HEALTH SYSTEMS INNOVATION HACKATHON

PARTICIPATION GUIDE

HEALTH SYSTEMS INNOVATION LAB
AT HARVARD UNIVERSITY

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About this report

This Handbook on how to participate in a health system innovation hackathon is part of a series of the Health System Innovation (HSI) Lab guidebooks and resources on creating an enabling ecosystem for innovations that could improve health system performance globally. The purpose of this handbook is to provide hackathon participants with an easily digestible overview on the function of hackathons, how to prepare and participate in hackathons, and what to expect after a hackathon.

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I. Introduction and context

What is a Hackathon?

A portmanteau of "hacking" and "marathon", Hackathons are a competitive sprint event that enable people to collaborate from different disciplines to solve a particular problem by developing a new technology, software, service, process, or institutional arrangement. Participants collaborate intensively to develop a proof of concept with a minimum viable product for a specific problem the Hackathon aims to address. Each year, numerous hackathons are conducted globally, providing a platform to address various themes across sectors and industries, enabling a diverse range of people from different backgrounds, contexts, and disciplines to participate actively in the innovation process.

How did Hackathons evolve?

In the late 1990s, the software industry pioneered the hackathon approach to rapidly develop new software, accelerate innovation, and identify opportunities for investment within the industry. The concept evolved to include other sectors to harness new talent and rapidly develop solutions to intractable or pervasive challenges. Due to the interdisciplinary nature of healthcare challenges—from transitions at the health systems level to the pharmacodynamics of new medicines at the biochemical level—Hackathons have been gradually adopted in the medical field, with several events convened annually, to develop interdisciplinary healthcare solutions. The Health Systems Innovation Lab (HSIL) has developed a specific methodology and approach for hacking in the healthcare sector that help identify and catalyse healthcare innovations with transformative potential at the systems level.

II.   Hackathon Scope

Hackathons differ concerning their (I) design and organization; (II) theme and focus; (III) participants; (IV) mentorship; and (V) post-hackathon support—which is clearly defined by organizing institutions. While the primary objective is to provide an energetic and fast-paced environment to drive targeted innovation, there are several other crucial objectives, including, among others, advancing community-building, promoting education and training, acquiring new talent, and facilitating organizational change, marketing, and communication.

Panel 1. Example of a Health Systems Innovation on Type 1 Diabetes

The Novo Nordisk partnership programme, Changing Diabetes in Children (CDiC), was launched in 2009 to improve access to care and life-saving medicine and supplies for children and adolescents with Type 1 Diabetes living in low- and middle-income countries (LMICs).

CDiC is currently operational in 16 countries and by December 2020 had treated and diagnosed 28,296 children with Type 1 Diabetes in 222 clinics established by CDIC; trained 15,100 healthcare providers and donated medical supplies and equipment needed to deliver effective care. To ensure sustainability, CDiC partner countries requested support to work on digital initiatives to inform data systems, registries, and care pathways.

The Type 1 Diabetes Hackathon was organized by the Health Systems Innovation Lab at Harvard University. The objective of this Hackathon was to support ongoing or planned digital initiatives in Changing Diabetes in Children (CDIC) collaborating countries by developing new approaches and solutions to articulated problems and challenges across CDIC.

This hackathon was geared at developing innovative approaches to data challenges that were identified in six countries in South-East Asia: Bangladesh, Cambodia, India, Indonesia, Myanmar, and Pakistan.

Design and organization

The optimal design and organization is influenced by several factors, including, among others: sector or industry, nature of problem, context, resourcing, and the objectives of the Hackathon. There are four elements to the design and organization of a hackathon:

- **Format:** hackathons may be held in person, virtual, or in a hybrid format. While in-person hackathons may enable more intense collaboration, interesting side events and team formation, a hybrid format enables broader engagement across geographical regions, bringing new actors into the innovation process.

