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Open innovation and prizes: is the European Commission really committed?

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46/2021 April

This project has received funding from the European Union Horizon 2020 Research and Innovation action under grant agreement No 822781

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1. Introduction

In January 2009, President Barak Obama steered the governance of American public administration in a new direction, which took the form of an Open Government movement: thanks to ICT, the aim was to bring the government and citizens closer, ushering in the age of e-government, big data and open data (Executive Office of the President, 2009) (Nam, 2012). This radical shift in how public administration is run, and in citizen-government relations, has been deployed in many countries including in Europe. For the last decade or so, by transforming their approaches, the European Commission (EC) and the governments involved have committed to greater transparency, interoperability and citizen satisfaction (European Commission, 2013; Mergel et al., 2019). While this transformation can be explained by a desire to function more democratically, it is intrinsically linked to the deployment of new technologies, and the digital transition in the public sector has introduced new ways of working and interacting with stakeholders. The design and implementation of the entire array of public policies have been affected, particularly policies to support research and innovation conducted on a European level. In 2016, Carlos Moedas, the European Commissioner for Research, Innovation and Science, published a report entitled "Open Innovation – Open Science". It defines the principles of the concept of Open Innovation for the EC and presents the main lines for the future (European Commission, 2016). Widely deployed by private actors since the 2000s (Chesbrough, 2006), open innovation (OI) has more recently been taken into consideration by public actors. Public-sector OI is now defined as a range of public initiatives that influence the processes of opening up innovation (Chaminade and Edquist, 2006).

Four years after the publication of Moedas' report, this paper attempts to understand how the EC, via its innovation prize initiative, is engaged in the open innovation movement. This paper endeavours to fill two gaps in literature: (i) Studies analysing how governments and public-sector organisations implement open innovation processes remain scarce (Randhawa et al., 2019; Mergel, 2015; Lee et al., 2012). The concept of "public-sector OI" is indeed complex because it lies at the crossroads of three movements (open innovation, digitalisation and innovation). Its objectives are not the same as those of the private sector (see the concept of open social innovation, Chesbrough and Di Minin, 2014; West and Bogers, 2017), in a context in which public sector innovation has its own specific definition. (ii) Our approach also follows on from research into innovation prizes (Adler, 2011; Kay, 2011). An innovation prize consists

in a challenge launched by a sponsor concerning issues that may be very varied (technological, societal, environmental, etc.), for which the winner(s) receive(s) compensation that may be monetary or non-monetary (Scotchmer, 2006). The rolling out of Web 2.0 has made it possible to revitalise this "old" mechanism, which constitutes an open innovation tool. While most research has focused on the prizes launched by private sponsors (Lakhani and Tong, 2012), few analyses have been carried out for prizes offered by public sponsors. Only a few public platforms have been studied (e.g. the American public platform challenge.gov; Mergel and Desouza, 2013). We intend to enrich and expand on these case studies by examining the EC's H2020 innovation prizes.

This paper's contribution is therefore twofold: firstly, using an original case study of 22 European innovation prizes within the DG RTD between 2015 and 2020, we analyse the European Commission's use of this political tool to boost innovation. Based on academic studies of OI and crowdsourcing in both the private and public sectors, we construct several analysis grids to, on the one hand, identify and characterise H2020 prizes (designed either to reward efforts or to boost innovative behaviours in various fields), and on the other hand, to assess their degree of openness. To do this, official documents, reports, videos, etc. are studied, and long, semi-directive interviews are conducted with the people involved in this initiative. Secondly, from a theoretical point of view, the research develops the concept of "public-sector open innovation": we highlight its complexity and inevitably multidimensional nature, and then show the extent to which achieving objectives depends on mobilising different but potentially complementary internal mechanisms.

Based on our findings, we suggest avenues to explore to both intensify and improve the quality (effectiveness) of the OI movement launched by the EC. These recommendations may also be, at least partially, useful for other public actors (national or regional) who wish to set up, launch and manage "open" innovation prizes.

The paper is structured as follows: Section 2 takes another look at what can be learned from OI and crowdsourcing in the private sector. Based on the phenomenon of digitalisation and the process of e-government, Section 3 sheds light on the specificities of public-sector OI. Having presented the challenges for the European Commission and suggested an analytical framework, 22 innovation prizes are examined and the initial findings discussed in Section 4. Section 5 offers a discussion and suggests avenues to explore to increase the degree of openness of the EC's and the DG RTD's innovation policy. Lastly, our conclusions are presented in

Section 6.

2. Open innovation and crowdsourcing: what we can learn from the private sector

Since the 2000s, theoretical and empirical studies on OI and crowdsourcing have proliferated. In this section, we give a brief overview of the major recognised benefits of OI in the private sector, and present the main existing typologies relating to these two concepts.

2.1 Open innovation: an organisational transformation

Over the last two decades, a large number of economic and management publications have highlighted the phenomenon of open innovation: the research by Chesbrough (2003) and Von Hippel (2005) makes a significant contribution to our understanding of this new way of innovating brought about by digitalisation and the internet in a context where the need to innovate more rapidly and more cheaply has become essential. This paradigm has led private actors to set up outside-in and inside-out innovation initiatives and to combine them if necessary (Gassmann and Enkel, 2004). With "outside-in" initiatives, companies use all the means available to them to capture knowledge (licences, partnerships, innovation, co-construction with lead-users, suppliers and even competitors, etc.) and for "inside-out" initiatives, they seek to promote their own knowledge (licences, spin-offs, etc.). The challenge is simple: to expand the company's borders so that it can seek knowledge from the exterior to enrich its own internal knowledge by calling on actors who are either not part of its network or who are not usually involved in the creation process (lead-users, consumers and even ordinary individuals) (Mergel, 2015).

Since then, mechanisms to boost OI have multiplied, either via intermediation platforms such as Innocentive (Liotard and Revest, 2018; Lakhani and Panetta, 2007) or via sites set up by the companies themselves. To this end, the OI mechanism brought about by the internet, thanks to the possibilities offered by digitalisation, has taken on a new dimension, which Jullien and Pénin (2014) have called OI 2.0. Companies call upon new individuals and/or organisations (outside-in), potential vectors of original and creative solutions, via crowdsourcing. They can also, in an inside-out context, use platforms to promote their own knowledge (yet2.com), and can combine these two movements by using means to innovate with communities.

Some of the literature endeavours to better understand the effects of OI according to the type of company, the type of industry and the sectors involved (Laursen and Salter, 2006). Analyses have focused on the reasons behind the disparate effects of OI on the creation of profitable new products and services (Dahlander and Gann, 2010). The variable effects of OI can partly be explained by the difficulty in assessing its costs (which may either be neglected or underestimated by the company). Another reason may be that the concept of open innovation cannot be understood in an exclusively binary way (open versus closed): a continuum of practices produces a variable degree of openness. The beneficial effects of OI on companies' performances have been highlighted for large multinational corporations such as IBM, Lucent, Intel and P&G (Chesbrough 2003; Dodgson et al., 2006; Huston and Sakkab, 2006), but these effects are far more nuanced for SMBs (Usman et al., 2018; Vanhaverbeke, 2017). However, OI opens up interesting perspectives for SMBs, which researchers have only just begun to explore (Radziwon and Bogers, 2019).

