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Learning innovation under resource constraints: The case of the Innovation for African Universities programme

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Abstract

This paper aims to answer the question of how we can facilitate innovation learning online, for participants in resource constrained contexts. This is important because approaches to innovation training developed in the global north may not work so well in the global south, and in an era of global challenges we need to be able to train more people to innovate effectively in their own, often resource constrained, national and organizational contexts. Here we use the Design Science Research Methodology to set out some research-based principles and guidelines for facilitating such learning and demonstrate their application in a successful programme of training for the Innovation for African Universities (IAU) programme. We report how the IAU programme's objective to train its participants was successfully achieved despite constraints on technological resources and conclude that the principles and guidelines shared here may also be useful in developing online innovation training programmes for use in other resource constrained contexts.

1. Introduction

While research already exists on how some approaches to innovation, such as Design Thinking, are learnt (Primus and Sonnenburg, 2024), little attention has so far been paid to the way in which innovation may most effectively be learnt in resource constrained contexts. It has been argued that approaches to innovation such as design thinking may be best absorbed and mastered through experiential learning (Primus and Sonnenburg, 2024, Birdi, 2021, Jones et al, in press). However this can present challenges, especially when learning needs to take place online, and where resources, especially technological resources, are constrained. Approaches to experiential learning of innovation practices developed for use in the global north may not always work so well in the global south, especially in an online setting.

Here we draw on our experience of delivering a programme of workshops as part of the broader Innovation for African Universities (IAU) initiative, in which the majority of participants were based in Ghana, Kenya, Nigeria and South Africa, to present one example of how active and experiential innovation learning was facilitated in an online context where many participants were located in technologically constrained contexts.

The question we intend to answer is: how can we facilitate an experiential approach to innovation learning online, for participants in resource constrained contexts?

Next, we will briefly explore existing theory on learning innovation and the potential role of technological resource constraints in this. We will then use the Design Science Research Methodology developed by Peffers et al (2007) to set out the problem, motivation and objectives of our work; the principles according to which we designed and developed our approach to facilitating online innovation learning for the IAU programme; a demonstration of how these were applied in the IAU context; and an evaluation of how effectively this worked; before seeking to draw out some more general conclusions from our study.

2. Conceptual foundations

2.1. Learning innovation

Recent examples of research into innovation learning include those presented by Birdi (2021) and Primus and Sonnenburg, (2024).

Birdi (2021) draws on findings from the creativity and innovation literature to develop and operationalize 'CLEAR IDEAS', a practical model for innovation training. The findings from their study suggest that their model was well-received, and led to both significant improvements in innovation competencies and the introduction of innovations in some trainees' workplaces. Some of the factors found to facilitate impact from the CLEAR IDEAS innovation training intervention included the 'opportunity to practice on the course' (i.e. an element of experiential learning) and the use of an 'electronic workbook' i.e. materials that could be used in asynchronous mode, to complement synchronous training activity by helping trainees to apply what they had learnt after the training had ended.

Primus and Sonnenburg's study (2024) focuses on the importance of training participants' first exposure to design thinking in determining assimilation of design thinking practices, suggesting workshop length, team formation and the combination of guided and unguided work as important factors.

Birdi's study (2021) was conducted with public sector workers in the UK, while Primus and Sonnenburg worked with MBA students in the US, and in both cases the training was conducted in person, whereas here we will consider a case of learning innovation online, with a significant majority of participants in the global south.

2.2 The role of technological constraints

Creativity and innovation processes can be affected by many different kinds of constraints. Acar et al (2019) have provided a cross-disciplinary integrative review of such constraints, resulting in a taxonomy that includes input constraints, such as time, financial resources and human resources; process constraints such as formalization and lack of autonomy; and output constraints, such as regulations and standards. Here we focus on the category of input constraints that Acar et al have called 'equipment constraints', considering in particular the national technological contexts in the countries from which our participants were joining us.

A study by Hyvärinen et al (2020) revealed the role of technological and other constraints in all stages of a water innovation process in Kenya, but did not consider innovation learning, and did not go into detail about the types of technological constraint at play.

Here we will consider two factors of particular significance: levels of access to broadband internet connections and device ownership, where in each of the countries participating in the IAU programme from Sub-Saharan Africa (SSA) conditions are significantly different from those in the UK, US and other countries in the global north, as we will show below.

