

Can Crowdsourcing Help Us Address Wicked Problems?

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Human ingenuity has continuously aided problem solving through time, yet the problem solving process gains complexity when encountering problems that present multiple participants with differing opinions and agendas – wicked problems. The onset of global integration through globalization has provided a platform for these problems to grow in volume and in intricacy. This is due to the added complexity of new participants added by various cultural and ethnic factors. This literature review aims to unearth whether the concept of crowdsourcing may be applied in combatting these wicked problems. This evaluation will explore how crowdsourcing can provide a means to solve wicked problems before discussing how best to organise and implement crowdsourcing to address wicked problems. An example using Hyperloop Transportation Technology will be presented - a company that currently leverages crowdsourcing capability to redefine space-time compression.

“Crowdsourcing harnesses the creative and competitive spirit of people all over the world, enabling them to solve big problems as well as small ones.” Vivek Wadhwa (WSJ, 2017.)

Introduction

Throughout history, humans have proved to be ingenious problem solvers in a multitude of scenarios from taming wild animals to controlling fire and curing diseases. Scientific problems may be complex but they have a solution. Social problems are harder to define – the “solution” affects the problem in unexpected ways and they have multiple stakeholders with different opinions and objectives. Rittel coined these problems “wicked problems” (Rittel et al. 1973). With globalisation, the world is becoming increasingly interconnected: the problems we used to face as communities and towns now need to be tackled on a global scale. This increases the wickedness of problems by increasing the number and diversity of stakeholders. Crowdsourcing, defined as outsourcing tasks to the crowd, has been a topic of interest in innovation research in the last decade. As an approach,

crowdsourcing enables us to tackle all types of problems according to Wadhwa.

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In this literature review, I will define the concepts of crowdsourcing and wicked problems, look at the evolution of crowdsourcing, focus on idea crowdsourcing as a means to solve wicked problems before exploring how to organise crowdsourcing to address wicked problems. We will further illustrate the points made with the example of Hyperloop Transportation Technology, a company leveraging crowdsourcing to once again redefine our relationship to time and space.

Defining Wicked Problems and Crowdsourcing

Kolko defines a wicked problem as “a social or cultural problem that is difficult or impossible to solve for as many as four reasons: incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems” (Kolko, 2012). Whilst Curtis talks about the six characteristics of wicked problems, Rittel gives the ten conditions that make a problem wicked (Curtis, 2016; Rittel et al., 1973). Due to the difficulty stakeholders have defining the wicked problem and the number of variables that affect it, there is no objective optimal solution to a wicked problem (Conklin, 2005). Solving wicked problems require a new problem-solving approach that is dynamic (Hautamäki et al. 2015).

Using the masses to solve complex problems is interesting as it limits individual biases and aggregates domain knowledge. Aristotle, the Greek philosopher, talked about the benefits of relying on the knowledge of the crowd when it comes to solving complex problems (Lord, 2013). However, before the internet, only local crowds could participate in solving problems, thus limiting the diversity of knowledge. Crowdsourcing, a term first coined by Howe in 2006, is defined as “taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call” (Howe, 2006). By dramatically lowering the cost of communication and enabling social interactions between strangers, the internet and social media have played a key role in the rise of crowdsourcing (Boncheck, 1995; Majchrzak et al., 2013; Brabham, 2008). Crowdsourcing has been successful across domains, industries and organisational sizes (Wilson et al. 2017, Machado et al. 2014).

Despite Howe defining crowdsourcing only a decade ago, the definition of crowdsourcing has evolved. Due to social change and technological innovations, Kietzmann revisited and updated Howe’s definition of crowdsourcing to “the use of IT to outsource any organisational function to a strategically defined popula-

tion of human and non-human actors in the form of an open call” (Kietzmann, 2017). This updated definition of crowdsourcing is broader than the previous and accounts for six changes that have occurred in the way we think of crowdsourcing (Kietzmann, 2017).

Despite recent efforts to define crowdsourcing, there is a lack of clarity between the terms “mass collaboration”, “crowdsourcing”, “open innovation” and “sustainable innovation”. The overlap in the definitions of these concepts might be due to the fact that they are new and evolving.