2.2 Crowdsourcing: a process integrated into OI

Crowdsourcing, a term coined by Howe in 2006, is usually considered to be an underlying process, embedded in OI, and has been the subject of numerous studies since then. Integrated into OI's outside-in movement and brought about by the arrival of digital networks, it allows organisations to call on the expertise of crowd members. This approach stems from the desire to attract individuals on Web 2.0 so that they participate in value creation. The crowdsourcing phenomenon is very often associated with individual problem solving, and in many cases, individuals do not cooperate amongst themselves (Penin et al., 2013). A definition of this concept, now widely adopted, has been given by Estellés-Arolas et al. (2012, p. 197) based on a review of the literature and the main points in common of the various forms of crowdsourcing. This definition was constructed using 8 questions asked by the authors (on 3 main themes) to summarise the main characteristics of crowdsourcing. This definition is used in Section 4.3 in our empirical study.

In parallel and often based on this characterisation, several crowdsourcing typologies have been constructed to understand its different dimensions (Brabham, 2009; Burger-Helmchen and Pénin, 2011; Schenk and Guittard, 2011; Pénin et al., 2013). These typologies highlight three main aspects: the types of resources/skills that the crowd can contribute (Howe, 2008), the types of task/mission suggested by the crowd (Penin et al., 2013; Lebraty and Lobre-Lebraty, 2013; Renault, 2017), and the types of interactions between the groups of actors involved (Pisano and

Verganti, 2008; Hutter et al, 2011; Renault, 2017). Renault (2017), for example, examines four crowdsourcing profiles linked to the forms of interaction between crowd members: cumulative, collaborative, competitive and coopetitive. Hutter et al. (2011) focus their attention on user behaviours in the context of private-sector contests[1], and determine the possible configurations of intervention and interference depending on the degree of their contribution. Based on existing literature, Table 5 presents the main typologies of crowdsourcing and private and public-sector OI (cf. Table 5, Columns 1 and 2).

3. e-government for public-sector OI

The issue of OI in the public sector cannot be addressed without a more global vision that includes the digital transformation of administrations, and this is reflected in the literature (Mergel et al., 2019; Fountain, 2004; Dunleavy et al., 2006; Meijer and Bekkers, 2015), as well as in various reports (OCDE, 2017). Increasingly, questions have arisen concerning the definition, role and initiatives of what is known as e-government (Meijer, 2015)[2] for a public sector seeking effective tools and procedures, leading Dunleavy et al. (2006) to allude to the notion of "Digital Era Governance", and to examine how public organisations appropriate technologies and radically transform their working practices.

[1] The term 'contest' is also used in literature in place of the word 'prize'.
[2] See Janssen and Esteves (2013) for a definition of e-government.

3.1 A conceptual framework to analyse public-sector OI

3.1.1 The specificities of public-sector OI

Digitalisation is perfectly adapted to the concerns of public-sector actors: boosting innovation to meet increasingly complex challenges, resisting intensifying pressure on financial resources, and meeting citizens' growing demand for new, flexible, high-quality services (Mergel et al., 2019; Arundel et al., 2019). Recent studies reflect public-service actors' interest in innovation, especially open innovation (Lee et al., 2012; Mergel and De Souza, 2013; Mergel, 2015, 2017; Loukis et al., 2017). Governments all over the world are aware of the urgent need to develop and improve their administration, propose new initiatives and, more generally, respond to the changes required by the external environment, and to transform their business models (Cavalcante et al., 2011). Recently, with regard to the concept of public-sector OI, the notion of open social innovation has emerged in studies (Chesbrough and Di Minin, 2014; West and Bogers, 2017) in which the implementation of public-sector OI processes is said to meet a demand for social change, and as a consequence, social challenges largely dominate other technological, economic or financial ones .

3.1.2 From e-government to citizen sourcing

In political science, the concept of citizen sourcing has recently emerged and provides a clear illustration of the pairing of OI and crowdsourcing in the public domain[3]. This movement refers to the production of services and political policies using input from citizens (Breul, 2010; Nam, 2012). It is based on three pillars: citizens' engagement, crowdsourcing, and an e-government context. The concept reflects two categories of major challenges: democratic – public consultation with stakeholders and technocrats – and access to experts' specialised knowledge. Forms of citizen sourcing can be classified using three parameters (Nam, 2012): the objectives sought, the type of collective intelligence, and the chosen strategies (Table 1). The objectives sought are varied: improving the image of public decision-makers, co-creating information and/or knowledge (Johannessen and Olsen, 2010; Misuraca, 2009), improving existing services, implementing new solutions by citizens, or co-creating political processes (Surowiecki, 2004; Lukensmeyer and Torres, 2008: 211). The desired collective intelligence involves harvesting expertise and professional skills, and extracting new ideas. Lastly, the third dimension refers to the strategies employed to meet these objectives: participating in contests,

[3] A growing number of scientists are making use of this concept: for instance Lukensmeyer and Torres, 2008

wikis, social media or social votes (Nam, 2012). In parallel, citizen sourcing can take two distinct forms: active citizen sourcing and passive citizen sourcing. The first refers to the use of digital means by government agencies to call on citizens to tackle a specific social issue. The platform challenge.gov, analysed by Mergel and Desouza (2013), is an example of this (see 3.2.3). The intensive and systematic use of social media by government agencies constitutes the second form (Charalabidis and Loukis, 2012; Ferro et al., 2013). In these cases, agencies break down and analyse political content that has been freely and spontaneously developed by citizens via social media (political forums, websites, political blogs, Facebook, Twitter, etc.). Through the different forms of citizen sourcing, the government and the citizen can take turns producing and/or consuming information by using these networks (Chun et al. 2010), leading Lukensmeyer and Torres (2008) to point out the ambivalence of citizens' role as not only the "users and choosers" of government programmes, but also the "makers and shapers" of policies and public decisions. OI and crowdsourcing can thus be considered tools that enable governments to achieve these aims, as the United States' use of the contest mechanism clearly shows.

3.1.3 Public-sector OI and innovation prizes/contests: the example of the United States

Today, there are multiple forms of public-sector OI throughout the world. In the early 2010s, some countries (the US, Australia and Singapore) were at the forefront of this movement and strategies took shape either via governments' top-down initiatives, or via bottom-up measures initiated by communities (Lee et al., 2012). The United States was very advanced in this, as can be seen in the GAO Report (2017) that highlights 5 forms of OI initiatives from American federal agencies between 2010 and 2016: i) crowdsourcing and calling upon citizens, ii) seeking new ideas, iii) collaboration to gather open data, iv) open dialogue, and v) using innovation prizes or challenges. Several American federal agencies implemented one or more of the initiatives listed above. National guidelines were developed for each OI practice to help and accompany agencies in their use. In this context, OI is considered as a way to deploy new mechanisms to enable "citizen-centred governance" in which, in particular, co-production initiatives with citizens (active citizen sourcing) are its prerogative (Mergel, 2015) (Table 1). Globally, the role of citizens in public-sector innovation has gone from strength to strength: based on a study of 23 American government initiatives, Mergel (2015) emphasises the major role of citizens in the upstream phases of these measures (collecting and selecting ideas), and their lesser role in the implementation phase. These phases are characterised by 3 different

approaches (crowdsourcing, peer production and co-production), highlighting the different forms of collaboration between public-sector actors and stakeholders.