3. Methodology

The study described here is exploratory research using a mixture of developmental and evaluative research activities and following the Design Science Research Methodology as set out by Peffers et al (2007). Our demonstration case is drawn from our experience of

delivering the Innovation for African Universities (IAU) programme, as explained in more detail below. We provide short, worked examples from the case of the IAU programme for each step of the DSRM process with the aim of drawing out some of the implications of technological constraints for this delivery of an online professional development programme aimed at a community based largely in the global south.

3.1 Problem identification and motivation

Here we define the research problem and justify its importance in terms of the value that a solution can bring to research and practice. As indicated above, the general problem we are aiming to address is that we currently know very little about how to deliver effective online innovation training in resource constrained contexts. Further understanding in this area can add value by expanding the theoretical basis on which future online innovation training programmes can be designed and delivered, as well as providing some practical guidelines for future work in this area. This is important in an era where we increasingly need global collaboration to address global problems.

3.2 Definition of objectives

The fundamental objective of a solution to the general problem outlined above is to be in a position to train more people to be able to innovate effectively in their own, often resource constrained, national and organizational contexts.

3.3 Design and development

Here we report the design, or artefact, that we developed as a solution to our general problem. ‘A design research artifact can be any designed object in which a research contribution is embedded in the design’ (Peppers, 2007). In this case, the artefact that we have designed is a set of general principles and guidelines for the delivery of online innovation training in resource constrained contexts that were then applied in the delivery of our training programme for the IAU, as described below. The research embedded in this design includes research of the kind set out in section 2 as well as our own previous work on facilitating learning of creativity and innovation (Jones et al, in press), and the use of technical artefacts and interventions to facilitate, rather than inhibit, the kinds of creative conversations that take place as part of design and innovation processes (Jones et al, 2009).

This DSRM step is intended as an iterative process, and we report here a view of our principles that evolved both during the course of delivering the IAU programme and since. Our principles relate to 3 different aspects of programme delivery, as follows.

- Innovation learning should emphasise experience: Through experiential learning, with a strong emphasis on reflection and use of arts-based methods and design, we aim to increase our participants' confidence in applying what they learn
- Innovation learning should promote shared values and purpose: To help participants navigate what can feel like chaotic environments, we emphasise the role of shared values and common purpose
- Online innovation learning should be tailored according to the technological constraints of its participants: To be able to fully participate in an online learning programme, participants need to have access to all the digital tools and technologies involved in its delivery.

Focusing here on the third of these principles, and drawing more generally on research in the area of human-computer interaction, our more specific guidelines are that delivery of online innovation learning should:

- Use tools and technologies that are easily accessible to all participants
- Only introduce new tools where these provide significant additional functionality
- Include an appropriate mix of synchronous and asynchronous components
- Use tools that don't interfere with creative flow
- Provide plenty of support for use of the chosen tools, especially where these are new

3.4 Demonstration

In this section, we demonstrate how the general principles above were applied in delivering learning about innovation under resource constraints as part of the broader Innovation for African Universities (IAU) programme.

3.4.1 IAU Context

The aim of the IAU programme as a whole was to strengthen entrepreneurship and innovation ecosystems based in Sub Saharan African (SSA) universities in Ghana, Kenya, Nigeria and South Africa. The IAU community for whom the programme was delivered consisted of between 300 and 400 people, with numbers varying across the different stages. Members of the community were mainly academics and professionals employed in organisations in local entrepreneurship ecosystems. Community members worked together in 24 partnerships, each including at least one UK university, at least one university from SSA and one SSA entrepreneurship ecosystem player. Together these partnerships delivered a total of 35 projects during the course of the programme.

The IAU programme was delivered by a Centre of Excellence (COE) that included experts from one UK university, one Kenyan university and one UK-based entrepreneurship ecosystem player, as well as a project team based in Nairobi, Kenya.

The programme began with a series of 10 three hour workshops, aimed at supporting all members of the community to develop their capacity to innovate in the context of the programme. The focus was on enabling them to deepen their understanding of the problems their projects would seek to address, and then developing the skills they would need for effective implementation. Because the community was so distributed, and also because of restrictions due to the Covid pandemic, workshops needed to be delivered online, in phase 1 of the programme, between September and December, 2021.