- **Tracks:** refer to specific concentrations within a particular theme (as detailed in a subsequent section) to which participants are allocated. These "sub-themes" enable participants to better focus on specific aspects of a problem. Tracks may involve a specific geographical region (e.g., Africa vs Asia), technology (machine learning vs cloud computing), disease cluster or subcategory (Type 1 vs Type 2 Diabetes Mellitus), treatment modality (surgery vs chemotherapy), among other areas of specification that assist in developing solutions for a problem. The incorporation of tracks may also simplify the judging process by assigning judges to different tracks, enabling them to assess innovations that relate to their area of expertise.

- **Team formation**: team members may be assigned involuntarily or voluntarily. Voluntary formation may occur by creating an idea marketplace, where individuals select partners based on the ideas they propose, their profiles, strengths, and background expertise. Involuntary team formation occurs when the hackathon organizers allocate participants randomly or selectively, creating teams of comparable interdisciplinary strength and diversity.

- **Form of communication**: communication channels are crucial to ensure that all participants in the Hackathon are updated throughout the hackathon. All stakeholders (organizers, participants, judges, and mentors) must communicate with each other to share ideas and resources, clarify what is required at each stage of the hackathon, and review important announcements. Particularly for virtual and hybrid hackathons, communication channels allow team members to communicate as they develop solutions across different regions and time zones, when they are not physically together. Common channels utilized include WhatsApp, Slack, Microsoft Teams, and Google Workspace. Typically, the channel is established by the organizing institution, but participants may utilize various elements of these platforms based on their needs. For instance, WhatsApp may be used to communicate, but Google Drive used to share resources.

Theme and focus

The theme of the Hackathon refers to the overarching healthcare area that needs attention and requires selecting the healthcare problem that participants will focus and develop solutions. In the context of HSI, participants are encouraged to practice "systems" and "big picture" thinking to identify root causes to a problem at a systems level. Participants receive a 1-page brief that outlines the problem, innovation ecosystem, major stakeholders, institutional setting, and broad context to place them in an informed position for brainstorming and development of solutions.

Participants

The optimal participants for a given hackathon will differ, given the overarching theme, and the format of the Hackathon. Individuals from various geographical regions, disciplines, and levels of expertise are encouraged to participate to provide a broad range

of perspectives and expertise in the innovation process. Section 3 outlines the ideal participants of a hackathon.

Mentorship

Throughout the Hackathon, participants receive structured mentorship from leaders and experts in the field. Hackathon mentorship is coordinated by the organizing team, as participants are oriented to the process, and mentors work closely with participants as the iteratively develop their solutions. Mentors are usually drawn from different fields and backgrounds and have extensive subject matter knowledge to assist teams refine their solutions. Mentors may interact with participants in-person or virtually via selected communication channels.

Post-hackathon support

Post hackathon support may be provided by the host institution, their partners, or select incubators, and accelerators, subject to sustainable funding. Support may entail the provision of funding, technical know-how, network access, education and training, or other resource (e.g., office space). Hackathon sponsors typically provide prizes to the winners of the Hackathon to incentivize teams to continue working on their innovations.

Panel 2. How do Health Systems Hackathons differ from conventional Hackathons?

(I)   Identify big challenges
Employ systems view to identify major health systems barriers to effective, efficient, equitable and responsive healthcare within a given country context or sub-population

(II)   Inform real-world implementation
Include health systems analysis to inform design, implementation and scale-up of innovation to achieve large-scale population level impact.

(III)   Promote systems thinking
Emphasis on systems dynamics and understanding how innovation and health systems interact to produce high value in healthcare for different stakeholders.

(IV)   Foster global collaboration and cross learning
Encourages participation from people across countries and from different disciplines, often facilitated via a hybrid approach.

(V)   Engages country experts in varied settings
Country experts are consulted in advance of the hackathon to understand barriers to designing, implementing, and scaling high priority innovations within the context of their health system

III.   Hackathon preparation

This section focuses on what participants, mentors, judges, and panelists must do to prepare in a Health Systems Hackathon.