Insert Table 1

Among public-sector OI initiatives, prizes are the measures that have proliferated, and are accompanied by the creation of platforms[4]. The most striking example is the American platform challenge.gov created in 2010 that enables all American federal agencies to publish contests online (Desouza, 2012; Mergel and Desouza, 2013; Mergel et al., 2014; Liotard and Revest, 2018). Public authorities' interest in this approach can be explained by agencies' research budgets having been slashed in recent years Contests enable agencies to get competitors to cover the costs of research, and they only compensate the result, once it is known and chosen (Kalil, 2012).

The aim of challenge.gov is to facilitate the dissemination of problems encountered by the federal government and to create ways of gathering solutions from different stakeholders including citizens. Among the many actors launching contests, there are four that stand out: NASA, the HHS (Health and Human Services), the EPA (Environmental Protection Agency), and the US Air Force. Science and Technology is by far the largest field for contests, followed by Health, Energy and the Environment, and Education (Desouza and Mergel, 2013). The contests offer both monetary and non-monetary prizes. The highest monetary prizes correspond to contests in which capital investment is high, as is the need for specialised knowledge. There is a very broad spectrum of current amounts of prize money (varying from $1,000 to $15 million). Non-monetary prizes are awarded for contests to provide information to the public, raise awareness of a specific issue or change certain behaviours (Mergel et al., 2014). More than 740 challenges have been launched since 2010, with a sum total of $255 million in prize money offered by American federal agencies, and the participation of over 250,000 solvers (challenge.gov, March 2018). The platform is managed by the General Services Administration (GSA), which provides upstream support to the agencies.

4 Case Studies: Innovation Prizes in Europe

[4] The NESTA experiment in the United Kingdom illustrates the development of contests (https://www.nesta.org.uk/)

In 2015, as part of its H2020 programme, the European Commission launched its first innovation prizes in addition to other tools to boost innovation. The use of innovation prizes thus appears as one of the responses to the new priority championed by the Commission: to focus on open science and open innovation. In this section, by studying 22 prizes launched by H2020, we propose to assess the extent to which the Commission (via the DG Research and Innovation) has achieved its OI priority (4.1). More specifically, this will involve studying the characteristics of these prizes in order to assess how consistent they are with regard to the concept of OI adopted by the Commission (4.2).

4.1 The European Context: Towards open innovation and open science

The European project to boost innovation dates back many years and has been advocated since Europe's constitution in 1952 by successive treaties (Gonzalez-Fernandez et al., 2019). The various plans to promote research and innovation were made a reality in Horizon 2020 and more recently in Horizon Europe (2021-2027), the 9th Framework Programme. In European politics, innovation plays a major role because of its economic, technological and societal impacts not only within Europe but also internationally with regard to the main rival countries or zones. The importance of innovation for employment and growth was clearly reiterated in the Lisbon Treaty (2009) and, since then, public policies have continually implemented measures to tackle these issues.

For some authors, discussions about a more dynamic policy for innovation should take place within a more global and complex conceptual framework, not unlike the triple helix model (Etzkowitz and Leydesdorff, 2000) to understand in its entirety the ecosystem of European innovation (Gonzalez- Fernandez et al., 2019). The government, industry and academia are at the heart of a hub that allows for the regulation, production and dissemination of knowledge for society (Etzhowitz, 2003). From this perspective, Open Innovation seems like a major key. Recently, EU authorities have been examining these practices, seeing in them a solution to enhance their innovation policy (*Open Innovation*, 2012, EC). The report "Boosting open innovation and knowledge transfer in the European Union" (2014) suggests initiatives to implement for OI 2.0 and co-creation practices to develop a favourable innovation ecosystem based on actor networking and "multi-collaborative" innovation. This document represents a cornerstone of the "Open Innovation, open science, open to the world" Report (2016) by Commissioner Moedas in which the role of OI 2.0 is reaffirmed as being a way to meet two requirements: the need to put the user or citizen at the heart of innovation measures (user-

centric) on the one hand, and on the other, to create an ecosystem that allows for co-creation mechanisms on every level. OI is thus considered a constantly-evolving concept to create open ecosystems, characterised by collaborative innovations within networks. In line with this objective, Commissioner Carlos Moedas established a specific institutional measure, the EIC (European Innovation Council) (Weber et al., 2019). The key role of the EIC will be to resolve the weaknesses inherent in the H2020 Programme and the "European Paradox" (investing more in high-risk innovations and breakthrough technologies and boosting the venture capital industry), to encourage ecosystem collaboration and to boost research on a European level. An EIC Pilot Programme was proposed in October 2017 as part of the H2020 Work Programme (2018-2020). It was at this time that the EIC Prizes were launched with a budget of 40 million euros.

The aim of our empirical study is to assess the extent to which the DG RTD (Research and Innovation) authorities have promoted these objectives through innovation prizes, and to analyse how open these prizes are.

4.2 Research design and data

Research design

Our case study is based on the innovation prizes instigated by the EC between 2015 and 2020. Under the auspices of Horizon 2020 (2014-2020), the European Research and Innovation Programme, the first prizes were launched in 2015 in various fields, both technological and societal (Makela, 2017). The initiative follows on from other measures set up on a national level in some European countries such as, for example, the UK's NESTA Programme. There are two reasons that justify the decision to study this policy tool. Firstly, the temporal use of these new tools concords with the commission's initiative for greater openness. Secondly, the prizes set up by American federal agencies are considered public-sector OI initiatives (see 3.2.3). In parallel, a research method based on case studies allows for better understanding of the challenges posed by the implementation of new policy tools (Grillitsch et al., 2019; Flyvbjerg, 2006; Yin, 2013). In the context of a case study, narrative analysis (via interviews) sheds light on a contemporary social phenomenon (Miles et al., 2014). Furthermore, our analysis contributes to enriching the recent concept of public-sector OI, without being limited by initial interpretations (Eisenhardt, 1989). Lastly, our research expands on the studies by Murray et al. (2012) and Mergel (2017) on public-sector innovation prizes in the US, which also used case studies.

Data

Our methodology used the study of available documents and semi-directive interviews conducted with various stakeholders. A systematic study of the available materials was carried out. These documents come from several sources: documentary and digital sources mostly from the European Commission website, and external sources. The DG RTD website brings together a large amount of information: i) the latest news for innovation prizes, as well as procedures and regulations to participate in the different contests, ii) information about past innovation prizes, videos (Innovation Days, September 2019), webinars, EC press articles, official presentations by the DG RTD, and information about other related events, iii) numerous official reports from the EC (see 4.1), the list of experts mobilised by the DG RTD over recent years, legal regulations regarding intellectual property, etc. Additional information has also been gathered from sources other than the Commission's official site (specialised press sites and professional blogs).

