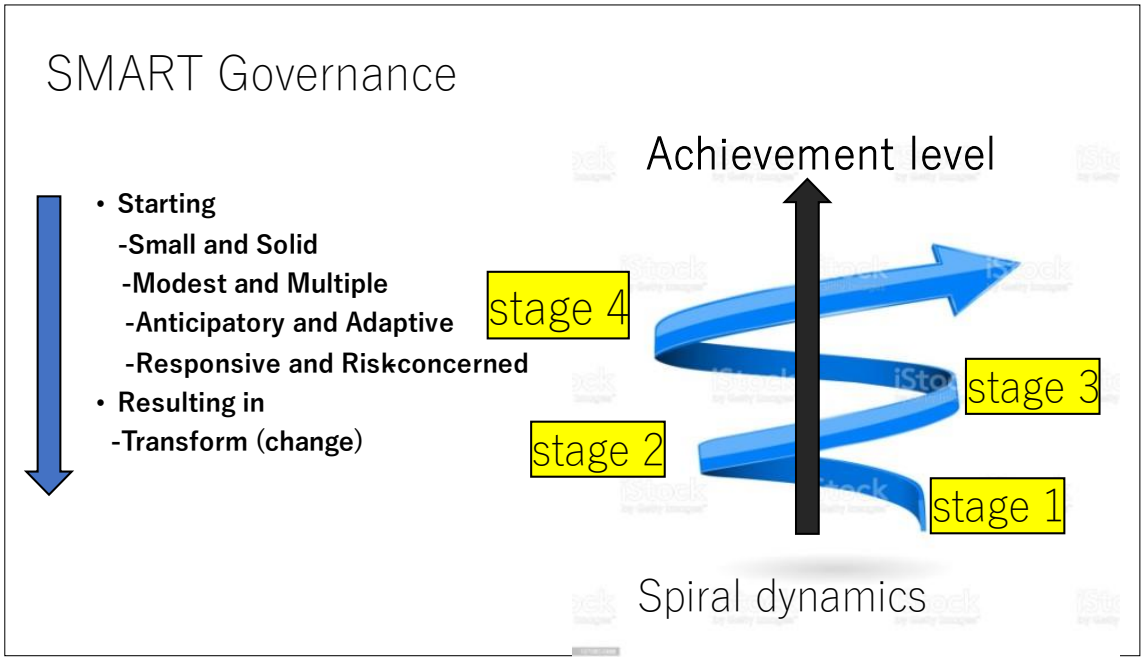

Figure 3. SMART governance and spiral dynamic processes

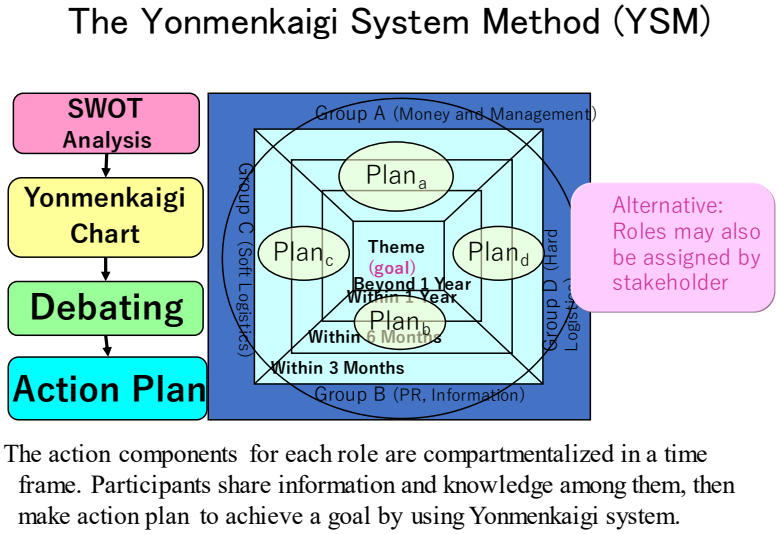

Figure 4. The Yonmenkaigi System Method (YSM)

5.3 Role 3: The I-C Scientist Looks Ahead: Considers How Challenges and Opportunities in Implementation can be Anticipated and Prepared For?