As mentioned in section 2, we will focus here on two factors of particular significance in the technological contexts from which our programme participants were joining the workshops: levels of access to broadband internet connections and device ownership.

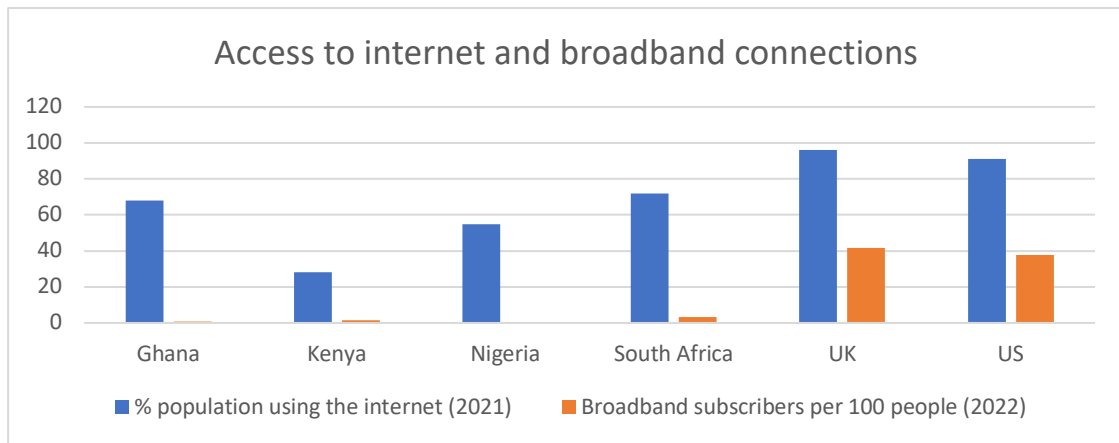


Figure 1: Access to broadband internet connections

As we can see from figure 1, at around the time we were delivering the IAU programme there were very noticeable differences in proportions of the population in each of the six countries shown that were using the internet, with the difference between SSA countries and the UK and US appearing stark when we consider the numbers of broadband subscribers.

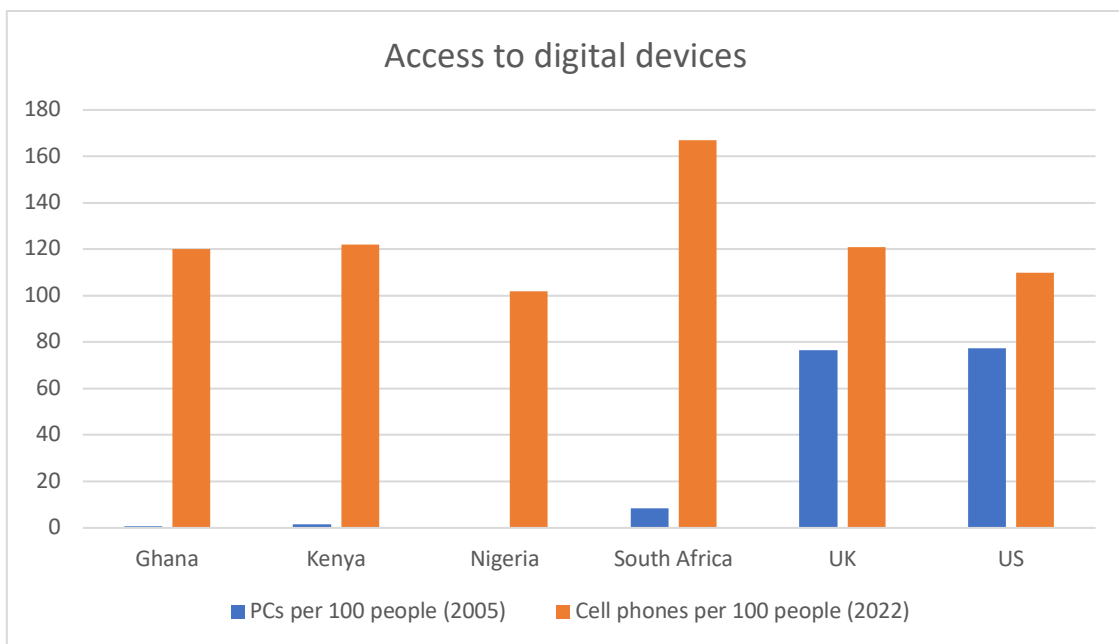


Figure 2: Access to digital devices

In figure 2, the differences in personal computer ownership across the six countries also appears stark – although it should be acknowledged that this data is relatively old (2005). More recent data indicates that mobile phone ownership is much more common, however, and much more similar across countries.