Data about prizes are public and easy to access. These prizes are managed by the DG Research and Innovation[5] and can be consulted via the site https://ec.europa.eu/info/index_fr. The prizes are not visible on a single platform that gathers them together. They can be consulted by advancing in the tree view of the European site, either by directing one's search to the "Research and Innovation" tab, or the "Funding and Tenders" tab. The prizes are identified by a dedicated page (see Table 2), and all the information (objectives, prizes, evaluation criteria, dates, rules of the contest, communication) useful to the tenderer are visible and standardised in the same format.

Insert Table 2

Application takes place via a "Funding and Tenders Opportunities" portal dedicated to all the innovation measures requiring a bid. We have compiled all the information concerning 22 prizes listed in the prize regulations (Table 3). These prizes are managed by the DG RTD (Research and Innovation), either directly by the teams of the European Innovation Council (EIC) responsible, or by the different Directorate teams.

Insert Table 3

[5] https://ec.europa.eu/info/sites/info/files/organisation_charts/ec_rtd_organigram-032020_fr.pdf

Furthermore, we conducted interviews between March 2019 and April 2020 with the stakeholders involved in these initiatives: programme leaders in the DG RTD, DG Connect, experts responsible for compiling prizes, and prize winners and participants. These interviews were semi-directive and lasted between 45 and 90 minutes. We proceeded via email communications, physical reunions and discussions via Skype or Gotomeeting. In order to obtain more detailed information, some people were interviewed several times. After an initial selection of interviewees, we identified other partners, in accordance with the "Snowball Sampling" procedure (May, 2011). The interviewees supplied us with other contacts whose experience and knowledge could be useful to us. These recommendations were assessed using the initial documents and depending on our progress in the interviews so as to have as full a vision of the prizes as possible. The interviews are summarised in Table 4. The Interview Guide (Appendix) covers a set of questions based on our analytic framework. Depending on the type of person interviewed, the questions were directed differently. For each person interviewed, we gathered information about his/her personal background and experience in prize management. Although we followed interview guidelines, the questions remained relatively open. The majority of interviews were recorded and transcribed by the authors.

Insert Table 4

4.3. A characterisation of public-sector OI via H2020 prizes

Firstly, using existing classifications (see 2.1 and 2.2) and official documents about H2020 prizes, we offer an initial characterisation of prizes from the perspective of OI and crowdsourcing. Several attributes of the mobilised OI are highlighted (Cf. Table 5).

Insert Table 5

An analysis of the 22 prizes (Table 3) was then carried out, adapted from the criteria taken from the definition by Estellés-Arolas et al. (2012). The analysis was made using the documentation relating to the rules of each contest, the dedicated pages and the interviews conducted with prize developers. Several findings emerge depending on the stages of the contest.

Design – a crucial stage

The vast majority of prizes examined were inducement prizes (mostly technological) that required specific knowledge and skills (Nam, 2012). Recognition prizes are fewer, and reward efforts made ex post. However, recently there has been a significant increase in hybrid inducement prizes combining technological and societal issues, as is the case, for example, of the "Early warning for epidemics" and "Affordable high tech for humanitarian aid" prizes.

The target crowd is, to a large extent, made up of companies and individuals, and groups, and, for a small share of the prizes, international associations and organisations. Blockchains for Social Good is an exception in that a small proportion of participants are individuals (individual developers, activists, hackers). A few (but not many) prizes targeted specific groups of respondents (low-carbon hospital, i-Capital). The only configuration in which we were able to find identified individuals was in recognition prizes. For the Prize for Women Innovators, only women with an innovative entrepreneurial project can apply.

A majority of prizes allow candidates to apply in groups (via a cooperation of actors): in this case, a Lead Contestant or Lead Participant must be chosen from the group. He/she will be the only one to communicate with the prize managers. This possibility is used relatively often and several interviewed managers emphasised the existence of applications run by consortiums, some of which were made up exclusively of SMBs. Blockchains for Social Good takes this even further, refusing applications from large companies.

The rewards are all monetary and range from 100,000 euros to 10 million euros. They are awarded either to a single winner or to several winners (in which case they are graduated). The more complex the prize and the longer its duration (3 or 4 years), the higher the financial reward. We observed that some of the EIC prizes have the highest rewards (10 million euros). On the opposite end of the scale, social or societal prizes have smaller rewards (around 100,000 euros).

Contest -a standardised stage

During the contest, tenderers are only in contact with the prize managers in the various Directorates (by email via a generic address) if they require further information. Prize managers are available to communicate with candidates through various communication channels.

The duration of contests has changed very recently. While the vast majority of prizes lasts on average two years, contests can now last for 3 to 4 years for EIC prizes (Fuel from the Sun). Interviews revealed that some prizes launched in 2015 had, to a certain extent, failed because

the duration was too short and did not allow teams to investigate and exploit their initial findings.

The prizes are structured according to H2020 regulations: once established and launched by the different Directorates, they cannot be modified whether with regard to the duration, the rules, the evaluation criteria, etc. There is one notable exception however: the "Early warning for epidemics", which was underway when the Covid19 health crisis emerged, and has been granted an additional deadline.

Final evaluation and the role of experts

With selection criteria and their moderation clearly stipulated in the rules, the solutions submitted must be evaluated by a panel of experts. These experts are selected shortly before the end of the contest by the prize launchers using a database specific to the EC as well as their own networks. In many contests, the evaluations are carried out in two stages: firstly, an individual evaluation by each expert, then, during a physical reunion, a collective evaluation, at the end of which solutions are ranked according to the number of points attributed. For some prizes, the panel of experts pre-selects finalists and auditions are held in Brussels to designate the outright winner. The outcome of the contest is officialised in an event organised either in Brussels or in the city of last year's prize-winner, during with the prize(s) is/are awarded.

4.4 An assessment of the degree of open innovation and crowdsourcing in H2020 prizes

We now assess, partially, at least, the degree of openness of the prizes studied. To do this, we use the earlier findings and an evaluation grid to analyse prizes' openness, which we constructed following the recommendations of Nam (2012) and Randhawa et al. (2019), and adapted to our specific study. The first defines a set of criteria to assess the effectiveness of the citizen sourcing set up by the government, and the second proposes an evaluation grid to analyse public-sector sponsors' degree of engagement in crowdsourcing activities. While a growing number of studies, particularly in the fields of political science and public-sector management, closely examine the question of public-sector crowdsourcing, very few have looked at the question of the effectiveness or quality of the crowdsourcing initiatives implemented by public-sector actors (regional, national or international). At this stage, we make use of both the regulations of each contest and the contents of the interviews. The evaluation grid used as well as the main findings are presented in Table 6. Three major dimensions of crowdsourcing are analysed: the design, the sponsors' engagement, and the process.

