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## Original Research

# An investigation of the features facilitating effective collaboration between public health experts and data scientists at a hackathon

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## ABSTRACT

**Objectives:** The objective of this study is to explore facilitating factors for collaboration at hackathons, intensive events bringing together data scientists ('hackers') with experts in particular subject areas.

**Study design:** This is a qualitative study.

**Methods:** Semistructured interviews were conducted with organisers before and after the event. The initial exploratory interviews influenced the content of questionnaires which were distributed to all participants asking about their motivations and experiences. Thematic analysis was used to explore key features of collaboration.

**Results:** Facilitating factors were clustered under the themes of preparation (the right amount of pre-event information, methods to maximise attendance and identification of suitable challenges), participants (enough people to progress and a mixture of skills and experience), working together (mutual understanding of the aim, getting the best out of each other, overcoming challenges together, effective facilitation and an enjoyable and valuable experience) and follow-up (recognised process for feedback and support for the development of prototypes).

**Conclusions:** The findings of the study provide insight into fostering collaboration in this context and provide evidence that may be used to tailor future events for the effective delivery of technological and marketing-based solutions to public health challenges. Hackathons provide a methodological advance with potential for broad public health application.

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## Introduction

Over recent years, there has been a growing movement to use hackathons (and similar events such as 'brainhacks' and

'datathons') to assemble multidisciplinary teams to create innovative technology and marketing-based solutions for demanding real-world challenges.<sup>1</sup> Hackathons are typically intensive two-day collaborative events bringing together those involved in marketing, software design and

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development (often referred to as ‘hackers’) with experts from particular subject areas. They provide a forum for lateral thinking, promoting creativity and innovation through the juxtaposition of groups with distinct skill sets. The process involves understanding and breaking down a problem, testing out technological and marketing-based solutions and developing prototypes. This can be referred to as ‘hacking’ the challenge.

Healthcare practitioners and planners have started to make use of this methodology, addressing challenges from a range of clinical and technological areas.<sup>2–4</sup> Although relatively new, the success of this approach is evidenced by the development of pioneering product design, the securing of investment, the formation of successful start-up companies and the continued collaboration of creative people from outside traditional health backgrounds with clinicians and other scientists to create novel advances in health care.<sup>5,6</sup>

Although not all areas of health care are ‘hackable’, there is potential to apply these development techniques in public health programmes. The hackathon emphasis on need-based remedies and cross-pollination between disciplines resonates with the public health principles of engaging with local communities and ensuring stakeholders are involved in finding solutions.<sup>7,8</sup>

Many descriptions have been written describing how to deliver a hackathon and the benefits of such events.<sup>9–12</sup> However, there is limited information about how best to use hackathons to address public health problems.

A public health hackathon was held over a weekend in May 2018 to explore actions to address Scotland’s unhealthy relationship with alcohol,<sup>13–15</sup> and this presented an opportunity to explore how the hackathon process could be used in a public health context. The hackathon was organised by Code the City<sup>20</sup> (CTC), a civic hacking initiative, in collaboration with National Health Service (NHS) Grampian Public Health. Participants were recruited using established CTC and public health networks and through social media. A dedicated group of local hackers regularly volunteer at similar events. The North of Scotland Public Health team, Scottish Alcohol and Drug Partnerships (ADPs), Alcohol Focus Scotland, recovery organisations, social networks and the licenced trade were invited to contribute ideas for challenges to be ‘hacked’ in advance of the event.

The 21 participants who attended the hackathon were split fairly evenly between hackers and public health experts, who included individuals with lived experience of addiction. On the first morning, organisers and participants listed 26 challenges and voted on which to include in the event. Groups formed around three challenges through a mixture of self-selection and encouragement from CTC leads who hosted the event. CTC have a well-rehearsed approach for undertaking hackathon weekends and took responsibility for attending to practical aspects. Teams spent the rest of the two-day event ‘hacking’ their projects. Three prototypes emerged in the following areas: (1) using artificial intelligence to identify misleadingly labelled alcohol products; (2) promoting alcohol-free social spaces; and (3) connecting recovery groups and communities across Scotland. More information on these areas can be found on the CTC website.<sup>20</sup>

## Aim

The aim of this study was to explore facilitating factors for collaboration between data scientists and public health experts at a hackathon event to inform future work.