The Evolution of the Concept of Crowdsourcing

Typology of Crowdsourcing

According to Prpic et al., four types of crowdsourcing exist based on two criteria: how the crowd contributes and how the organisation takes into account these contributions (Prpic et al., 2015). Lobre et al., have defined ten different applications of the crowdsourcing concept ranging from “crowdfunding” to “crowd-care”, each having its strengths and weaknesses (Lobre et al., 2015). Ali-Hassan and Allam’s work is more complete as it assesses the similarities, differences and overlap in the twelve sub-categories of crowdsourcing they discovered based on nine factors (Ali-Hassan et al, 2016). In this literature review, we are going to focus on idea crowdsourcing (when the crowd comes up with subjective solutions that the organisation filters), which we think is the most promising type of crowdsourcing to solve wicked problems (Prpic et al., 2015).

From Micro-Tasking to Idea Crowdsourcing

What we define as micro-tasking is what Howe called crowdsourcing: outsourcing to the crowd a task usually performed by employees. Micro-tasking is when the organisations break down processes into small repetitive tasks performed by the crowd and then aggregates the crowd’s work. So far, micro-tasking is the most common form of crowdsourcing. It has mostly been used as a way to perform tasks faster, cheaper and more efficiently than employees can (Brabham, 2008). Micro-task crowdsourcing can “help firms access previously inaccessible resources to build a competitive advantage” (Prpic et al., 2015).

Our literature review has lead us to differentiate micro-tasks that are done intentionally by the crowd and those who are done unintentionally. To prove our point, we will take two examples: Duolingo and Wikipedia. When users decide to share their knowledge, they write an article and intentionally contribute to the free online encyclopaedia that is Wikipedia. Duolingo, is a language learning

app, however, by learning a new language, users are inadvertently participating in translating the internet (Garcia, 2013). Luis Von Ahn and his colleagues at Carnegie Mellon University have used this same model with reCAPTCHA, using the crowd to protect websites from spam robots while digitalising books (Von Ahn, 2008). While both of these types of crowdsourcing are extremely valuable, they currently do not tackle wicked problems. “Microtasking is well suited to problems that can be addressed by repeatedly applying the same simple process to each part of a larger data set. Microtasking alone, however, is inadequate for addressing wicked problems.” (Michelucci and Dickison, 2015).

However, in the future, projects like Duolingo, that use human computation which is defined as “the science that aims to combine the unique strengths of humans and computers to create new capabilities”, could become a way to solve wicked problems if machines and humans manage to augment each other simultaneously (Michelucci and Dickison, 2015). “The human computation ecosystems of the future have huge potential to help address wicked problems, but are currently being explored in less wicked contexts” (Michelucci and Dickison, 2015).

While there is a lot of research around the types of crowdsourcing, a clearer differentiation between crowdsourcing as a social innovation and crowdsourcing as a means of social innovation is needed.

Literature review: Can crowdsourcing help us tackle wicked problems?

According to N. Roberts, there are three approaches to solve wicked problems: authority, competition and collaboration, each of them having their own advantages and disadvantages (Roberts, 2000). Human beings have a natural tendency of using authority or competition to solve problems, but it is collaboration that is the most suited for solving wicked problems (Roberts, 2000). Based on Roberts’ work and the opportunity that collaboration represents in solving wicked problems, Denning and Yeholkovsky developed a five-stage process to allow for better collaboration (Denning et al., 2008). In 2000, Roberts urged research efforts to focus on the promising collaborative approach to wicked problem-solving. Her voice seems to have been heard. Indeed, since the turn of the millennium, there has been an emphasis on collaborative forms of innovation such as open innovation and networks in academic research with a (Hautamaki et al. 2015).