A common feature of troublesome implementation gaps has been that the troubles were not anticipated or prepared for. Instead, very often, the troubles were seen as surprises: "no one could have foreseen this" or "someone must be to blame." Yet the repeating nature of such experiences and the similarities that can be observed in them suggested an alternative view: there has been insufficient attention to the structural challenges in planning and implementation.

Good planning and implementation processes as discussed in section 2.2 can mitigate some troubles and facilitate the seizing of favorable opportunities. But it would be extremely helpful if the planners and implementers in such processes had some capability to anticipate and prepare for possible troubles and potential favorable opportunities. Thus, an important objective of implementation science should be to develop predictive capabilities. These will provide practical benefits in planning and implementation of projects and policies. Predictive capabilities will also contribute to the overall development of implementation science as they will facilitate the creation of testable hypotheses.

Where might the i-c scientist seek tools for prediction? The obvious and appropriate approach is to use information from the kind of observational and design studies discussed in sections 5.1 and 5.2. An initial objective could be to identify situations likely to be associated with large gaps and properties of processes that might lead to large gaps. Because planning and implementation are dynamic processes extending over time, the crucial second objective would be to identify warning signals, indicators that large gaps might appear.

How can predictive tools be used in adaptive processes? There will always be uncertainty in a planning and implementation process. For that reason, flexibility and adaptability are desirable attributes: plans and their implementation can be adjusted if things don't go as planned. Warning signals can make a pivotal contribution to adaptation by enabling action before a threat or opportunity emerges. However, since warning signals are rarely perfect indicators, responses to them must be carefully calibrated.

Adaptive approaches bring new challenges: Although adaptive processes offer substantial benefits in coping with uncertainty, they also create new challenges for planning and implementation processes. The most basic challenge stems from people's desire for certainty: people want to know what to expect. By maintaining flexibility, a planning and implementation process denies the possibility of certainty; loss of the appearance of certainty can lead to a loss in public confidence in the process.

Further challenges are also built into the very nature of adaptation. Vigilance will be needed to look for warning signals and other significant changes in circumstances. That vigilance must be maintained. But when nothing happens for a while, vigilance can atrophy: people may get tired and complacent. Furthermore, two types of vigilance will be needed, and they make different and often conflicting demands (Goble, Bier and Renn 2018. Also, Goble, Carr & Anderson 2022). Type 1 vigilance is vigilance when you know what to look for: known warning signals, known and predictable changes in circumstances. Type 1 demands focus: careful attention to each identified possibility. But a second type of vigilance is also needed.

Type 2 vigilance is vigilance when you don't know what you are looking for: unpredicted anomalies that must be interpreted if they appear, unexpected failures of things to go as planned, etc. Type 2 vigilance requires defocusing, an openness to a broad range of unanticipated possibilities.

Predictive capabilities themselves can also create new challenges: A further challenge posed by uncertainty is that people, the parties in the planning and implementation process, can be overloaded in considering the array of possibilities for things to go wrong. Overload can lead to discouragement and discouragement can lead to reluctance to do anything. Working in small steps as called for in SMART governance (Okada 2018) can help alleviate overload. Project morale along with initial commitment must be considered an element in the planning and implementation process.