Understand the problem and research it before arriving at the event

- Major Problem: hackathon partners should accurately outline the hackathon theme in the form of a problem statement as detailed in the prior section, which ideally should be shared with all prospective participants before the hackathon commences. An example of a theme may include, "How could we track and monitor patients with Type 1 Diabetes more efficiently in X country?"

- The problem statement in HSI Hackathons is typically comprehensive and provides detailed information from distinguished leaders that are intimately involved and experienced in the theme and problem of interest.

Prepare logistics and orient yourself with communication channels

Logistics entails understanding what you need to bring on the day, what is needed for registration and contacting the organizing team if you require a visa or special accommodations for the event. Participants should orient themselves to the different communication channels. Typically, participants will require laptops, pens/pencils, and paper, although stationery may be provided.

Establish individual and team objectives and outline expectations from the Hackathon

For every participant, it is essential to identify individual-level objectives for the Hackathon and collective group objectives. These objectives must be in line with the

overarching theme and goal of the Hackathon and should be specific, measurable, achievable, realistic, and time bound. Group objectives may be decided after team formation, during the initial meetup, and could be tracked using a task chart that links each team members with a specific responsibility.

Panel 3. Problem Statement Example - Type 1 Diabetes Hackathon (Pakistan)

Problem

It is challenging to collect and track a standard set of evidence-based data for Type 1 Diabetic (T1D) patients in Pakistan.

Problem Elaboration

Today, about 19 million people are living with Diabetes in Pakistan. However, there is inadequate information about the incidence and prevalence of patients with T1D due to the unavailability of systematic processes to identify patients with T1D and track their data. Like other countries, it is likely that T1D causes a significant impact on the economy and broader sustainable development due to absenteeism, reduced productivity, and avertible morbidity and mortality. Currently, there is no registry to systematically collect Type 1 Diabetes data in Pakistan in an evidence-based way to inform enhanced health system planning and service delivery and resource allocation.

Key Stakeholders

In Pakistan, the Federal Health Ministry organizes a uniform policy to provide a comprehensive health care program for T1D across the country, issue guidelines to all the state health ministries to deliver this service and allocate the necessary financial budget for the successful implementation. Other significant stakeholders include, among others: clinicians, and the private sector, which consists of both entities that provide healthcare services and those that provide the medicines, diagnostics and supplies needed to deliver healthcare services in Pakistan effectively.

Health System Overview

The healthcare system of Pakistan is complex because it is divided into healthcare subsystems by federal governments and provincial governments, and informal private sector healthcare systems. As a result, there are likely many undiagnosed patients, managed poorly, and those that due to complications such as Diabetic Ketoacidosis. The public system is under-resourced and caters to most Pakistanis, while the private sector is comparatively well resourced and delivers care to penitents from higher-income quintiles. The medical record system is predominantly paper-based and completed by clinicians (doctors and nurses) who document a patient's clinical history, clinical examination findings and relevant laboratory investigations. The federal government is in close liaison with Prof Dr Abdul Basit as one of the main contacts for diabetes as part of the NCD program in Pakistan. Some of the provincial ministries have already signed MOUs to collect the data in the Diabetes Registry of Pakistan (DROP).

Context

The broad context is favorable for introducing and developing a more unified digital data system for T1D in Pakistan. 80% of Pakistanis have access to a mobile phone, and internet access is widely pervasive. Domestic legislation around how clinical data is collected, pooled, and used by clinicians is not well articulated, which could create opportunities for introducing digital system initiatives.

Review your role in the Hackathon

Participants, mentors, judges, and invited guests comprise the major stakeholders involved in a hackathon. Each stakeholder makes a unique contribution to the Hackathon to provide an environment that fosters creative problem-analysis, ideation, and strategic thinking. Invited guests typically participate as keynote speakers, panelists or convenors of side events. We provide a detailed descriptions what is expected of each major stakeholder:

Participants

Participants are the backbone of the hackathon. These are the individuals that will work in their teams to develop novel solutions the problem of interest. Participants typically consist of people from diverse backgrounds with varying skillsets and expertise. Participants collaborate to develop and propose solutions to the problems defined under each track of the Hackathon. They interact with team members to analyse the problem, co-develop an innovation, and refine their solutions with mentors. Their primary objective is to present a minimum viable product that addressing the problem of interest to the judges.