3.4.2 IAU workshop programme design and delivery

The objective of the innovation training that was developed for the IAU programme was set out in the programmes's logic model as an immediate outcome:

IMO3: Network partners acquire new knowledge, skills and networks with regards to strengthening entrepreneurship ecosystems in their contexts.

The way in which the general principles set out in section 3.3 should be applied in the delivery of the IAU programme to achieve this objective was discussed and decided, in the first instance, by the IAU COE. Feedback was also sought from programme participants at the end of each workshop, as part of the reflective element of the programme, meaning that approaches to delivery could be refined as the workshops progressed. A summary of our approach in relation to each of the guidelines set out above is as follows.

Use tools and technologies that are easily accessible to all participants: Working with the project team based in Kenya, we determined that an appropriate tool for use in synchronous delivery of our online workshops would be Zoom, while asynchronous communication could effectively be achieved using email and Telegram. These tools could all be accessed via mobile phones, and could also be used, in case of need, without a strong broadband signal, though it was noted that full use of video, screen sharing and even audio and chat features in Zoom could be challenging in this case.

Only introduce new tools where these provide significant additional functionality: Since Zoom functionality at the time of the workshops did not include effective whiteboarding facilities, we also used Miro as a visual collaboration tool in some workshops where we wanted participants to be able to actively engage in generating and sharing ideas. To facilitate the development of the widely distributed IAU community, as well as the asynchronous sharing of information between participants, we also embedded the use of Hivebrite, a community engagement tool.

Include an appropriate mix of synchronous and asynchronous components: As above, most of the synchronous activity in workshops was done using Zoom, and occasionally Miro, while asynchronous activity and communication outside workshops was done using email, Telegram and Hivebrite. Emphasis was placed on linking synchronous workshop activity with

further activity that could be carried out asynchronously in Hivebrite, for example by setting the participants 'homework' at the end of a workshop that they could report on in the following workshop.

Use tools that don't interfere with creative flow: Flow is an important aspect of the kind of creative thinking necessary for effective innovation, as noted by Primus and Sonnenburg (2024). This is perhaps most important during workshops, for synchronous activity, but can also apply to participants working asynchronously, for example in Hivebrite. Flow on an intended task can be blocked by the need to attend to another task, so if digital tools are too hard to use, require too much new learning, or stop working for any reason (for example due to a break in internet connection), flow can be lost and creative thinking can become less effective. This meant that tools chosen should as far as possible be familiar to the participants, and reliable despite technological constraints in relation to broadband connections; also that our use of tools, especially in workshops, should be as consistent as possible.

Provide plenty of support for use of the chosen tools, especially where these are new: All members of the COE were present in most workshops, and able to guide participants through the use of Zoom chat facilities and polls, breakout rooms, screen sharing, use of camera and microphone as needed. Guidance was offered in the same way on use of Miro during workshops. Separate tutorials were offered to participants regarding the Hivebrite platform, to encourage participants to make full use of its features.

3.5 Evaluation

In this section we evaluate the extent to which the design and delivery of the training described above, for the IAU programme, achieved the relevant objective (IMO3, above).

Data was collected using Zoom polls conducted at the end of each workshop, feedback forms that were circulated to all participants after the workshops, virtual focus groups and a phase 1 baseline questionnaire circulated to all members of the IAU community.

Workshop attendance varied between 83 people (workshop 8) and 170 (workshop 1). By the end of phase 1 of the programme around 225 people were also registered on the Hivebrite community programme, with a third of those engaging more actively there.

Workshop satisfaction was high: in the poll during workshop 10, 60% reported their overall experience of the IAU workshops as 'excellent' and 32% as 'good'. Of net promoter scores collected in end of workshop polls for workshops 3 - 9, 5 were 'Excellent' and 2 'Exceptional'.

