**What are the features of effective collaboration between public health experts and data scientists? Evaluation of a hackathon addressing society’s relationship with alcohol.**

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**Highlights**

* Hackathons are a new approach to solving public health challenges using technology
* **They provide a valuable forum for engaging with service users**
* Effective collaboration between public health experts and data scientists is key
* Personal benefits from participation include networking opportunities and skill development
* Those planning future hackathons could use the range of strategies suggested by this study to encourage collaboration, with particular consideration given to maximising the participation of subject area experts

**Abstract**

Objectives

To identify factors facilitating collaboration at hackathons, intensive events bringing together data scientists (‘hackers’) with experts from particular subject areas. .

Study Design

Qualitative evaluation

Methods

Interviews were conducted with organisers and questionnaires were distributed to all participants asking about motivations, experiences and the usefulness of any outputs. Thematic analysis was used to identify key features of collaboration.

Results

The features identified clustered under the themes of Preparation (*the right amount of pre-event information, methods to maximise attendance, identification of challenges, practical issues*), Participants (*enough people to progress, 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*), Outcomes (*potential of prototypes, benefits for individuals*) and Follow-up (*recognised process to feedback, follow up links and support the development of prototypes*).

Conclusions

Hackathons provide a methodological advance with potential for broad public health application. The findings of this study provide insight into how to foster collaboration between subject area experts and data scientists in this context, and provide evidence that may be used to tailor the delivery of future events for the effective delivery of solutions to public health challenges.

**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 challenges1. Hackathons are typically intensive two-day collaborative events bringing together those involved in marketing, software design and 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.

Health care practitioners and planners have started to make use of this methodology, addressing challenges from a range of clinical and technological areas2,3,4. Although relatively new, the success of this approach is evidenced by the development of pioneering product design, the securement 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 innovation in health care5,6.

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 needs-based remedies and cross-pollination across disciplines resonates with the public health principles of engaging with local communities and ensuring all the stakeholders are involved in finding solutions.

Many descriptions have been written describing how to deliver a hackathon and the benefits of such events.7-10 However, there is limited information about how best to use hackathons to address public health problems. The opportunity of a hackathon addressing Scotland’s unhealthy relationship with alcohol11-13 was used to identify features of effective collaboration.

The hackathon was held in May 2018 at Aberdeen University and organised by Code the City[[1]](#footnote-1) (CTC), a civic hacking initiative, in collaboration with NHS Grampian (NHSG) Public Health.

The aim of this study was to identify factors that facilitated or inhibited collaboration, in order to inform future efforts.

**Methods**

The hackathon was evaluated by a Public Health research team at NHSG. Researchers conducted semi-structured interviews with the Public Health substance misuse lead, the Aberdeenshire Alcohol and Drug Partnership (ADP) team lead and a director of CTC. Electronic questionnaires were distributed to all participants after the event, asking about their motivation, experiences of the event and the perceived usefulness of the outputs.

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

**Results**

Ten of the twenty-one participants completed the questionnaire; four identified as subject area experts (those working in Public Health, relevant third sector organisations or with lived experience), five as ‘hackers’ and two as organisers. Three interviews with organisers were conducted.

**Description of the Hackathon**

On the first morning organisers and participants presented 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.

Teams spent the rest of the two-day event “hacking” their projects: understanding and breaking down the problems, testing out technological and marketing-based solutions and developing prototypes. Resources included: open data, feedback from other groups and CTC leads, and shared tools (e.g. to help define vision and Unique Selling Point).

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.[[2]](#footnote-2)

**Features Identified**

**Preparation**

*The right amount of pre-event information*

Those who registered for the event were sent brief information on the theme of the hackathon prepared by subject area experts. The preparation was not prioritised by the organisers, and this approach is in line with the ethos of a hackathon, where fresh ideas are created spontaneously with little prior preparation:

“*If I could have thought it up to start off with on my own, why would you need a hackathon?*”

However, survey responses from hackers suggested that they would have preferred more information in advance, e.g. about the proposed challenges and the timeline for the weekend.

