1. Search strategy

- Searches were conducted across Medline, EMBASE, NICE Evidence, SCOPUS, Google Scholar and Google to capture both peer reviewed and grey literature. The search terms used were: (sandpit AND research) OR ("idea* lab*"). The list of references is provided in the Bibliography in section 8.

1. Results

- 37 references of relevance were retrieved. These comprised:
  - 16 journal articles,
  - 3 blog posts,
  - 5 books or chapters in a book,
  - 2 reports,
  - 8 web pages,
  - 3 conference papers/abstracts.

- There appears to be very little primary research evaluating sandpit methodologies in the medical or social sciences fields. The literature discovered appears to report on the use of and need for sandpit exercises as well as the drawbacks. There is a wealth of literature on interdisciplinary research in general. The business literature also covers ideation governance extensively – this looks at how product ideas are managed and its place as a key stage of forming new ideas. Articles were excluded if they focused specifically on engineering / technical sandpit rooms designed to develop new business products.

- This was a rapid rather than exhaustive literature search in order to identify the key elements of a research sandpit exercise in particular and the factors that make them successful. Those articles with abstracts or full-text are reviewed here.

2. What are sandpits?

- Sandpits were first promulgated by the ESRC to stimulate new research ideas and “reinvigorate” existing disciplines. Coupe defines sandpits as “residential workshops that bring together researchers from different institutions and disciplines to discuss a specific topic or problem.” Alternatively known as an ideas factory or Ideas lab, sandpits are intensive discussion forums where free thinking is encouraged to delve into the problems on the agenda to uncover innovative solutions. Hargreaves and Burgess frame this as driving “lateral thinking through role play, small group work and brainstorming activities.”

- The sandpit process covers:
  - Defining the scope of the issue
  - Agreeing a common language and terminology amongst diverse backgrounds and disciplines.
  - Sharing understanding of the problem participants’ expertise.
Using creative and innovative thinking techniques in break-out sessions to focus on a problem.

Turning sandpit outputs into a research project

Sandpits are intensive events. To preserve group dynamics and enable the process of continual evaluation to happen across the sandpit, participants stay for the whole of the event.

Examples of sandpit exercises are those described by Camden town Unlimited, who used the ideas lab approach to focus on innovative ways of tackling four everyday problems: finance, data, governance, economy, and Perkins et al who used half-day sandpit exercises as a back-up to quarterly focus group meetings of special interest groups in Wales as part of an 18 month knowledge exchange project in Wales. For example, the Medical Technology group considered which chronic diseases were not met within the NHS, where expertise may exist in Wales and whether participants in the sandpit were collaboratively equipped to enable a technology to manage a met condition better or address an unmet disease. 40 participants from academia, NHS, and industry met to look at the expertise and solutions to identify one proposal to take forward.

3. Sandpit participants & roles

The ESRC suggests that sandpits are formed of 20-30 participants.

- **Director:** has an overarching role over the process as well as responsibility for safeguarding the sandpit’s principles and ensuring the exercise meets its objectives.

- **Facilitators:** 3-4 facilitators help stimulate the discussions and create an atmosphere conducive to free-thinking but without getting involved in creating the content.

- **Mentors:** 3-5 intellectual specialists in an important aspect of the topic who are also there to foster a discussion and debate and provide challenge on whether the ideas are novel. Although they bring specialist knowledge, mentors must be able to fit into the spirit of the sandpit. Generally there are mentors.

- **Stakeholders:** these are people working at the practical end of the sandpit topics. They provide a sense-check on the ideas.

- **Participants:** drawn from as broad a range of disciplines as possible, with all participants being “open-minded, flexible, genuinely curious people who are not too invested in their own ideas and comfortable with give-and-take, [able to] work together to define the problem, key priorities and the obstacles to solutions.” (Collins et al) The ESRC has discovered that early careers researchers do well at sandpits because they have no particular name to uphold. The ESRC warns that “pre-eminence does not give an automatic right to participate” – attendance should be open to those able to approach the sandpit with “the right spirit.”
• Provocateur: can be brought in to challenges the thinking being generated by the group.
• The funding body may also be present to provide feedback on the ideas being generated.
• The UK Government Global Food Security sandpit selected participants via a two-page application form outlining ability to work in team, experience of interdisciplinary work and how expertise contributes to addressing the topics of the sandpit. Selection criteria for participants included:
  • Eligibility as an early career researcher at lecturer level or equivalent (if selected, verified by a letter of support from the Head of Department)
  • The ability to develop new, adventurous and highly original research ideas
  • The potential to contribute to interdisciplinary research
  • The ability to work in a diverse team across academia
  • The ability to explain research to non-experts.