Idea crowdsourcing has advantages that make it the most promising collaborative approach to innovation in order to tackle wicked problems. Crowds cancel out personal biases, therefore leading to more rational results (Majchr-

zak et al., 2013). Furthermore, “the expertise [that] you need in dealing with a wicked problem is usually distributed over many people” (Rittel, 1972, p. 394). To tackle wicked problems, teams must be diverse and interdisciplinary (Surowiecki, 2004, Erickson et al., 2012; Hautamäki et al., 2015). Crowdsourcing, by involving many people with different backgrounds and expertise in the problem-solving process, is a promising way to address wicked problems. Thanks to crowdsourcing, organisations tap into groups with a unique skillset that can generate innovative solutions to wicked problems (Prpic et al., 2015).

In addition, stakeholders affected by the wicked problem should actively be involved in the problem-solving process (Rittel, 1972, p.394, Hautamäki et al., 2015). Whilst idea crowdsourcing does not, by default, include stakeholders affected by the problem, it allows for them to take part in the problem-solving process. Conklin adds that despite stakeholders usually having contradicting opinions, they can raise issues and are more likely to accept the solution if they have been included in the problem-solving process (Conklin, 2005). Local circumstances must be considered in order to effectively solve a wicked problem (Conklin, 2005). Brunswicker et al. argue that wicked civic problems can be tamed if the solutions are both integrated and contextualised (Brunswicker et al., 2017). Idea crowdsourcing allows for the integration the stakeholders and the local context in the wicked problem-solving process. Through hackathons, Techfugees, an NGO that promotes technological solutions to help refugees, has seen many refugees, who have integrated and contextualised knowledge, find solutions to help other refugees (techfugees.com).

Despite the numerous advantages we have found to crowdsourcing, there is a lack of research on idea crowdsourcing as a means to solve wicked problems. Despite the recent regain of interest in this field of study with the human computation concept (Von Ahn, 2013; Michelucci and Dickison, 2016), Rittel was already talking about the need for diverse knowledge and collaboration to tackle wicked problems back in 1972.

How to Best Organise Crowdsourcing to Tackle Wicked Problems

Now that we have proved that crowdsourcing can help us solve wicked problems, we are going to evaluate how we must organise crowdsourcing for wicked problem-solving.

The inherent difficulty that arises from tackling wicked problems is that stakeholders do not agree on the definition of the problem and there is no objective solution, therefore, the idea crowdsourcing process must be structured

(Roberts, 2000). While Roberts argues that collaboration is the best approach to tackling wicked problems, the Xprize approach uses a blend of collaboration and competition. Xprize is a foundation that aims at funding projects that have the potential to positively affect one billion people by 2020 (Xprize.org). While there is a sense of purpose that can arise from tackling a wicked problem, extrinsic motivation can be leveraged to tackle a wicked problem too. Through its open call competition system, Xprize sets clear deadlines and objectives, thus structuring the idea crowdsourcing process (Xprize.org). Furthermore, the Xprize approach leverages people's competitiveness with the winners of the competition getting press coverage and financial benefits. The approach to crowdsourcing that blends what Roberts defines as the collaborative and the competitive approaches seems to benefit from the advantages of both approaches while reducing each other's limits. This approach to organising idea crowdsourcing needs to be further researched.

When tackling wicked-problems, organisations should consider measures to limit the shortcomings of idea crowdsourcing. The difficulties that arises from working with experts who have knowledge in different fields is one of the main downside of idea crowdsourcing. "Participants often live in different intellectual worlds and have distinct technical languages. The gulfs between behavioural norms and values across industries and professions can be even wider" according to Edmondson (Edmondson, 2016). Another shortcoming of idea crowdsourcing is "crowd hijacking" when members of the crowd may push their own agenda over the organisation's agenda (Wilson et al. 2017).

Potter et al., argue that mass collaboration problem solving is an effective approach to address wicked problems (Potter et al. 2010). However, in recent years, idea crowdsourcing seems to have moved away from mass collaboration to go to a selected group of experts selected from the crowd for their domain knowledge (Hofstetter, 2017). Indeed, thanks to technological innovation, small teams of experts are able to do what only large organisations and governments could do in the past (Diamandis, 2012). The approach taken by Xprize is the following: organising an open call competition to get access to the most suitable talent from across the globe. By carefully selecting experts from different fields, the chances of "crowd hijacking" are lowered.