*Methods to maximise attendance*

CTC have a dedicated group of hackers who regularly volunteer at events and others were attracted through social media and word of mouth. Public Health, as the sponsor, was required to invite subject area experts and invitations were made to Scottish ADPs; through Alcohol Focus Scotland and via social networks. One respondent suggested 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. Another learning point was that participants’ backgrounds were mostly unknown to the organisers before the event, so it was not possible to target deficits in experience before the event.

*Identification of suitable challenges*

The North of Scotland public health team, Scottish ADPs, Alcohol Focus Scotland, recovery organisations, social networks and the licensed trade were invited to contribute ideas for challenges. Responses ranged from a broad “*approach rather than a topic*” 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*”.

*Practical issues*

CTC have a well-rehearsed approach for undertaking hackathon weekends and took responsibility for attending to practical aspects, such as venue, catering and stationery.

**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 over the weekend, particularly among those with lived experience. One interviewee reiterated the need to have people attend who could “*articulate what the challenges are and stay and drive it*”.

*Mixture of skill sets and experience*

Each challenge benefitted from the attention of participants with a mixture of skills and experience. For example, the group promoting alcohol-free social spaces 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’.*”

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.*”

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*”.

**Working together**

*Mutual understanding of the aim*

Each group had a well-defined remit. This was viewed as a particular strength of the event because it aided collaboration within and between groups.

*Ability to get the best out of each other*

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

Movement of individuals between groups and regular presentations brought fresh perspectives to challenges and generated further ideas. Respondents appreciated the opportunity to input into challenges other than the one they were primarily focused on. However, this freedom also meant that over the weekend one group became mainly subject area experts and another was, in the majority, hackers. The perception was that the hackers wanted to help in the second group but did not know how to, so moved to where they could see uses for their skills.

Forty percent of respondents thought the hackers and subject area experts worked very well together; and hackers tended to think this more than subject area experts (50% versus 25%). There was also a difference in that all the hackers thought their skills had been used, whereas only one-quarter of the subject area experts agreed. Hackers tended to think that bigger groups would have resulted in improved outcomes, whilst other participants 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*.”

*Overcoming challenges together*

One respondent observed “*the* *working styles of some hackers and subject experts are quite different*”. Another discussed the use of jargon and how participants naturally look at an issue from their own cultural perspective. The interviews highlighted some tensions that can exist when working in partnership, which included:

* For some, hackathons are a hobby and something to be enjoyed at their own pace, while for others, the topic may be an emotional and personal one and they will come with a desire to be productive.
* There is a need to be open-minded to many possible solutions but some participants will wish to see very specific issues addressed.
* There was a need for continuity of group membership but also for cross-pollination of ideas.

These tensions within the groups needed to be kept in balance, and did result in some conflict in one group. Tools helped participants from different backgrounds to understand each other’s perspective and language, for example, through supporting the visualisation and breakdown of a strategy, however, some of the tools 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*.”

*Effective facilitation*

CTC played a key role in facilitating the event. They “*sit with [the participants]…coach them, show them examples online…nudge them towards re-focussing*” but balance this with creating a “*relaxed atmosphere…[where you go] at your own pace*”. The Public Health leads 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. Participants were encouraged to talk more informally with the other groups throughout the weekend; this further promoted the generation of new ideas:

“*The cross-fertilisation of ideas was really helpful*.”

Responses from subject area experts indicated that they would have particularly benefited from further facilitation and guidance within the groups; this appeared to be less of an issue for the hackers. It was suggested by one interviewee that the Public Health leads could have taken on more of a formal group facilitator role. Despite this, 90% of participants thought that the hackathon was facilitated ‘very well’ or ‘well’ and that the briefing from Public Health was ‘very clear’ or ‘clear’.

**Outcomes**

*Potential of prototypes for further development*

Seventy percent of respondents thought the prototypes were ‘very good’ or ‘good’, 20% ‘average’ and 10% ‘poor’. Comments varied from *“Very good considering we had 36 hours*” to “*There was nothing constructive nor collaborative produced. The idea didn’t find or identify any directional nor development output*”. Eighty percent felt the outputs had ‘very good’ or ‘good’ potential for further development.

*“I believe the concept that was discussed and investigated has a great reach which would incur limited input financially and technologically”.*

Following the hackathon, there has been further work to develop some of the outputs and consider some of the other challenges that were presented. Alcohol Concern in England has expressed interest in one of the outputs and are in contact with CTC. NHS Grampian plans to use artificial intelligence in a bid for national innovations funds; an idea came directly from learning at the hackathon.