## Methods

Researchers conducted semistructured interviews before and after the event with the Public Health substance misuse lead, the Aberdeenshire ADP team lead and a director of CTC. Before the event, these interviews were exploratory and influenced the content of electronic questionnaires that were distributed to all participants after the event. In these, participants were asked about their experiences of the event, including the quality of the facilitation, how they contributed and how different groups worked together. Simultaneous follow-up interviews explored these topics in more depth.

Interviews were transcribed and coded independently by three researchers. Consensus was reached through discussion and reflection. Themes were identified across the transcriptions and survey free-text answers, highlighting key features of the collaboration between public health experts and data scientists at the hackathon.

## Results

Ten of the 21 participants completed the questionnaire; four were identified as subject area experts (those working in Public Health, relevant third sector organisations or with lived experience) and six as ‘hackers’. Two of the interviewees also completed the questionnaire. The features emerging from the thematic analysis are detailed below and summarised in [Table 1](#). Quotations have been coded S for subject area experts and H for hackers.

### Preparation

#### *The right amount of pre-event information*

Prior information was not prioritised by the organisers, an approach that is in line with the ethos of a hackathon,

**Table 1 – Features of effective collaboration by theme.**

Theme	Feature
Preparation	<ul style="list-style-type: none"> <li>• The right amount of pre-event information</li> <li>• Methods to maximise attendance</li> <li>• Identification of suitable challenges</li> </ul>
Participants	<ul style="list-style-type: none"> <li>• Enough people to allow sufficient progress</li> <li>• Mixture of skills and experience</li> </ul>
Working together	<ul style="list-style-type: none"> <li>• Mutual understanding of the aim</li> <li>• Getting the best out of each other</li> <li>• Overcoming challenges together</li> <li>• Effective facilitation</li> </ul>
Follow-up	<ul style="list-style-type: none"> <li>• An enjoyable and valuable experience</li> <li>• A recognised process for feedback</li> <li>• Support for the development of prototypes</li> </ul>

where fresh ideas are created spontaneously with little preparation. However, survey responses from hackers suggested that they would have preferred more information in advance, for example, about the proposed challenges and the timeline for the weekend: ‘circulating the projects in advance would allow people more time to consider ideas’ (H1); ‘some pre-read might have helped make a quicker start’ (H2).

#### *Methods to maximise attendance*

Maximising attendance was of concern to organisers, particularly attracting enough subject area experts. A suggestion was made that the organisers could have improved attendance and maximised the potential of the event by considering more systematically who they wanted to attract and how to encourage attendance, as part of planning for the weekend.

#### *Identification of suitable challenges*

Suggestions for challenges ranged from a broad ‘approach rather than a topic’ (S1) to multiple specific challenges. One participant thought that it was useful to have a variety of challenges so that people had choice and that ‘the one I gravitated towards was the one I felt was doable in a short while whilst also being of immediate applied value’ (S2). All respondents felt that the challenges they worked on were interesting and important to varying degrees.

#### **Participants**

##### *Enough people to allow sufficient progress*

There were fewer participants than anticipated. This was thought to be related to the focussed nature of the topic and the difficulty in recruiting public sector staff over a weekend. There was also some dropout during the event, particularly among those with lived experience, and there was a common view that ‘we could’ve done with more stakeholders on the project’ (S3). Several respondents reiterated the need to have people attend who could ‘articulate what the challenges are and stay and drive it’ (H3).

##### *Mixture of skill sets and experience*

Most respondents mentioned that the challenges benefitted from the attention of participants with a mixture of skills and experience. An example was given by a member of the group promoting alcohol-free social spaces which developed an idea for local ‘mocktail awards’: inspired by the needs of those in recovery, shaped for profitability and generic appeal by those with business backgrounds and with marketing experts suggesting promotional strategies.

[we were] wowed at the ideas of the marketing people. It [the potential solution] was put so simply and so clearly that you just think “ah, that’s a really good understanding of our problem and a really simple way that we could potentially solve that problem” (S2).

Collaborating with those with lived experience appeared to alter the direction of the outputs away from the usual technology-based solutions of other hackathons:

They were actually much more human-centric and much less technology-centric and they were thinking about what it would be like to be that person in recovery. (H3).

All respondents thought that the ‘right’ people had been present, despite an absence of some identified stakeholders e.g. police and housing officers. One interviewee observed that ‘there was no possibility of [sitting around with no ideas] because of the people who were there’ (S1).