4. Sandpit methodologies
• Maxwell et al reported on the first sandpit in Norway (Idélab), selecting 30 participants from 155 applications and working with 8 mentors and two coordinators. Participants’ accommodation costs were met, institutions paid travel costs. The event lasted a working week with the first two days brainstorming the problem and thinking around the theme, two days shaping proposals to address the problem with final presentations made on the final day.
• Schnadelbach describes sandpit methodology, most of which was completed virtually: collaborate on an ideation phase then formed subgroups around particular themes to develop research proposals.
• Nottingham University’s sandpits are arranged for postdoc and early careers researchers with the programme designed to give all participants one minute to speak about their research followed by break-out sessions to discuss collaborations with the aim of developing new and innovative bridges between different disciplines
• Northumbria University is part of an international network that hosts sandpits with the aim of being trans-national, trans-sectorial and trans-generational (3T)
• Collins et al report on a US ideas lab derived from the ESRC sandpit concept. Rather than be designed for the specific purpose of creating research bids, the ideas lab aimed to “develop novel and potentially transformative approaches to a grand challenge.” New, interdisciplinary groups are formed during the sandpit around themes. The groups change in membership as the ideas are refined through repeated cycles of presentation to, and feedback from, all participants. A provocateur made regular presentations on the topic at large while mentors challenged the thinking and assumptions and made connections between people. The ideas lab presented a large knowledge map of the topic and challenged participants to:
• Establish initial groups based on a particular aspect of the knowledge map to consider the problem.
• create a map of the skills needed to tackle the problem(s)
• imagine a newspaper headline as result of success completion of a project in the area – making a mock up of the newspaper piece to think through the issue and the solution.
• Make multiple presentations to all participants to outline and refine thinking and produce a short proposal at the end of the ideas lab.
• Kasatkina reports on an analysis of an ideas lab run in France reimagining a future city. A variety of tools including mind-mapping, brainstorming techniques such as inventory lists and and content structuring approaches such as post-it clouds were used. The ideas lab used an imaginary citizen to find the characteristics of different types of city lives. Mind-maps were built by the group and organised on flipcharts/whiteboards. An artist translated some of the ideas into visual illustrations to generate new interpretations and further discussion. An inventory list of ideas fleshed out the mind map with more details. This supports more common understanding and reduces opportunity for different interpretations. Sandpits therefore require physical tools (white board etc) and socio-technical tools such as mind-mapping.
• Coghill & Francombe-Webb report on a two day sandpit looking at ways of addressing health inequalities in older people in Bath, Bristol, Exeter, and Cardiff. Day 1 was run as a world café around themes with people moving groups every 10 mins, adding to or rearranging ideas noted on post-it notes to create prioritisation/consensus. Day 2 was used to pitch agreed ideas via a dragons’ den approach.
• The Cloud Chamber used the Diamond 9 prioritisation framework. It has four stages:
  1) Brain storm (as a large group) the key phrases / concepts for a topic
  2) smaller groups of three or four people select the nine things which the group thinks are the most important.
  3) The small group then orders the factors / characteristics into a diamond shape with the most important towards the top and the least important towards the bottom. Again, this generates more discussion and develops shared understanding as well as a priority list.
  4)The small groups share their diamond 9s with each other, justifying why they put a particular factor / characteristic at the top.

*Figure 1: the Diamond 9 prioritisation tool*

• Makhoalibe proposes the use of a project artistry framework to help clarify goals and objectives between diverse researchers. Using the imagery of building a house, the design process creates the roof, the design pillars (creativity, reflection, convergence etc) hold up the roof and the foundational bricks support the pillars (engagement, experimentation, exploration etc).

• In Australia, the Sandpit Network aims to cultivate a cross-sector community and provide a safe space “to think, play, plan, model, prototype and test ideas – where failure is embraced as an opportunity to learn”. Its sandpits comprise:
  1: Flag it/vote it: deciding on the issues to tackle where a sandpit exercise could meaningfully help and whether people want to be on the driving team to develop it
  2. Insight nights: short TEDtalk like sessions + interactive discussions on the topics around an issue and agreement of next steps
  3. Co-design / driving team sessions to bring together a subset of people to channel collective skills etc to take next steps forward.

• The ESRC ran a sandpit in 2005 for 25 researchers with the aim of creating a story bank / repository of ideas / vignettes etc that captured community issues relating to technology. The power of vignettes stimulated the development of projects.