Across the ten workshops, large proportions (80%+) of participants consistently stated that they had acquired the intended knowledge and skills. 87% strongly agreed or agreed that network members had freely shared insights of their higher education and entrepreneurial contexts, and 61% strongly agreed or agreed that attending the workshops had provided them with valuable networking opportunities. Importantly, 87% of partnerships strongly agreed or agreed that the workshop content overall had been relevant and was applicable to their IAU project, with 19 of the 24 partnerships reporting that they had already been able to apply learnings from the workshops to their IAU projects by the end of phase 1 of the programme.

The Zoom environment was experienced favourably overall, with a rating of 4.2/5, despite the technological constraints. 21 of the 24 partnerships also reported that Hivebrite was user-friendly and easy to navigate and that they had downloaded resources from the platform.

A small number of technical challenges reported by participants in post-workshop feedback forms were largely related to internet connectivity, registering on Hivebrite, challenges with Zoom and working with Miro. For example, problems with network and internet connectivity were reported by one or two participants after 7 of the workshops, with one participant explaining that this was due to load shedding and electrical power cuts in their region. Miro was a new tool to many, and technical challenges with Miro and navigating around it were also mentioned by a small number of participants, for example: 'interacting with miro was a bit challenging but am familiar with it now'.

The other main overarching challenge was with time. A number of participants would have preferred the workshops to be shorter than the allocated 3 hours.

3.6 Communication

The final step in the DSRM process as outlined by Peffers et al (2007) is communication: describing what has been done to appropriate audiences, and drawing out its relevance to academics and practitioners. For the IAU programme as a whole, this stage is still underway, but in addition to this short paper, the COE team have also begun to share their findings through a final report and toolkit provided to the funders, to facilitate the roll out of further similar programmes.

4. Implications for learning innovation under resource constraints

In section 3 we identified the general problem of lack of knowledge about how to deliver effective online innovation training in resource constrained contexts, and the need to solve this problem so that we can train more people to be able to innovate effectively in their own, often resource constrained, national and organizational contexts. Based on existing research, as well as our own practical experience, we set out a number of principles and guidelines for conducting such training. We then demonstrated one successful example, from the IAU programme, of how these principles and guidelines were applied in delivering an experiential approach to innovation learning online, for participants in resource constrained contexts.

Although we can see in some of our evaluation data some minor effects of technological constraints such as lack of access to broadband internet connections and some forms of digital devices, it is good to note that the objective of enabling IAU participants to acquire new knowledge, skills and networks with regards to strengthening entrepreneurship ecosystems in their contexts was quite effectively achieved despite these. This makes us hopeful that the principles and guidelines presented in section 3.3 may also be useful in developing online innovation training programmes for use in other resource constrained contexts and we look forward to further studies that can test their applicability in a broader range of situations.

In addition, some recommendations for improvement, from our IAU programme participants, which could be considered in future implementations of similar programmes include:

- Shortening synchronous online training sessions to less than three hours

- Providing more technical support for tools such as Hivebrite which form an important part of the training programme but are new to many
- Ensuring that tools such as Hivebrite are available on mobile phones
- Using more familiar tools, such as Telegram, to boost engagement with the less familiar tools, such as Hivebrite

5. Discussion and future directions

Tidd and Besant (2021) set out six core principles that help make up a ‘frugal innovation’ mindset, and it is interesting to note how these find resonance in the approach we adopted to tailoring the delivery of the IAU programme workshops to operate effectively within the technological constraints of participants’ environments. We kept things simple, relying mainly on a core set of familiar digital tools. We used an iterative approach, engaging members of the IAU Centre of Excellence with experience of delivering similar programmes in other contexts, together with a programme team familiar with the resource constrained context we were targeting for the IAU programme, and finally involving the programme participants themselves, who gave feedback each week that helped to refine the way in which workshops were delivered according to their needs.

As Birdi (2021) has pointed out, creativity and innovation training programmes are hard to evaluate, and it can take months, or even years, for their true impact to become clear. Data relating to the impact of the IAU programme as a whole is still being analysed, over a year after it officially ended. We look forward to understanding any longer term impacts of the training on participants in the IAU programme in due course, and also to any further insights this may offer for the general case of learning innovation under resource constraints.

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