6. IMPLEMENTATION IN DIVERSE FIELDS: ISSUES OF FRAMING

All fields that have practical applications are concerned with implementation; however, their concerns might not be explicit and, when made explicit, they may prove to be very different from the implementation concerns in other fields. The public health and medical field's framing, which we discuss in 6.2 is quite narrow, how to put in place evidence-based practices. In contrast the implementation challenge in general policy contexts is viewed as a more general one, how to effect behavioral change in particular groups (Sabatier 1986, Sabatier and Mazmanium 1980), or to make societal changes in general; attempts to address such challenges often invoke "theories of change" (Cerna 2013, Goble, Carr, and Anderson 2022). Both framings, however, still assume that there is a known outcome to be sought. Our broader framing of the notion of implementation gaps will, we believe, be recognizable across many fields. We also believe that while there certainly will be different aspects of emphasis associated with different fields, there is enough overlap in problems in implementation and there are enough opportunities for learning that cross different fields, that the goal of a broadly construed, field-independent implementation science is a reasonable one.

6.1 Implementation for Disaster Risk Management

Several of our discussants raised two questions: i) whether our concern was limited to implementation for disaster risk management? ii) whether the disaster risk management field had special characteristics that would shape an implementation science that would be useful in the field?

While our starting point in this endeavor was to think about the implementation of disaster risk management measures, we do believe that an implementation science should have a broader reach. Disaster risk management does pose particular challenges to implementation: these are not unique, but they have shaped and focused our approach. The challenges include:

- Uncertainty: the timing, the nature, and the severity of disasters are very often unpredictable and so, often, is the response of a threatened public.

- Intermittency: disasters do not happen all the time; they may recur, but unpredictably, and needed resources must often be idle.

- The three-phase nature of emergency response: preparations for responding to disaster, emergency action in the disaster, and recovery from the disaster: there are thus both very short and longer time periods to consider.

- Complex situations with multiple players.

These features have shaped our approach. Because of uncertainty and difficulties in planning, our broad framing of implementation gaps puts the perspectives of practitioners and various stakeholders on the same level as those of planners. Uncertainty also leads us to emphasize adaptive processes. The presence of many players with complex relationships means that communication, as stressed by Yoshiyuki Yama, is a prime concern. However, the challenges of uncertainty, timing complications, and complex interactions among multiple players are by no means unique to the realm of disasters.

6.2 Implementation in the Medical and Public Health Sciences

In recent years the medical and public health fields have developed a substantial body of knowledge relating to their perspectives on and needs for implementation science. They have also created infrastructure to support the further development of that science, including a journal and degree programs at a number of universities. There is much we can learn from their efforts although their interpretation of "implementation science' is much narrower than what we seek.

The roots of these developments in medicine and public health were set in the 1990's in the area of mental health (Mandell 2020). The concern then was the evaluation and justification of mental health programs. Over the first decade of the 2000s, the idea of implementation science spread to other medical and public health specialties and a literature of studies and interpretations of studies grew very rapidly. The journal *Implementation Science* (Wensing et al. 2021, Implementation Science 2022) was founded in 2006 to respond to and encourage this research. Since then, the growth in the literature has accelerated; government policy-makers have embraced the idea; national and international committees attempt to achieve consensus on various aspects of implementation science, and there are now a number of university programs (for instance University of Washington 2022) offering courses and degrees in implementation science.

Framing matters, and the framing in the medical and public health fields still derives from its history of seeking to put tested ("evidence-based") interventions into broader practice. Two definitions from the University of Washington website (2022) are typical;

- Implementation science is the scientific study of methods and strategies that facilitate the uptake of evidence-based practice and research into regular use by practitioners and policymakers.

- The field of implementation science seeks to systematically close the gap between what we know and what we do (often referred to as the know-do gap) by identifying and addressing the barriers that slow or halt the uptake of proven health interventions and evidence-based practices.

A similar definition appears on the NIH/National Cancer Center (2022) website.

Others, however, do present broader definitions somewhat closer to our framing in disaster risk management, though they still assume clear intentions as the driving force:

- Peters et al. (2013) offer ‘Implementation science is 'the scientific inquiry into questions concerning implementation — the act of carrying an intention into effect, which in health research can be policies, programmes, or individual practices (collectively called interventions).'