#### **Working together**

##### *Mutual understanding of the aim*

Each group had a well-defined remit. This was viewed by several respondents as a particular strength of the event because it aided collaboration within and between groups. However, one respondent commented that ‘the aim and direction of the project was neither properly discussed nor properly agreed among participants’ (H4). In addition, some participants appeared to come with the intention of seeing very specific issues addressed, whereas others were open-minded to many possible outcomes: ‘If I could have thought it up to start off with on my own, why would you need a hackathon?’ (S1).

##### *Getting the best out of each other*

The CTC methodology focused on helping participants to understand the challenges first, guiding them in their prototype development and generating a relaxed atmosphere where everyone felt they could go at their own pace.

Overall, respondents tended to think the hackers and subject area experts worked well together; although hackers emphasised this more than subject area experts. Hackers were also more inclined than subject area experts to think that their skills had been used. This was in contrast to some subject area experts’ views, who discussed the challenges of working together and thought there was potential for tapping further into the knowledge and skills of those who were present: ‘It was so valuable to have people with lived experience there and participating but how [do] you encourage that participation and help it along in that setting ... you need to be able to get that contribution from everybody.’ (S2).

I believe the correct skills and people were there but the group I worked with didn’t seem to be able to access their input or advice and they seemed a little reluctant to get involved. (S5).

This led on to exploration of facilitation as a possible solution.

##### *Overcoming challenges together*

One respondent observed ‘the working styles of some hackers and subject experts are quite different’ (H4). Another discussed the use of jargon and how participants naturally looked at an issue from their own cultural perspective. Tools were available to help participants from different backgrounds to understand each other’s perspective and language, for example, through supporting the visualisation and breakdown of a strategy, however, these were not used much. One interviewee thought that they were not needed, due to the groups’ clear remits; another thought that the participants’ lack of familiarity with

them discouraged their use. It was suggested that a formal group facilitator may have helped the groups overcome challenges and allowed more progress to be made: ‘When you bring a group of people together, you know that personalities can clash, and that needs to be managed.’ (S2).

#### *Effective facilitation*

Different participants appreciated different approaches. One valued the willingness of CTC leads to ‘sit with [the participants] ... coach them, show them examples online ... nudge them towards re-focussing’ (H3) but balance this with a respondent’s desire for a ‘relaxed atmosphere ... [where you go] at your own pace’ (S1). The subject area experts valued the initial briefing by CTC on general aims and the process of the hackathon, which included guidance on working in groups and how to make progress. Movement of individuals between groups and input from others through regular group update sessions were recognised by respondents as bringing fresh perspectives to challenges and generating further ideas: ‘The cross-fertilisation of ideas was really helpful.’ (S4).

However, this freedom also meant that over the weekend, groups became polarised, with one mainly subject area experts and another weighted towards hackers, which was not ideal. Responses from subject area experts indicated that they would have particularly benefited from further facilitation and guidance within the groups: ‘there was very little facilitation, guidance or leadership in the breakout groups’ (S5); this appeared to be less of an issue for the hackers. It was suggested by one interviewee that the Public Health lead could have taken on more of a formal group facilitator role. Despite this, nearly all the participants indicated that the hackathon was facilitated well and that the briefing from Public Health was clear.

#### *An enjoyable and valuable experience*

The majority of respondents found the collaboration experience very enjoyable. Benefits of attending included the experience of applying skills, learning from others with different perspectives, networking and providing personal or professional development:

gaining new insights about problems I’ve never heard before (S5).

developed some ideas that will have real world application (S3).

great fun, good networking, learnt new skills and hopefully made a difference (H4).

Following the event, one interviewee had ‘Already joined data network – connections have been made’ and felt that such an event ‘... opens folk’s minds to the potential’ (S1). Making links with others for longer term collaboration was widely seen as a benefit.

#### *Follow-up*

Having a recognised process in place to feedback on the hackathon, follow up on links and support the development of prototypes was suggested by several participants, and

interviewees suggested a debrief meeting to include all organisers. One commented how ‘collaborating wider over a longer period of time with an intent to develop some of the ideas that come out could be really fruitful.’ (S2). While it, therefore, may also be beneficial to have a process to help participants get together to further develop prototypes, it was acknowledged that ultimately they ‘would need someone to adopt and invest in our product to make it a real “thing”’ (H1).

## **Discussion**

This study contributes a new insight into approaches to foster collaboration between public health experts and data scientists at hackathon events, with potential to enhance this promising methodological advance. The features identified provide a basis for collaboration that is in line with public health principles<sup>7,13</sup> and give direction to shaping future events adapted to the delivery of solutions to public health challenges.