Ideal participants for a health systems hackathon may include medical students, engineers, computer scientists, clinicians and other health professionals, students in public health, epidemiology, biostatistics, data science, and data engineering. Most importantly, participants must demonstrate a passion for healthcare innovation. Prior experience working in healthcare innovations will be an asset but is not required.

Invited guests

Invited guest may be keynote speakers or panelists and often include thought leaders from academia, public sector, voluntary sector or businesses with relevant expertise on the theme of the Hackathon. Their role as a keynote speaker or panelist is to provide participants with a unique perspective relating to the theme or track of interest. Invited guests should aim to inspire the participants, encourage their active participation, and provide unique insight into the problem or innovation ecosystem.

Mentors

A critical component of the Hackathon is mentorship. For every Hackathon, mentors are an asset that provide tailored feedback to participants to help refine and shape their solutions. The Hackathon should ideally incorporate multiple structured check-in and mentorship sessions for every team. Mentors should aim to provide guidance and advice as the teams analyse the problem, develop their solutions, and practice their final pitches.
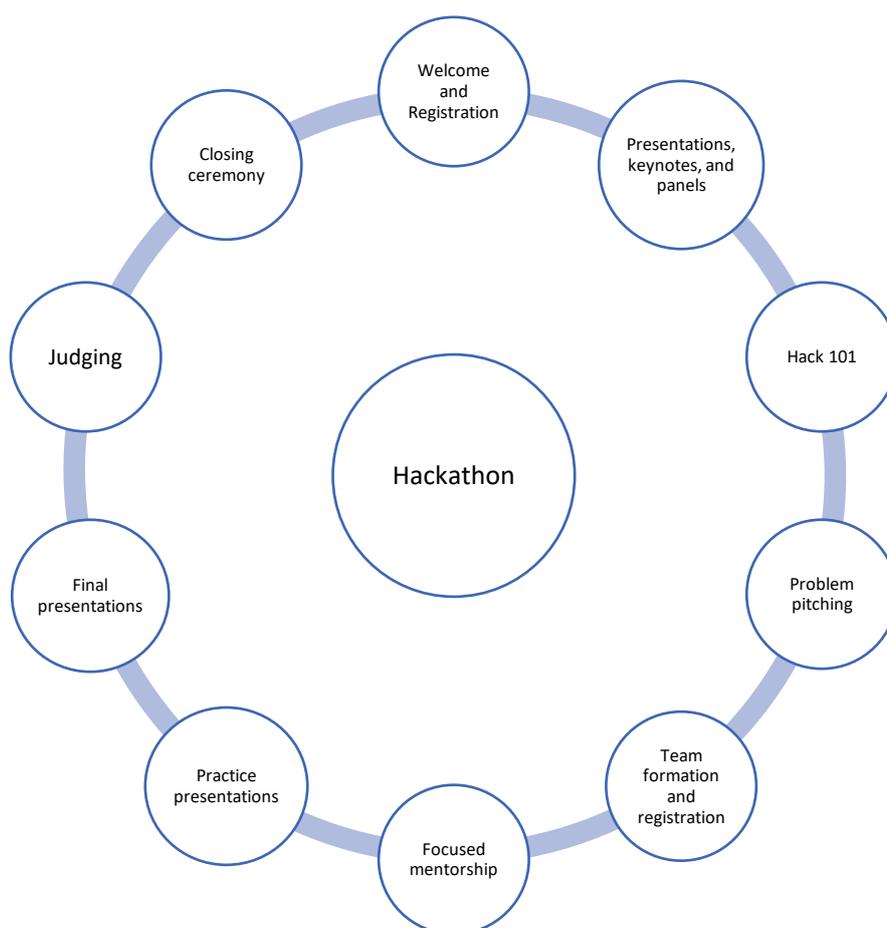
Judges

Judges, like mentors, are individuals who possess extensive subject matter knowledge on the theme of the Hackathon. The judge's role is to assess each team during their final pitches, which will decide the hackathon winners. Assessment of the final presentations is informed by a standardized judging rubric and set of assessment criteria (Appendix 1). The number of judges may differ based on the number of competing teams, duration of the Hackathon and tracks. Judges should familiarize themselves with the judging criteria in advance of the event.