*The expected benefits for individuals are achieved*

Eighty percent of respondents found the hackathon experience ‘very enjoyable’ and most reported benefits, including: improved experience of applying skills to real world problems (90%), networking (90%) and valuable for their personal or professional development (90%). Other positives aspects mentioned were:

*“gaining new insights about problems I’ve never heard before”*

*“developed some ideas that will have real world application”*

*“great fun, good networking, learnt new skills and hopefully made a difference”*

Learning from others with different perspectives was the most valuable part of hackathon for one participant. Following the event another had *“Already joined data network – connections have been made”* and felt that such an event *“...opens folk’s minds to the potential”*. 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*

After a hackathon, CTC leads meet to reflect on what worked well and what could be improved for next time, but there is currently no other process to follow up on developments. Interviewees suggested a debrief meeting which included all organisers. One interviewee 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*.” Whilst 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’”.*

**Discussion**

Overall the hackathon provided a useful forum for detailed pragmatic discussions around potential solutions to aspects of society’s relationship with alcohol. Participants were mainly positive about the event and the benefits to themselves.

*Main finding of this study*

The features of effective collaboration identified were clustered under the themes of Preparation, Participants, Working Together, Outcomes and Follow-up, and are described in detail in the results section. They reflect aspects of the event that were considered important to participants, and provide points for consideration by organisers of similar events. This insight into approaches to fostering collaboration between public health experts and data scientists may serve to enhance a promising methodological advance, and deliver events adapted to the delivery of solutions for public health challenges.

*What is already known on this topic*

Although hackathons already appear in the literature, these studies are mainly descriptive, focusing on the novelty of the approach1-4,7,9 and the value of the outcomes.5,6 In addition, a feature that didn’t receive much attention in this evaluation, but appears in the literature, is that of participant learning.4-8;10 The development of this aspect in future hackathons may further encourage attendance and enhance outputs.

*What this study adds*

This study adds an analytical approach to hackathon methodology, identifying features that can be used to structure future work of benefit to public health.

The direction of the work and the outputs were dependent on the participants’ interests and skills, and it emerged that working across the professional boundaries required careful facilitation in order to maximise individuals’ participation. There was a balance that needed to be achieved between the ethos of freedom, fundamental to hackathons, and some degree of leadership in order to make the best use of the opportunities. This finding is supported by other work, which identifies effective leadership as essential.10

Diversity in the experience and background of participants was viewed as a very positive feature, and the public health team, especially, valued the opportunity to learn from other perspectives. The attendance of participants with ‘lived experience’ of the issues underpinning the event were found to be extremely valuable, and essential to keep the work rooted in reality. Other studies have also recognised hackathons as an effective way to engage with service users.3,14 Our findings suggest that engaging these individuals was one of the main challenges, and the question of how best to recruit and retain these participants should be prioritised at the planning stage.

Participants expressed a range of views on the quality of the outputs and their potential for development, although most thought these were positive. The progress of the prototypes will be monitored over the next 12 months to assess long-term value. Clearly many participants did not judge the success of the event by outputs, but rather by the opportunity to network with a view to future collaboration, gain experience in applying their skills to real-world problems and learning from other perspectives.

The traditional hackathon approach, 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 an issue, using the format of an identified challenge with competition between groups, which has been employed successfully in other areas of health.5,14

*Limitations of this study*

A limitation of this evaluation is that some participants did not give their views, potentially biasing findings by emphasising positive aspects and under-stating the negative. It would also 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.

**Conclusion**

Hackathons provide a methodological advance with potential for broad public health application. The findings of this study provide insight on fostering collaboration between subject area experts and data scientists in this context, and provide evidence to tailor the delivery of future events for the effective delivery of solutions to public health challenges. Learning may be applied immediately, in future hackathons or similar events.

Ethical approval

Not applicable; for internal service evaluation.

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Competing interests

The authors declare that they have no competinginterests

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1. <https://codethecity.org/> [↑](#footnote-ref-1)
2. <https://codethecity.org/hack-weekends/code-the-city-13-hack-societys-relationship-with-alcohol/> [↑](#footnote-ref-2)