The public health principles of collaboration and engagement and empowering people and communities underpin the hackathon ethos and are mirrored in the features explored in this study. The features related to preparation and participants are aligned with guidance that advocates the inclusion of all relevant communities in the codesign of interventions and services, putting them at the heart of change.<sup>13</sup> Methods to maximise attendance and mixture of skills and experience should take into account the representation of people with relevant experience to the issues under discussion, particularly if they are from groups that are often marginalised. The attendance of participants with ‘lived experience’ of the issues underpinning this event was seen as extremely valuable in this study and essential to keep the work rooted in reality. Other studies have also recognised hackathons as an effective way to engage with service users.<sup>3,16</sup> Our findings suggest that engaging such individuals was one of the main challenges, and the question of how best to recruit and retain these participants should be prioritised at an early planning stage.

The choice of challenges for consideration and pre-event preparation are also vital in ensuing effective, informed involvement and that communities are empowered to get the changes they would like onto the agenda. Because public involvement is a fundamental aspect of hackathon ethos, they avoid the pitfalls of ‘tokenism’ sometimes suggested in engagement between health services and communities or service users<sup>17</sup> and create an opportunity to be responsive to matters of public concern, providing a forum for genuine involvement in line with public sector priorities.<sup>18,19</sup>

Features under the theme of working together, centring on effective facilitation, are also vital in this respect. Findings suggest that to work together effectively participants would like an enjoyable and valuable experience, with benefits that included building relationships, learning from other perspectives and the sense of fulfilment arising from ‘making a difference’. However, some participants felt they were not able to contribute and use their skills to their full potential. Facilitation and support for communities and individuals to develop solutions to address their health challenges is recognised as important,<sup>7</sup> and thus, mechanisms should be in place to maximise the participation of all who attend. These

may include formal group facilitation, ensuring the skill sets and experience of members are understood by others, and the use of shared tools and materials.

A tension was highlighted between the approach of being open minded to many possible solutions and some participants wishing to see very specific issues addressed. A traditional hackathon, as exemplified in this case study, is very flexible and creative and probably not suited to the development of specific predetermined ideas. The approach could perhaps be modified to accommodate more focussed public health work around a particular issue, using the format of an identified challenge with competition between groups, which has been used successfully in other areas of health.<sup>5,16</sup>

The conflict between the needs for cross-pollination of ideas and some continuity of group membership is another illustration of where facilitation could improve the flow of ideas. For some participants, hackathons are a hobby and something to be enjoyed at their own pace, whereas for others, the topic may be an emotional and personal one and they will come with a strong desire to be productive. Overall, there was a balance that needed to be achieved between the ethos of freedom, fundamental to hackathons, and some degree of leadership to make the best use of the opportunities. This finding is supported by other work, which identifies effective leadership as essential.<sup>12</sup>

Finally, respondents indicated that a follow-up process would be helpful to encourage the development of prototypes and other emerging ideas. Indeed, one of the main benefits identified was building new collaborations and seeding innovative ways of looking at challenges that could be developed over time. In line with public health good practice, further developments and evaluation should be in collaboration with the relevant community representatives.<sup>7,13,19</sup>

In addition to engagement and collaboration priorities, there are also clear public health intentions to innovate in the areas of data science and technology.<sup>13</sup> The hackathon method provides a way to address this goal by applying public health expertise, data and intelligence and draw on our communities' lived experience using digital solutions and innovative technologies to enable, drive and support change.

### Limitations of this study

Asking participants and organisers to assess the value of their own work is inherently biased, but a mixture of views, not all positive, were obtained. Participants clearly valued the experience of collaboration and provided useful insights into the process. It would have improved the quality of the data to include interviews with the participants who had 'lived-experience' of alcohol issues, but this was not possible.

Findings are based on the experiences of participants at one hackathon, and although we believe that the recommendations and features explored may be useful for other similar events, readers need to consider the context of this hackathon in assessing the extent of their transferability to different situations.

### Conclusion

The findings of this study provide insight on fostering collaboration between public health experts and data

scientists in the context of a hackathon and provide evidence to shape the style and approach of future events for the development of new ideas in addressing public health challenges. Hackathons provide a methodological advance with potential for broad public health application.

## Author statements

### Ethical approval

Not applicable for internal service evaluation.

### Funding

No funding was received for this study.

### Competing interests

The authors declare that they have no competing interests. They work in the same NHS Board as the Public Health team who commissioned the hackathon, but were not involved in any aspect of its implementation.

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