Insert Table 6

The analysis of the three dimensions concerned tends to show a certain degree of transparency (via the prizes' dedicated webpages). However, it remains very limited with regard to the participation and collaboration of stakeholders. Stakeholders are consulted only during the preparation of the prize's theme, which often takes the form of an exploratory survey lasting approximately 6 months. The prize managers mobilise their networks, experts from scientific, professional, political circles, etc. depending on the prize's theme. These experts give their opinions about the prize theme, and can make recommendations about the scope of the prize, the target public, the evaluation criteria to use, and so on. Preparatory workshops are also organised to benefit from participants' interaction. The managers then construct the rules of the prize concerned. No interaction is planned between the EC and the mobilised networks after the preparatory phase. One of the reasons put forward is to enable people from these networks, if they wish, to enter the contest themselves and thus avoid any potential conflict of interest. As a result, the process between the online community and members of the Commission does not involve co-creation. In this sense, the situation appears, in part, to be aligned with what the literature calls "co-initiation" (Sorensen and Torfing, 2018; Mergel, 2020): a process in which citizens cooperate with public-sector agents to identify the problems and needs of a community and then devise a programme to develop an innovative solution. Lastly, experts are then mobilised to assess the responses submitted by the candidates. Increasingly, recent prizes have combined technological and societal dimensions, leading managers to call upon new people and thus diversify and include new experts in their database.

There is, then, no dynamic interaction between stakeholders and the sponsor during the contest, and any eventual requests for collaboration always come from the European managers (top down). The overall procedure thus presents very little inclusion or reflexivity. The fact of selecting only experts from a defined field, both for the initial consultation and for the jury panel, offers no access to multidisciplinarity and limits the contest to producing knowledge from a single domain. In other words, the challenges could benefit from the contributions of other disciplines and the serendipity effect. In parallel, interactions between participants during the response to a prize remain limited. Collaborations can, however, be observed via consortiums that compete for prizes, but these are formed ex-ante by the candidates.

Nevertheless, during this period, the EC seems to have strengthened its learning process to devise prizes to be more effective and more multidisciplinary and inclusive. From 2017, EIC

contests appear to be open to a wider public (international, associative, NGOs, individuals, etc.). Furthermore, recent, more hybrid prizes such as "Early warning for epidemics" seek innovations in the humanitarian field, thus encouraging interactions between specialist technological knowledge and the characteristics of the humanitarian domain.

Our analysis appears to show that stakeholders (users, citizens, companies, etc.) are not sufficiently involved in the initiative (although this has evolved in recent competitions): (1) stakeholders present a somewhat similar profile (scientific community linked to the prize's theme, company from the prize's sector, or NGO); (2) they intervene at a very specific stage of the prize process (pre-study and jury) and during none of the other phases. There is, therefore, no continual interaction between them and the members of the Commission.

5 Discussion and Implications

Analysing European innovation prizes sheds light on a crowdsourcing process within a broader framework of public-sector open innovation. Discussions and reflection about their openness are needed to improve the prize process, make it more efficient and meet inclusivity requirements. On the one hand, recommendations should be made to involve pluridisciplinary stakeholders, which would enrich knowledge. This advantage has already been highlighted in studies on private platforms (Lakhani and Panetta, 2007 on Innocentive). On the other hand, stakeholders' role in constructing prizes and their continual and active involvement during the entire process should also be taken into consideration (Mergel, 2020).

In this section, we would like to explore two ways to improve. The first consists in encouraging a process focusing more on peer-production and co-production (5.1). This increased inclusivity could be possible via access to or the creation of online innovation communities, as a complement to the contest mechanism (5.2).

5.1 How to involve more stakeholders in public-sector OI: a reflection about prize design

Two complementary leads emerge to tackle the question of implementing continual interaction between the various stakeholders and the EC during the contest's different stages: the processes of peer production and co-production, and greater attention to the prize design. Research into OI that examines the role of peer production and co-production (as concepts encompassed by crowdsourcing) is extremely interesting. The notion of commons-based peer production has

been described by Benkler and Nissenbaum (2006). It does not merely involve adding together fragmented and scattered individual knowledge, but refers to a cooperative process of "crowd" members whose actions are directed towards a precise objective (Mergel, 2015). Among the public-sector OI initiatives, for example, Mergel (2015) identifies votes and comments between stakeholders as activities that can improve the process. As for co-production, it focuses on the different forms of collaboration between stakeholders and public-sector actors, with both parties sharing certain prerogatives involving devising new services, products, programmes, etc. Co-production in public-sector OI meets the following recommendation: if the innovations are for the citizens, they should be devised and implemented in conjunction with them (Bason, 2018). Co-creation can even exceed the framework of improvements and can be mobilised to define collectively the notion of public value (Alves, 2013). It can be considered as a form of guideline that can help structure the involvement of internal and external stakeholders, boost the innovation capacities of public-sector actors and ultimately lead to behavioural changes that have real societal impacts (Bason, 2018). Some of the literature on public-sector innovation has appropriated this concept to suggest 5 forms of stakeholder involvement in the public service production cycle (Mergel, 2020): co-initiation, co-design, co-implementation, co-delivery and co-evaluation. These forms will be used in our recommendations

While these mechanisms are interesting from a theoretical point of view, putting them into practice is complex. More specifically, this raises the question of how to initiate stakeholders' peer production and co-production practices within the contest's framework, and integrate them effectively during the three stages of the process.

One suggestion consists of focusing on the prize's design. This is a fundamental stage for sponsors, who should pay very close attention to it. Kay et al. (2017) stresse the importance of the following steps during the design's construction: determining the amount and the nature of the monetary prize, a sound knowledge of participants' motivation, a better assessment of the results obtained, etc. While Kay (2011, 2012) is one of the few scientists to emphasise the crucial stage of constructing the design, his analysis and suggestions are directed towards a reflection about design (criteria, duration of the competition, etc.) to improve the prize's chances of success. However, this reflection could also be used to support the question of inclusivity: what architecture and what criteria are required so that a prize continually implements peer production and co-production? Some prizes launched by American federal

agencies especially are already showing signs of openness and inclusivity (Liotard and Revest, 2018)[6].

However, the proposed approach remains heavily top-down: effectively, collaboration and co-creation initiatives are rolled out exclusively by the prize sponsors. We propose to broaden the reflection to include researching and putting into motion a more bottom-up process.