In the medical and public health fields the generally assumed model for action comes in three steps:

1) a known to work (evidence-based) practice or intervention is to be put into wider use;

2) barriers to implementation are identified;

3) strategies to overcome the barriers are applied and tested.

Sometimes the barriers are unknown at the beginning and must be discovered. This model for action fits the furniture story quite well. The medical/public health model for action is not well suited, however, to describe many of the issues we have stressed: persistent unknowns, difficulties in planning, diverse views among different players, lack of communication, etc. When seeking help from this literature, it is useful to keep in mind their framing, their model for action.

Within the health framing model for action, there are important and useful features described in the literature:

- There is a substantial literature considering types of barriers and large numbers have been identified; most often the identification is in relation to implementation strategies (Addis, Wade, and Hatgis 1999, Waltz et al. 2019, Moussa et al. 2021)

- The greatest attention in the literature focuses on identifying and classifying strategies (Leeman et al. 2017).

- The field has engaged and continues to engage in considerable efforts at self-examination, partly through individual research efforts and partly using committees to seek common terminology for barriers and strategies (Powell et al. 2015, Waltz et al. 2015) and trying to clarify and classify the theories that might link strategies to barriers (Proctor et al. 2011, Nilsen 2015, Birken et al. 2017).

Other aspects of our framing for disaster risk management appear on our limited survey to receive less attention:

- Little is offered for implementation situations when little is known and people are "flying blind". Divergence and lack of specificity in goals are not usually discussed.
    - Successful implementation of the evidence-based intervention is the highest good imagined in the model for action, so potential seizing of opportunities to make things better is not considered
    - More generally there is less attention to the potential of creative improvisation in the implementation process.
    - However, possibilities for changes in the implementation process are acknowledged (Miller et al. 2021)
- There seems to be little attention to dealing with information that is incorrect (though one exception is an interesting and useful paper on de-implementing (Norton and Chambers 2020))
- Most often the identification of barriers focuses on the immediate reasons, without considering the reasons behind the reasons such as a deeper consideration of incentive structures.
- In general, there seems to be less attention to systemic aspects and to the uncertainties and lack of predictability associated with complex systems. One exception concerning hospital practices comes in a plea from Dekker (2010) based on an example described by Smetzer et al. (2010). Another exception is an effort (Emmons and Chambers 2021) to use a policy science framework to address social determinants of health.

In addition to the literature, there is much we can learn from the infrastructure supporting implementation science in medicine and public health. A journal or at least a designated section of a journal can make a big difference. Educational efforts, courses, even degrees will do much to develop new ideas and promulgate them. Committees that keep track of progress in the field and strive for common ground in terminology and classification perform a useful service.

And finally, better communication between our implementation concerned members and the implementation scientists in medicine and public health would facilitate our learning, but also, because our problems can be different in nature and our perspectives are also different, we could hope for creative interactions that advance implementation science more broadly. We have common ground in the COVID-19 experience – a medical and public health problem, but also a major disaster, and one which does not fit the simple action model underlying most medical and public health implementation science. Possibilities for other emerging diseases are also potential disasters and would be a further area for joint exploration. There are, we believe, similar possibilities for communication with the field of risk analysis. The social amplification of risk framework (Kasperson et al. 1988, Larson, Lin, and Goble 2022, Schweizer, Goble, and Renn 2022) has implications, we believe, for implementation in disaster risk management and in the medical and public health fields.

6.3 An Analytic Approach Toward the Development of an Implementation Science

One reviewer of the earlier version of this paper suggested that we reorganize the paper to provide an analytic structure as an alternative to the looser narrative that you are reading. Such a reorganization would be an alternative entry to a broader implementation science, just as Miranda Dandoulaki's suggestion of a focus on barriers would provide an entry. The analytic approach would build outward from existing well-studied topics in implementation such as the medical/public health studies described above, drawing on the public policy literature to enlarge the scope of definitions. The analysis would be to examine what applies directly to the issues that arise in disaster risk management (or other fields), what needs to be modified, and what sorts of modifications or new concepts are needed. The analysis could be organized using the three scientific roles of 5.1,5.2, and 5.3.