• The UK Government Global Food Security Programme led a sandpit aimed to identify proposals that would answer three questions around the food system and sustainable diets. The programme of the sandpit covered:
  • Defining the scope of the challenge
  • Evolving common languages and terminologies among people from a diverse range of backgrounds and disciplines
  • Sharing understandings of the challenge, and the expertise brought by the participants to the sandpit
  • Break-out sessions focused on the challenge, using creative thinking technologies
  • Capturing the outputs in the form of highly innovative research projects
  • A funding decision on those projects at the sandpit using ‘real time’ peer review
  The sandpit was led by a Chair and mentors who act as independent reviewers of the proposals generated. It was held in two parts, a three-day workshop and a two-day follow-up two weeks later.

• Cancer Research UK uses sandpits as a “real-time peer review” process to turn research ideas into pilot studies. The format covers:
  1. Define the scope of the challenge and build on collective knowledge
  2. Set challenge themes (eg “Harder to Reach Groups’, ‘Risk Perceptions’ etc)
  3. Real-time peer review of ideas generated
  4. Highly innovative feasibility study proposals capture the outputs.

The three day process is illustrated in figure 2. This covers the concepts of exploring the challenge, innovation of thinking, and creating strong and sustainable idea:
5. Potential issues with a sandpit

- Maxwell et al say that the sandpit process has not yet been “rigorously operationally defined.”

- Coupe suggests that the highly competitive nature of academic research does not always lends itself to sharing ideas and projects. A sandpit therefore must “facilitate academic generosity.” This may mean looking at theoretical frameworks rather than specific pieces of work.

- Hargreaves & Burgess focus on the intense nature of the sandpit. The speed of work risks having insufficient time to get to grips with some of the conceptual challenges posted by interdisciplinary working. Along with Maxwell et al, they repeat the message that achieving a “common understanding” takes time. Maxwell et al also highlight the risks of not understanding or missing out on detail in the effort to keep the pitch general. They suggest that sandpits need a “low threshold” for asking for clarification on terminology. Developing a common language and adopting “a community of practice approach where members exercise collective influence on a group decision” may mitigate. Giles also reported on the difficulties of understanding language. At a 2004 ESRC sandpit, “Mathematicians, for example, complained that the biologists wanted to build models containing too many variables, whereas the biologists were frustrated at what they saw as the mathematicians’ inability to explain clearly just what their models could achieve.”

- Blackwell suggests that “radical innovation requires risk taking” with the biggest risk being at the boundaries of disciplines and knowledge. Intellectual property issues, career progression fears and the risk of creating silos around new enterprises are all

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Figure 2: structure of a Cancer Research UK sandpit

[https://www.cancerresearchuk.org/funding-for-researchers/how-we-deliver-research/research-innovation-workshops](https://www.cancerresearchuk.org/funding-for-researchers/how-we-deliver-research/research-innovation-workshops)
potential barriers to a successful sandpit, particularly as interdisciplinary work is not always of benefit to academic researchers whose status is not already established. Blackwell also points out that “each discipline has its own frame of reference and its own kind of knowledge that may not necessarily be understood by another discipline.” Both Calvert et al and Holm et al also point out that differing methodologies between disciplines can create difficulties. Each discipline may need to map its strengths and identify where “radical” interdisciplinary research may be possible.

- Paskins describes a process at UCL designed to focus new attention on sustainable urban spaces by bringing together three depts (Built Environment, Engineering Sciences, Mathematical & Physical Sciences) recognising that sustainability does not respect academic boundaries and it is unlikely any one discipline has all the answers. The majority of sandpit participants did not know each other beforehand but although cross-collaboration was generally welcomed, some found it difficult. Paskins reports that “entrenched positions” made it hard to find solutions, such collaboration was an additional aspect of the job with no immediate benefit. However, the positive benefits were felt to overcome the negative in terms of the real interest in learning from colleagues and the collective expertise that could be brought to the table.

- Writing in the Times Higher Education Supplement, Arts & Humanities researchers reported in 2009 that the process “infantilised” them. This may be because ESRC sandpits are designed to allocate funding with the result being a competitive, “reality TV” atmosphere. Concerns were also raised that the process “over-manages” collaboration with an artificial way of creating interdisciplinary ideas. Maxwell et al also found that participants felt hindered in developing novel ideas because of the way that funding bodies work and the difficulty in obtaining funding. They warn that sandpit exercises “should not be “a fancy brainstorming event” that retreats afterwards into familiar looking projects” simply because the way in which the research agenda is being developed does not match what the research funders currently support.

- Maxwell et al concluded that each participant’s research must be seen as equal with that of everyone else in the sandpit; the exercise works best “where each team member was willing to become mutually dependent on each other’s knowledge and expertise.” However, they warn of “a paradox that two dominant science policy discourses, namely solving the Grand Challenges and building an excellent disciplinary science base, appear to be irreconcilable.”