IV.   On the day of the Hackathon

Hackathons are fast-paced events that are bustling with people from diverse backgrounds, skills, and experiences; there is hence much to learn at the Hackathon and new people to meet. Understanding how the hackathon sessions will work and the sequence of affairs will help you and your team participate effectively in the Hackathon. Appendix 2 provides a sample schedule of the event with select activities highlighted. This schedule may be modified as appropriate given the Hackathon scope.

Figure 1. Major sessions in the hackathon process

Registration

Registration begins before the event officially begins to record attendance of all participants, mentors, judges and invited guests.

Welcome

A brief welcome note marks the officials launch of the event to set in motion the hackathon process.

Presentations, keynotes, and panels

The welcome note is typically followed by a series of keynote presentations or panels to set the stage of the hackathon, analyse the problem, provide insight into the innovation ecosystem, detail contextual and health system considerations, and drive participant engagement.

Side events

Participants may take advantage of side events when available to explore specific knowledge areas, skills or networking that may assist participants in developing their solutions. This is an opportunity to benefit from experts in coding, data analysis, health systems, among others. Given the fast-paced nature of the Hackathon, participants should not expect to learn an entirely new skill on the day of the event. The organizing team will provide announcements to remind participants of side events in accordance with the hackathon schedule.

Hack 101

Participants are given a brief introduction to the Hackathon process, which provides an overview of what is expected during each session of the schedule. The members of the

organizing team are introduced to ensure that all stakeholders know who to approach for specific challenges and concerns.

Problem pitching

Using a concise 3-4 slide deck, an expert that is intimately involved in the problem or desired solution of interest, provides an overview of the problem statement. The problem statement consists of the problem analysis, innovation ecosystem, major stakeholder influencing adoption, institutional setting and broad context.

Team formation and registration

Participants meet their teammates, finalize their teams and register their teams with the organizing committee. As discussed in a prior section, teams may be formed voluntarily or involuntarily.

Mentorship

Focused mentorship sessions are a brief check-in period where mentors follow up with all teams to ensure they are on track and progressing in the right direction. Mentors are expected to actively engage teams and participants are encouraged to sign up for specific sessions in which mentors will provide structured provide advice and feedback.

Practice presentations

Teams are strongly encouraged to meet with their mentors and members of the organizing committee to practice their presentations pitches, who could provide targeted feedback in advance of their final pitch submissions and presentation to the entire hackathon group.

Final presentations

Depending on the size of the hackathon, all teams may present during the final presentations or only a select number of the most promising teams. When a select number of teams are invited to participate in the final presentations, a prior round of assessment occurs where participants submit a video recording of their presentation to the judges.

Judging

Final presentations progress through judging, where judges select teams to advance to the finals using a judging rubric (Appendix 2) and subsequently select the final winners of the Hackathon. Judges are expected to deliberate and select winning submissions for each defined innovation track. While not all teams may qualify for the final presentations, all finalists will be required to present to a live audience with all participants present.

Prize-giving and closing ceremony

After the final presentations are completed and the judges select the winners, prizes (subject to availability) are presented and the event culminates in a closing ceremony with final remarks by designated individuals, hackathon class photograph, networking, and exchange of contacts.

V. Venture support and post-Hackathon incubation

This section outlines the various forms of support that hackathons may provide, and potential sources of resourcing teams may wish to consider. Participants should remain in contact with the Harvard Health Systems Innovation Lab to be alerted of future events and opportunities.