As with a focus on barriers, we believe that this could be a useful approach and lead to valuable insights. It is essentially the approach recommended by Janet Hering (Hering 2018) in seeking an implementation science appropriate for environmental studies. We encourage the pursuit of alternative approaches to implementation science and we believe that the science will ultimately be a synthesis of findings from different approaches. We also believe that our focus on implementation gaps better accommodates possibilities for multiple and diverse perspectives and framings from many actors, not just planners and practitioners.

7. CONCLUSIONS AND RECOMMENDATIONS

Our starting idea was that implementation gaps could serve as an entry point for developing an implementation science. The notion of a gap immediately raises the questions "how is a gap perceived?" and "whose perceptions are to be considered?" These questions led to our first and primary observation: an implementation science must direct its attention to the multiple different actors in any implementation situation, the roles they play, their capabilities,

their knowledge, perceptions, and values, the goals they have, and especially their interactions with each other.

Continuing in this vein, we noted that that there can be multiple perspectives in framing implementation gap issues. Following, in part, advice from commentators on our initial effort, we developed recommendations for using narratives to provide rich descriptions of implementation gap situations that account for multiple perspectives. Such descriptions can be cataloged and indexed, and, ultimately, they can be classified.

We identified three clusters of questions that an implementation science might address and presented them as "roles for an implementation-concerned (i-c) scientist":

- Role 1: the i-c scientist observes: characterizes implementation gaps, classifies them, and makes the classifications usable
- Role 2: the i-c scientist designs and tests: identifies models for appropriate processes and observes how they work
- Role 3: the i-c scientist looks ahead: considers how challenges and opportunities in implementation can be anticipated and prepared for?

The discussion of describing, cataloging, and classifying was our opening contribution to work in role 1, paying particular attention to implementation for disaster risk reduction. For roles 2 and 3, even more remains to be developed, but we have offered some pointers. Of particular note is our suggestion that because of the diversity of actors, communication is of central importance in developing shared understandings of the situation and for aligning goals.

Collaboration is an essential aspect of implementation. Finding shared goals among a group with different perspectives, knowledge, and capabilities is a dynamic activity. We believe that IDRiM can go beyond its already significant contributions to encourage and foster good collaborations in developing an implementation science. The experience in medical and public health efforts offers some lessons:

- The importance of a journal: IDRiM does not need or want another journal; however, the IDRiM journal could do even more in soliciting implementation studies and having an identified section to place them. In soliciting papers and in the review process, it will be important to maintain the broad perspective on the nature of implementation that is suggested from considering implementation gaps.
- Educational efforts: again, it would be premature to offer degrees solely in implementation science, but academic members of IDRiM could rethink their course offerings and disaster risk reduction in the light of implementation. Certificates could be considered. Furthermore, much education takes place outside of degree programs: workshops and trainings could provide a new look

at implementation. IDRiM meetings, forums, and workshops could provide opportunities for presentations and discussions of such efforts. Again it will be important to encourage broad perspectives on implementation.

- Outreach: collaborative efforts could usefully extend to interactions with people in other fields. IDRiM could provide a platform for fostering such interaction. Much also could be done at an individual or small subgroup level by IDRiM members.

The medical and public health communities have not engaged in much outreach to other fields, so they don't directly offer lessons about outreach; theirs is a large enough field that they can feel self-sufficient. Nonetheless, there are individuals within those fields interested in broader framings and, as we noted, there is common ground for us to work together in the realm of pandemics such as Covid-19, in addressing health disparities and in reducing avoidable deaths. There are also potential opportunities for connecting with fields such as risk analysis and international development. We recommend a modest but strategic attempt to develop new dialogue with such "prospective neighboring disciplinary communities."

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