5.2 Opening up to a bottom-up movement: a reflection on communities

Recent research into private-sector OI (West and Sims, 2018) listed 3 forms of crowdsourcing activities and combined organisational forms: calling upon the crowd, calling upon an innovation community and a third category combining the two (hybrid crowd). While innovation prizes fall into the category of calling on the crowd (a competitive process calling on the online community), the (innovation) "community" category could make it possible to overcome certain limitations previously highlighted including the lack of pluridisciplinarity and an exclusively top-down movement launched and supervised by the sponsor. An innovation community is defined as a network of repeated actions among its members who share a common identity and goals. Communities are characterised by varying degrees of openness. Crowds and communities can be regularly or occasional complementary. Existing communities may supply a problem-solving method based on the crowd, or crowd participants may forge relationships that lead them to form communities, especially if there are peer-to-peer interactions (Boudreau and Lakhani, 2013). According to West and Sims (2018), in time, the coexistence and overlapping of communities and crowds can even give rise to a hybrid crowd, a situation that includes both elements of competition based on crowdsourcing, and the collaboration of the community to help design the prize or promote the products. The combination of crowd and community would thus have the following advantages: i) The community created or solicited would make it possible to reach a larger, more diverse crowd motivated by the same objectives but with members with very different statuses, reputations, skills and knowledge, thus meeting the need for greater pluridisciplinarity. ii) The community could enrich the reflection on numerous points: prizes' themes and regulation, the mechanism to evaluate results. iii) The community could intervene continually throughout the process with the capacity, if required, to adapt the contest's regulations and duration, in agreement with the team managing the prize.

[6] The evaluation criteria of the Rebuild by Design Award launched by the US Department of Housing and Urban Development involved the composition of teams and their collaboration capacities between themselves (OST, 2014). For the Harvard-NASA Tournament Lab, NASA teamed up with the platform Top Coder and Harvard University to have access to a larger community of developers (Lakhani and Tong, 2012).

iv) The winners, and above all the losers could join the community and increase its overall knowledge of the subject involved. The question of knowledge capitalisation, particularly for knowledge produced by the losing teams was highlighted by Mergel (2015) concerning prizes posted on the challenge.gov platform. Identical concerns voiced by those we talked to emerged with regard to the H2020 innovation prizes, with some people wondering how also to reward "good" solutions that did not win the contest.

Although combining organisational forms, contests and communities seems to be a promising lead, it is not without obstacles. The first obstacle involves support for a shared identity and objectives, characteristics that are intrinsic to the existence of a community; the monetary rewards included in the contest mechanisms do not appear to be sufficient to involve the long-term commitment of community members (Boudreau and Lakhani, 2009; Terwiesch and Xu, 2008). Langner and Seidel (2015) suggest an avenue to explore via two examples involving private companies. The authors shed light on practices – such as carrying out projects in common – that lead to the construction of a dual social identity (between the identity of the company and that of the community), which can lead to lasting commitment from members of both organisations. The construction of an identity such as this could also be envisaged on the level of a public organisation (such as the EC) and a community. For innovation prizes organised by the Commission, active bridges with other programmes connected to open innovation and research could be envisaged.

A second obstacle to overcome in order to combine prize and community effectively is the mode of governance. These two forms of organisation are not ruled by the same principles. On one hand, in general, the governance of communities is characterised by democratic processes and self-governance (Dahlander et al., 2008). The aim is usually to spur the participation of individuals by generating recognition and increased responsibilities (O'Mahony and Ferraro, 2007; West and O'Mahony, 2008). On the other hand, the governance of innovation prizes is decided upon and implemented by the sponsor. Combining the benefits of innovation prizes and communities requires that we think very carefully about appropriate modes of governance. One of the pitfalls mentioned by those interviewed was the conflict of interest for people who both suggest ideas and would also like to take part in the contest. We therefore need to think about governance mechanisms that are adapted to both forms, and sufficiently flexible to take into account the specificity of the themes. An interesting avenue to explore with regard to the question of more flexible modes of governance is suggested by Kulhman and Rip (2019) with the notion of "tentative governance". This form of governance is limited in time and

characterised by trial and error as well as learning mechanisms. Thinking of governance as flexible, adaptable and changeable also makes it possible to integrate more easily dimensions such as inclusivity and reflexivity. The recent Blockchains for Social Good prize launched by H2020 illustrated a way of envisaging inclusivity For the first time, the selected winners of the first stage presented their solutions during a conference that was open to everyone, experts and amateurs, individuals and organisations involved in the theme. The stakeholders who attended were able to talk to the winners and comment on the proposed solutions so that they could refine and/or consider new leads. The members of the jury followed these discussion but from a distance, and were able to take them into consideration in their final decision. We recommend that this approach becomes widespread and lasting by teaming up more closely with the communities.

6. Conclusion and Perspectives

For the first time, a study has been conducted into innovation prizes launched by the EC within the framework of H2020. The aim of this research was to identify the extent to which the prizes launched during this period correspond to a new era of open innovation within the EC. By studying the prizes, reviewing and analysing official documents, and conducting interviews, we have highlighted the properties relating to the openness of contests. (i) Most of the prizes studied show a certain degree of openness with regard to stakeholders but essentially during the preparatory phase (preliminary study before the launch). (ii) The profile of the stakeholders involved shows a certain lack of pluridisciplinarity. (iii) The portal hosting the prizes is not designed to make them visible via a dedicated site, which may hamper its comprehension by the uninitiated online community. However, considerable efforts have been made in terms of communication about prizes on social media. (iv) The current reward mechanism (no follow-up of how the prize is used and, more generally, of ex-post repercussions) does not shed light on the direct and indirect effects for winners.

Nevertheless, we have emphasised that, over time, European prizes have evolved towards more openness and inclusivity, as illustrated by the Blockchains for Social Good prize. However, this trend mostly concerns prize's rules and expectations, and not yet their construction and management. In other words, the process as a whole during its various stages should be more open to present and proactive stakeholders.

What's more, the fact that the Horizon 2020 programme did not entirely meet European expectations (European Commission, 2019a) has been officially recognised: the document issued by the High-Level Strategy Group (2018) affirms the limitations and weaknesses of the policy to boost innovation in Europe, and constitutes one of the pillars for Horizon Europe's implementation. This report campaigns for a more inclusive and democratic society that would strive for an industrial overhaul towards new KETs (Key Enabling Technologies) (Bedsted et al., 2018). Nonetheless, this demand echoes the notion of the RRI (Research and Responsible Innovation), structured within the Science and Society framework of the DG Research and the "Horizon 2020" programme (Owen et al., 2012) whose initiatives are carried out in the "Science with and for Society" programme. H2020 did not, then, fully meet the objective to align research and innovation with the values and needs of society, especially within the framework of the big challenges set by Europe (Rip, 2016).

Building a more inclusive European society, based on co-construction and taking account of the concepts of Open Science and Open Innovation are now the clearly stated objectives of Horizon Europe (2021-2027) with a budget of 100 billion euros. Three dimensions are being explored: (1) Strengthening the scientific and technological bases of the EU and the European Research Area, (2) Boosting innovation capacity, competitiveness and employment, and (3) Realising citizens' priorities, supporting the socioeconomic model and values (European Commission, 2019b).

In parallel to this new guidance for the Commission, we suggest two major types of recommendation for innovation prizes. The first advocates the integration of the concept of openness right from the construction of the design to allow for peer production and co-production (including co-initiation, co-design and co-evaluation). The second suggestion concerns calling on innovation communities in conjunction with prize mechanisms in order to encourage bottom-up movements and bring together individuals and organisations with shared objectives and identities. The proximity with the EC's RRI focus also leads us to suggest more interactions between the RRI movement and the EIC, currently spearheading innovation prizes launched by the EC (Gonzales-Fernandez et al., 2019). From the perspective of academic research, our paper thus contributes to the debate about the concept of crowdsourcing and public-sector OI, and also about new organisational forms in the public sector that may combine crowd and community mechanisms.

