Make fun of your research

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Digital and physical games are now widely used to support learning and engagement, including in the climate change and energy domains. We believe games have a further, underappreciated role: helping us as researchers to reflect on our own research, generating deeper understanding and, hopefully, more impactful research projects.

Energy research, especially where it concerns systems or ideas rather than individual technologies, can often be quite intangible, abstract and remote, especially for more general audiences. Games can provide a more emotionally engaging[3] and experiential approach to learning[4] about such situations. Moreover, they can take subjects often associated with negativity and even despair, such as climate change and environmental degradation, and frame them in a constructive way that inspires hope and is ultimately fun[2]. In the energy area, recent examples of games which aim to capitalise on these attractions include *Energetic* from City Atlas and *Carbon City Zero* from 10:10, both of which put players in the position of planning low-carbon transitions in cities.

While these user-appeal and learning benefits are well-recognised, games have a further, underappreciated role: helping researchers to reflect on their own research, generating deeper understanding and, hopefully, more impactful research projects. ,. Here we reflect on three key benefits we have experienced from the process of developing a board game (together with our colleagues David Shipworth and Anna Gorbatcheva) based around the idea of peer-to-peer (P2P)

energy trading: prompting creative research thinking and conversations; improving our focus on the users of our work; and fostering genuine two-way engagement.

Game development

In our game, *Watts the Deal?*, players take the role of households in a P2P energy trading scheme, and must buy and sell power between each other and the wider grid to meet their daily electricity demand.

We didn't originally set out to develop a game (we were all gaming novices); rather we had proposed to create a physical model of a P2P trading system with the aim of making it easier to discuss the subject with stakeholders, either as part of engagement or qualitative research. To help ensure this tool addressed user needs, we followed an agile, user-centred design process, based around rapid cycles of prototyping, user testing and revision (see Box 1 for basic guide).

Our first step was to choose who the tool would be targeted at. As representatives of our two key stakeholder groups, we selected a householder participating in a P2P trial, and a policymaker assessing this new business model. We then tried to imagine ourselves in the position of these specific individuals and discussed what their interests, goals and pain points might be. We decided the tool should be highly interactive, promoting discussion rather than simply observation and explanation. It was only through the user-centred process that an interactive, game-like approach began to emerge.

It was also through this process that we experienced the first unplanned-for benefit: creative team discussions.

Creative research conversations

The early and ongoing development of the game prompted many interesting discussions and research ideas within our team. It made clear areas we aren't so knowledgeable about, and forced us to question assumptions and think in detail about the realities of how (in our case) P2P trading

schemes might be implemented and operated in reality -- which in turn suggested new avenues for research.

For example, in the game, players get to see each other's energy demand and generation in a way that is unlikely to happen in reality because of privacy regulation. However, this insight clearly affects players' actions – for example, they might choose to sell energy to one player rather than another, even for the same price, when they perceive them to have greater need. We wondered how, in the real world, you could harness this new ability to both recognise and respond to differing needs, while still preserving privacy. This prompted consideration of factors such as what information is most useful in trading communities, at what level of aggregation, and how trading choices are determined and expressed, all of which pose interesting questions for further research.

The role of the game in coming up with questions like this was two-fold. It focused our minds on the reality of the choices P2P scheme designers would be faced with, but also gave us permission to allocate time to thinking about questions like this in a creative way – something that isn't always easy to prioritise in a busy academic schedule. In this way it helped foster a fertile environment for creative research ideas to develop[5].

Identifying with our stakeholders

Our user-centred development process required us to be very clear about the characteristics of our intended users. We found putting ourselves in the position of users as a powerful way to build empathy. We thought (and felt) more deeply about what their wants and needs might be – and how they could be most appropriately addressed – than we would perhaps otherwise have done. For example, how much might they want to talk about issues of inclusion, or privacy?

Of course, we could not say how far our imagined stakeholders might align with the real version and so we began testing out the game with others as soon as possible – firstly with colleagues, and increasingly with groups who more closely resembled our chosen stakeholders. We played the game

with members of the public at a science festival, with residents of an eco-town, and with representatives of an energy regulator and a consumer organisation, among others. We were able to draw on all of these interactions to check our imagined stakeholders against the reality, observe their questions and concerns, and not only evolve the game accordingly but also think more deeply about how our other research outputs might more usefully address them. The benefits of direct interaction with stakeholders through the use of games has been experienced by other researchers[6].