- And finally, Kasatkina draws attention to the need to limit participants because of spatial constraints. Mindmaps etc and whiteboard use can only be read up to 2m away.

6. Factors for the success of a sandpit

- Narayan identifies three “capabilities” required for breakthrough innovations: “a framework of discovery, incubation, and acceleration.” Knowledge management processes are also required to embed these.
The Centre for Facilitation identified 5Cs of the innovation process required of a successful sandpit:
- Connect (getting to know each other)
- Comprehend (mapping the territory)
- Create (generating ideas, what if etc)
- Cultivate (forming project teams)
- Contract (agreement for funding)

The Cloud Chamber consultancy identified the key factors for a successful sandpit as being:
- Intellectual challenges and discussions held at a swift pace quickly developing, binning, refining and creating ideas.
- A completely open mind.
- The pace at which ideas are generated and the whittling down of vast ideas into manageable yet ambitious potential projects.
- Energy in the room enabling people to mix easily – good facilitation is critical to make this work.
- Plenty of space to learn about others and their interests and expertise as new connections will likely lead to new opportunities in the future.

Blackwell et al believe that the success of a sandpit lies in the fact that:
- The topic will not be expressed in any particular discipline – framing the issues as interdisciplinary will help achieve interdisciplinary investment.
- There will be capacity to respond to future needs on the topic
- Development will be able to continue long after the formal end of the initiative.

Blackwell also points out that “success” requires a leadership who can create a new “brand identity” for the topic with a team that is able to work towards a shared goal with the confidence that they can deliver the outcome.

7. Lessons for PETRA
- In drawing up a research priorities framework, PETRA may like to consider the following factors for its sandpit:
  - 20-30 participants drawn from a diverse academic, third sector, and policy background with the ability to think beyond traditional disciplines. Consider some selection criteria or “contract” with sandpit participants to ensure participation over both days, a fit with the aims and free-thinking remit of the sandpit, and a willingness to learn from collective expertise.
  - Include an external facilitator as Sandpit Director; 4-5 facilitators to work with small groups, 2 mentors as subject specialists, a representative of the UK PRP funders to
provide feedback on funding interests. PETRA may also like to include a provocateur to challenge and keep the focus on the big picture.

• The sandpit should be residential in order to build sufficient connections between participants.

• The sandpit programme should cover at least four of the five C’s of innovation, in particular: Connect (getting to know each other), Comprehend (mapping the territory), Create (generating ideas, what if etc), Cultivate (forming potential project teams). NB: The fifth element of Contract (securing funding) is outside the remit of PETRA’s sandpit as the aim is to identify research needs rather than a commitment to funding specific projects in this instance.

• Consider using the Diamond 9 framework to prioritise research ideas.

• Content of the PETRA sandpit:
  • The three intelligence-gathering events could be compiled into a knowledge map at the start of the sandpit with a representative from each event making a 5 minute presentation on the outcomes.
  • This could then be used to create three “grand challenges” for future research in trade and health. These grand challenges could be used to shape ideas for future research questions / projects.
  • A skills map may be needed to identify the type of expertise that is required to solve the issues raised by the grand challenges.
  • Groups could be formed to discuss themes emerging from the grand challenges via a world café style approach

• The sandpit should make use of a variety of creative practices such as presentations, small group work, mind-mapping, inventory lists and post-it exercises. Consider also the need for cross-sector and /or public communication by running a newspaper exercise to write the headline and an accompanying article for a daily paper to describe the success of a project.

• Equipment needed will include:
  • Whiteboards
  • Flipcharts
  • Post-it notes
  • A working space that allows unrestricted movement between small groups with plenty of display space
  • Projection facilities
  • Additional online technology (eg mentimeter.com) as a way of providing feedback to ideas etc.

• Leadership of the sandpit will need to look at “brand” identity to ensure that no individual discipline represented in the room dominates and that the research framework is capable of attracting interdisciplinary investment.
8. Bibliography


Benneworth P, Maxwell K. Why retaining fundamental research funding for the social sciences and humanities is critical to producing societally relevant research. [blog post] 2018 https://elephantinthelab.org/research-funding-is-critical-to-societally-relevant-research/ (Accessed 4 March 2020)


Corbyn, Z. ‘Sandpits’ bring out worst in ‘infantilised’ researchers. Times Higher Education 2009; 2 July


Maxwell K, Benneworth P, Siefkes, M. Sandpits can develop cross-disciplinary projects, but funders need to be as open-minded as researchers. [blog post] 2018;