Two avenues to explore emerge with regard to the future. The first is directly linked to the subject of our study: it would be interesting to explore in greater detail the governance mechanisms of prizes to better understand the factors that encourage their emergence, how they function and their durability. The question of sharing power between the various actors remains crucial and complex. The second avenue is part of a wider debate about transforming public authorities to boost innovation. In a report for the EC, Mazzucato (2018) points out that public institutions geared towards mission-oriented policies should lead to experimentation, contribute new skills from unusual collaborations and facilitate bottom-up solutions. In light of the complex, global challenges, this second line of research would involve studying the complementarity of various political tools: prizes, subsidies, calls for tender, and financial tools, to highlight the precise connections of these mechanisms, their points in common and their complementarity. The key idea for the future remains our societies' capacity to respond to major technological and societal challenges. The recent global Covid 19 pandemic provides a striking example of the type of challenges our societies increasingly risk facing. Our capacity to respond requires a radical transition of the entire socio-technical system, involving profound changes with regard to infrastructure, skills, industry structures, products, regulations and user behaviours… for which we need to be prepared (Schot and Steinmueller, 2018).

Acknowledgements

The authors acknowledge support from European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 822781 GROWINPRO–Growth Welfare Innovation Productivity.The research leading to these results also receives support from the MSH Lyon Saint-Etienne, and funding from IDEXLYON, University of Lyon under the program « Investing for the future » (ANR-16-IDEX-0005) ».

Appendix : interview guide[7]

General questions:

Is this the first time that your directorate has launched an innovation contest?

Is this your first time managing one?

Are several people managing this prize within your directorate?

Before launching the prize:

Did you get help, advice or expert assessment inside or outside the EC to define, launch and manage the prize? Did you appeal to stakeholders before launching the prize? (preliminary study)

Who defined the goals/purpose and the theme of the contest?

Who determined the nature and the level of the reward?

Who decided which participants would be eligible? (e.g. legal entities, individuals, non-profit organizations)

Who determined the selection rules and criteria?

Did experts take part in defining the theme?

How were they selected? Was it from a list? By who? What was the profile of the experts?

Were non-expert citizens involved in the process? If so, how did they take part and at what stages?

Were you in direct contact with experts before the prize was launched?

During the contest and the evaluation process:

Did you interact with candidates? With experts?

Were there consortiums of candidates?

Did your directorate set the agenda?

Did you interact with other EC departments to manage the contest?

What types of contacts did you have with participants?

Did the participants communicate with each other? Was it possible for them to work together at specific stages of the competition?

During the evaluation process, did you organize face-to-face meetings between experts?

Did the applicants present their project in front of the jury members?

Did the experts select the winner alone? What were the stages of this decision?

After the contest:

Was there any impact evaluation of the contest in terms of jobs, entrepreneurship, product commercialization, etc.?

Were there other types of post-contest assessments?

Do you think you will stay in touch with the winner(s) after the award?

[7] Interviews of EC innovation prize programme managers

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Table 1: Aspects of citizen sourcing and public-sector open innovation

Citizen sourcing (Nam, 2012, p. 14)	
Purpose	• Image making • Information creation • Service coproduction • Problem solving • Policymaking
Type of crowd wisdom	• Professional skills and knowledge • Innovative ideas
Strategy	• Contests • Wikis • Social networking and social voting
Public-sector open innovation	
Mergel (2015, p. 609)	Phase 1 • Idea solicitation • Crowdsourcing Phase 2 • Incubation (voting, feedback and improvement) • Peer production Phase 3 • Validation and implementation of innovation outcomes • Coproduction
Randhawa et al. (2019)	• Innovation contests • Brand communities • Local crowdsourcing • Grand innovation prizes
Gao (2017) (USA)	• Crowdsourcing and citizen science • Ideation • Open data collaboration • Open dialogue • Prize competition and challenges

Table 2: List of prizes studied

	EC Horizon 2020 (H2020) prizes and other EU prizes	Contest open	Submission deadline	Cash reward
1	Better use of antibiotics	10/03/2015	17/08/2016	€1 million
2	Breaking the optical transmission barriers	28/05/2015	15/03/2016	€500,000
3	Food scanner	09/09/2015	09/03/2016	€800,000 ; €100,000 (each to 2 runners-up)
4	Collaborative spectrum sharing	30/09/2015	17/12/2015	€500,000
5	Cleanest engine of the future	20/04/2016	20/08/2019	€3.5 million
6	Cleanest engine retrofit	20/04/2016	27/09/2017	€1.5 million
7	'Birth Day' (to prevent maternal and infant deaths)	28/04/2016	06/09/2017	€1 million (each to 2 winners) ; €500,000 (to 1 runner-up)
8	Integrated photovoltaic energy system	05/07/2016	26/09/2018	€750,000
9	CO2 reuse	05/07/2016	03/04/2019	€1.5 million
10	Low carbon hospital	05/07/2016	03/04/2019	€1 million
11	Materials for clean air	26/01/2017	23/01/2018	€3 million
12	Zero-power water monitoring	07/04/2017	11/09/2018	€2 million
13	Social innovation: improved mobility for older people	27/11/2017	28/02/2019	€1 million €250,000 (each to 2 runners-up)
14	Tactile display	17/04/2018	27/11/2018	€3 million
15	EU Prize for Women Innovators	06/11/2018	16/01/2019	€100,000 (each to 3 winners) €50,000 (for 1 rising innovator)
16	European Capital of Innovation Awards 2019	20/02/2019	06/06/2019	€1 million €100,000 (each to 5 runners-up)
17	Affordable High-Tech for Humanitarian Aid	4th quarter 2017	1st quarter 2020	€1 million (each to 5 winners)
18	Fuel from the Sun: Artificial Photosynthesis	4th quarter 2017	1st quarter 2021	€5 million
19	Innovative Batteries for eVehicles	23/02/2018	17/12/2020	€10 million
20	Early Warning for Epidemics	26/04/2018	01/09/2020	€5 million
21	Blockchains for Social Good	16/05/2018	03/09/2019	€1 million (each to 5 winners)
22	Low-Cost Space Launch	12/06/2018	01/06/2021	€10 million

Source: https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/horizon-prizes/#the-prizes

Table 3: Prize characteristics (numbers refer to prizes in Table 2)