People actually want to engage with us

Engagement with a variety of stakeholders is now an expected part of working in research, but is also something that many researchers find challenging. It can be difficult and time-consuming to identify or create opportunities to engage and, when these opportunities do arise, it is not always easy to know how far you are really responding to stakeholder needs. Because the focus of research projects is often quite tightly fixed in advance, it can also be hard to build in a genuine two-way exchange that has substantive impact on the direction of your work.

The game, and its development, helped us address both these challenges. Interested parties pro-actively approached us asking us to facilitate game-playing sessions with their teams – for example as an exercise at away-days. This increased our opportunity to play the game with the originally intended stakeholders , namely policymakers and householders. And as described above, the insight we received could be fed back both into further development of the game and our own research programme, making both more reflective of stakeholder needs.

Risks and challenges

A game like ours is essentially a model of reality. The challenge is to make the game simple enough to pick up quickly and usefully convey the essence of system to the players, without oversimplifying it in ways that risk introducing important misconceptions. Unlike in standard modelling exercises, this challenge is compounded by the need to also make the game fun.

An example of this from our game was the decision to have players actively discuss their energy trades and negotiate terms between themselves. In reality, this process will almost always be done algorithmically on the basis of set defaults, and there will likely be little if any direct contact between participants. However, our aim (developed through the user-centred design process) to develop an engagement tool dictated that it was more important that players get to have fun discussions and understand the underlying mechanics of P2P trading than that they get the most realistic experience of what participating in it would really be like.

This trade-off will likely have consequences for how players perceive P2P trading (e.g. they might think participating would be more burdensome that it is in reality), which means that clear contextual explanation and discussion is also important. This challenge is not made easier by the fact that often players are either subject experts or game aficionados. Both groups tend to push to build in 'reality' or 'game strategy' at the expense of each other – and always at the expense of simplicity.

Conclusion

User-centred game design helped encourage us to view our research differently. It helped us to be creative, and to think from the point of view of research beneficiaries, and to incorporate their interests and concerns more directly into the work we do. Perhaps most importantly, it does this in a positive, fun way that people actually want to participate in. While it might not be possible to turn all research topics into a game, we think that all energy researchers could and should consider what opportunities there might be in the areas they cover.

Box 1:

Using user-centred design to develop your own energy game

We used Roman Pichler's *Product Canvas* (https://www.romanpichler.com/tools/the-product-canvas) [citation] to guide us through the user-centred design process. This simple tool first prompts you to describe a representative individual for each of your main target stakeholders, and write down what they do and what they need in your area of interest. What are their pain points in achieving what they need? (Ideally you could base this on interviews or focus groups, but in our experience it is better not to dwell too long on this stage, and progress rapidly as possible to user testing.)

This is where your game comes in. What topics or features should it include to both fit with their needs and meet your own engagement or research goals? This could be to learn something, or discuss something, to include a particular process, etc. Write out all these topics or features and rank them according to importance and ease of accomplishing in some (even very low-tech) way. Select the easiest and most important features and use these as the basis for the very first workable version of your game – the minimum viable product (other features get added to a backlog). In our version, this involved players rolling a die to set that day's demand, then rolling a second time to give their generated power, and negotiating between themselves to deal with excess/shortfall – keeping a record of all the figures on a notepad. Test this out with some colleagues, ideally some who work in a different subject area to you. What do they find easy or confusing, and what seems to get people enthused? Iterate, simplifying confusing bits and adding in features from you backlog. Test with new players, ideally closer to your intended stakeholders, and revise again. Repeat, making sure to keep testing. Good luck!

Competing interests

The authors declare no competing financial or non-financial interests.

Acknowledgements

We developed *Watts the Deal?* together with our colleagues David Shipworth, Anna Gorbatcheva, and (more recently) Charlotte Johnson. The game was developed under the EPSRC grant PETRAS Internet of Things (IoT) Research Hub under the project The Internet of Energy Things ('P2P-IoET'). We acknowledge additional contribution from the UKRI Centre for Research into Energy Demand Solutions (grant number EP/R035288/1).

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