In 2004, Surowiecki said "If four basic conditions are met, a crowd's "collective intelligence" will produce better outcomes than a small group of experts"; these four conditions are independence among members, diversity in opinion, decentralization and aggregation of opinions (Surowiecki, 2004). Therefore,

crowdsourcing wicked-problem approaches should be organised in ways that respect these four conditions.

Due to the variety in the types of wicked problems that exist, the difficulty stakeholders have defining them and the number of variables that affect them, there probably is no generic “best approach” when it comes to organising crowdsourcing to solve wicked problems. However, more research should be conducted to define the drivers of success in the approach taken by successful crowdsourcing projects tackling wicked problems.

Crowdsourcing as a Means to Solve a Wicked Problem: The Hyperloop Transportation Technologies Example

Hyperloop may be the perfect example of crowdsourcing. Hyperloop is a system of “levitating pods that would travel in near-vacuum tubes at near the speed of sound” (wired.co.uk). In 2013, Elon Musk published HyperLoop Alpha a white paper explaining the engineering and physics behind what he coined the fifth mode of transportation (Hyperloop Alpha, 2013). Whilst Hyperloop could change our relationship to time and space, the development of the fifth transportation mode is a wicked problem according to Kolko’s definition as the knowledge around the concept is incomplete, a great number of people with different skills and perspectives must be involved in the development of Hyperloop, building one route from San Francisco to Los Angeles would cost over six billion dollars and these problems are interconnected with other problems (Applegate et al., 2017).

Being too busy with Tesla and Space X, Elon Musk donated this concept to the world for the crowd to develop it. Despite not being directly involved in any company developing this technology prior to 2017, Elon Musk decided to support this project by hosting annual competitions on the pod design and providing a testing space for other features in his current companies (Tesla and Space X): he uses the same competition format as Xprize to incentivize teams to develop this technology (Applegate et al., 2017).

Hyperloop Transportation Technologies (HTT) is the only “crowd-powered” hyperloop company: “not just by crowdsourcing the design and early financing of new Hyper transportation system that HTT would build, but also in its development and launch” (Applegate et al., 2017). Indeed, with Hyperloop One, HTT is the most advanced hyperloop team despite the fact that, until recently, it had no full-time employees (Applegate et al., 2017). Hyperloop TT is being developed thanks to over 800 contributors from 38 countries who work at least ten hours a

week and are rewarded with stock options.

HTT even went further in the crowdsourcing aspect as they have used the crowd to raise funds through their Indiegogo crowdfunding campaign and are partnering with companies, leading universities and governments all over the globe to make hyperloop a reality (Applegate et al., 2017). Ahlborn and Gresta, the co-founders of Hyperloop TT, argue that crowdsourcing has enabled them to develop a great plan, to have access to strategic partners and to world-class performers (Applegate et al., 2017). “We believe that we are not only transforming the nature of transportation, we are also defining the future of work in the 21st century” says Dirk Ahlborn (Applegate et al., 2017).

Conclusion

Discussing the case of Hyperloop TT has deepened our understanding of idea crowdsourcing and how organisation may wish to structure their approach to tackling wicked problems.

Over the past decade there has been a blurring of boundaries in many different contexts including how organisations conduct innovation. Due to the novelty of the concept of crowdsourcing, research must be constantly conducted to stay up to date with the evolution of the concept. As crowdsourcing becomes more main stream, research should shift from a case study approach to a broader use of empirical data.

In this paper, we reviewed the types of crowdsourcing and differentiated micro-tasking and idea crowdsourcing by saying that the first was a social innovation in itself whilst the latter was a means to create social innovations. We discovered the advantages of idea crowdsourcing and its potential to tackle wicked problems. We identified the blend of the collaborative and the competitive approach as being of interest to address wicked problems. Finally, we determined that more research must be conducted to help us design the right crowdsourcing approach to address wicked problems.

Despite the fact that HTT has not yet reached its objective, a lot can be learnt from this case study as it is a good position to do radically redefine our relationship to time and space, thus proving Wadhwa right.

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