Immediately post-Hackathon

<u>Prizes</u>

Prizes in cash or kind may be awarded to participants subject to availability.

<u>Incubation</u>

Successful and promising teams may be invited to receive structured incubation within the Health Systems Innovation Lab. These teams will be provided with a structured HSI Venture curriculum, mentorship, resources, networks, and strategic advice to grow their ventures.

Additional resources and options for venture teams

Various forms of support are available to grow your ventures and create a minimum viable product. We provide common sources of funding and resources to support your ventures. What is crucial is basing funding and resourcing requests on a rigorous plan to develop your MVP and test and iterate in a real-world setting. These resources include, among others:

Harvard and MIT Ecosystem:

A host of entities within this ecosystem offer incubation support and mentorship for startups and ventures.

Competitions

Several local and global competitions exist, typically awarding a cash prize to winning teams. These include the MIT Solve competition, Harvard President's Innovation Challenge and Accenture HealthTech Innovation Challenge.

Other incubators

Several incubators exist globally that offer support for early-stage ventures. These include Launchpad Digital Health, StartUp Health and Athena Health.

Accelerators

Some organizations offer promising ventures mentorship, capital, and connections to investors and business partners. These accelerators are essential to enhance and scale the growth of the venture. Examples of accelerators include MassChallenge, Techstars and Y Combinator.

Self-funding

Ventures may initially use self-funding as pre-seed capital while exploring more sustainable options of funding.

Grants

Several institutions may provide grants to individuals and teams to advance their innovations. Several databases are available online that comprehensively list out these grants, their requirements, and deadlines for application.

Loans

Financial institutions may offer loans to startups if they meet the eligibility requirements.

Angel investors

Specific individuals may offer venture startup capital in exchange for ownership equity.

Venture capital

Private equity institutions or firms may offer startup capital to promising ventures using monies pooled from individuals, investment companies and other funds.

VI.   Appendix

Appendix 1. Sample of judging rubric

Judging criterion	Points
Impact	5
Innovation	5
Business model	5
Presentation	5
Total	**20**

Appendix 2. Sample of Hackathon schedule

Day 1

Time	Title	Speaker	Talking points / critical messages
5 minutes	**Welcome and introduction**		
30 minutes	**Keynotes**		
25 minutes	**Moderated panel discussion and Q&A**		
15 minutes	**BREAK**	All	Tea/Coffee Break
15 minutes	**Hack 101**		
1 hour	**Problem Pitching**		
1 hour	**Team Formation**	All teams	Participants join tracks and teams to which they have been allocated prior to the Hackathon
	Team Registration Due	All teams	All teams register their final team names
30 minutes	**BREAK**	All	Lunch/dinner break
2 hours	**Focused mentorship begins**	Mentors + All participants	Participants to sign up with mentors at least once and at least two other mentors from the mentor's list for 15-minute consultation sessions
	Focused mentorship ends	All teams	Teams continue working on their innovations

Day 2

Time	Title	Speaker	Comments
5 minutes	**Welcome and review of Day 1**		
25 minutes	**Keynotes:** **Moderated panel discussion and Q&A: Select challenges requiring digital innovation**		-
1 hour	**Focused mentoring**	Mentors + All Participants	Participants to sign up with mentors at least once on Day 2 to obtain feedback on their innovations and practice
1 hour	**Practice presentations**	All teams	
30 minutes	**BREAK**	All	
20 minutes	**Final pitches**	All teams	All teams will make final presentations on their innovations Each team to present a pitch for 2 mins, followed by 3 mins Q&A (Total of 5 mins / presentation)
30 minutes	**Judge deliberations**		Judges to deliberate and make a final decision on the first, second and third winning teams Judging will be based on judging criteria to which all judges will have access
	Awards and closing	All	Winners declared, and awards presented

Appendix 3. Gallery

Mentors interacting with participants

Teams pitching their innovations

Teams busy at work

Group Pictures after the event