Who are the innovators (the crowd)?	Individuals: 1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22
	Legal entities: 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19 , 20, 21, 22
	Groups of legal entities: 1, 2, 3,4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22
	There is a lead contestant/participant: 5, 6, 7, 12, 13, 17, 18, 19, 20, 21, 22
	The entry is submitted by a small- or medium-sized business or non-profit organization acting alone or together with other entities that are part of the same team: 2, 4
	The contest is open to all (i.e. individuals or legal entities, including international organizations) or groups of legal entities regardless of place of establishment: 7, 17, 18, 20, 21, 22
	Contestant belongs to a specific community: 8, 10, 15, 16
What is the crowdsourcing innovation objective?	A mainly technological solution (inducement prize): 1, 2, 3, 4, 5, 6, 8, 9, 11, 12, 14, 17, 18, 19, 20, 21, 22
	A mainly social/societal solution (recognition prize): 13, 15, 16
	Both: 7
Who is the crowdsourcer (seeker)?	European Commission via the Directorate-General for Research and Innovation Programme manager (ec.europa.eu) and the 'Funding & tenders opportunities' platform
What is the contest design?	Contestant anonymity: contestants submit the proposal via 'Funding & tenders'; they can communicate with the programme manager; contestant identity is known by manager
	Prize visibility: each prize has its own website listing key information
	Prize design developed by each EC directorate specific to the field: goals, rules, contestant eligibility, timing, publication online, agenda, expert selection and jury, criteria and evaluation, award
	EC directorates are assisted by the wider community (researchers, businesses, non-profit organizations) via a preliminary feasibility study to define selection criteria of the future prize.
	IP clauses; https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf
What do the innovators receive in return?	All prizes are monetary: from €100,000 to €10 million, mainly as an individual prize for one winner, sometimes allocated to several winners
What is the approach of the call for projects?	A combination of openness and community: several exclusion criteria (e.g. certain countries, bankrupt businesses, those guilty of crime, etc.)

Source: adapted from Estelles (2012) and our interviews

Table 4 List of interviews

Interviewee	Affiliation	Timing	Date
1	European Commission	30 min, 60 min	03/07/2019, 05/20/2019
2	Start up: competitor	30 min	10/03/2019
3	Start up: winner	40 min	11/23/2020
4	Start up: competitor	70 min	11/15/2019
5	European Commission	50 min	01/29/2020
6	European Commission	64 min	04/07/2020
7	European Commission	59 min	04/10/2020
8	European Commission	74 min	04/21/2020
		90 min	04/24/2020

Table 5: The main characteristics of crowdsourcing and open innovation for H2020 prizes

Crowdsourcing		**H2020 prizes**
Types of social interactions (Renault, 2017)	Cooperative, competitive, collaborative, cumulative	Competitive
Types of resources (Howe, 2008)	Collective intelligence, work and creativity, crowd wisdom, crowdfunding	Collective intelligence, work and creativity
Types of tasks and missions (Penin et al., 2013, Renault, 2017)	Simple and routine tasks, complex tasks and inventive activities, creative tasks	Complex tasks and inventive activities, creative tasks
Types of proposed activities (Lebraty et al., 2013)	Crowdjobbing, crowd wisdom, crowdfunding, forecasting, innovation, authenticity, crowd auditing, crowd control, crowd curation, crowdcare	Crowd wisdom, innovation
Types of user (Hutter et al., 2011)	Competitors, cooperators, communicators, observers	Competitors
Open innovation		
What kind of collaboration? (Pisano, Verganti, 2008)	Innovation mall, innovation community, consortium, elite circle	Innovation mall
What kind of open innovation? (Julien, Penin, Dalhander et al., 2010)	Knowledge transfer, open innovation, open innovation 2.0	Open innovation 2.0, outside-in, pecuniary
Citizen sourcing (Nam, 2012)		
Nature of sourcing	Professional skills and knowledge, innovative ideas	Professional skills and knowledge, innovative ideas
Objectives	Image making Information creation Service coproduction Problem solving Policymaking	Image making Information creation Service coproduction
Strategy	Wikis Contests Social networking and social voting	Contests
Public-sector open innovation (Mergel, 2015, p. 609)		
Phase 1	Idea solicitation Crowdsourcing	Yes Outside-in (eligibility criteria for candidates)
Phase 2	Incubation (voting, feedback, improvement) Peer production	Weak No
Phase 3	Validation and implementation of innovation outcomes Coproduction	Weak No

Table 6: Evaluation of crowdsourcing in H2020 prizes

Aspects	**H2020 prizes (2016–2020)**
Sociotechnical and functional	• No dedicated single platform; information is available on the 'Funding & tenders' portal and related web pages • The tree structure is not intuitive to access contest information • No open discussion forum between future candidates • A mailbox is provided for questions from potential candidates for clarification (exchanges are bilateral) • Low diversity of online tools
Procedural	• For each competition, a document details the rules: eligibility conditions, objectives sought and evaluation criteria • The stakeholders (professional, social and academic experts) are only consulted during the 'study' phase, which lasts about 6 months (but is not an interaction) and there are no more exchanges once the prize is launched
Communication policy	• Twitter, Facebook, Linkedin: various accounts (European Commission, Directorate-General for Research and Innovation, directorates of specific areas) • Webinars to present and explain the prizes • Other stakeholders: specialists in a given topic contacted for the preliminary study (researchers, entrepreneurs, experts, etc.) • European Commission representatives of member countries • Media and journalists, alumni networks, EC experts
Project diversity	• Inducement and recognition prizes • Operational prizes, oriented towards fundamental research or towards global societal issues
Resource commitment for crowdsourcing	• Non-specific resources for launching prizes and crowdsourcing • Each EC directorate may decide to launch a prize, which is viewed as a policy instrument • *The prize managers learn gradually* • The EC has a pool of experts in specific areas • Awards are only funded by directorates, no co-funding with private organizations or foundations (with the exception of the 'Birth Day' prize) • No or little collaboration between directorates • Awards are delivered only at the end of the competition (no intermediate remuneration)
Engagement framework for crowdsourcing	• Directorates are encouraged to use prizes, but are not required to do so by formal obligations • The Enhanced European Innovation Council (EIC) pilot project illustrates the Commission's gradual willingness to increase the use of these tools

Systems and processes for crowdsourcing	• No integrated systems and processes dedicated to crowdsourcing: the 'Funding & tenders' portal is for all EC programmes • Fragmented use of prizes, yet a shift with the experience of the EIC pilot
Information transparency	• Information on prizes is available to everyone (rules, award criteria, award amount) • Possibility of additional information via email • Other resources: videos, webinars, conferences
Participation	• Stakeholder participation prior to the launch of the competition during the feasibility study and preliminary investigation phase • No collaboration between applicants and stakeholders during and after the competition (no solvers blog) • No collaboration between teams during the competition • Single-round contests; no iteration mechanisms (i.e. possibility to resubmit after receiving feedback) • Importance of geographical diversity (objective: not favour one European country over another)
Collaboration	• No applicant partnerships with other actors • No self-organization: top-down governance • Deliberation is based on both individual and collective expertise • Each proposal is assessed by all the experts, resulting in a ranking of candidates to be auditioned • Prize managers act as moderators to achieve a consensus
Effectiveness	• Some prizes may not result in winners (this was the case for two competitions initially launched) • After the competition, no follow-up by the directorates on job creation, start-up creation or the occurrence of other externalities
Impact	• No direct impact of the prizes launched by the EC. Indirect feedback after the results of an audit. See the new H2020–2024 programme.

Inspired by Nam (2012), Randhawa et al., 2019 and adapted by the authors.