

## Chapter 13

# Creative Problem Solving in Online Innovation Contests: What Motivates Top Solvers to Participate in the New Collaborative Economy?

**Rolf K. Baltzersen**

*Østfold University College, Norway*

### **ABSTRACT**

*Online innovation contests represent one of the most interesting new ways of utilizing creative skills in the new collaborative economy, but we still know very little about what motivates the problem solvers. Previous studies suggest that the economic reward is not the only motivational factor, but there are many other motives too. The aim of this research study is to identify the core motivational dimensions based on the experiences of top solvers in three different types of online innovation contests. The empirical findings are used to construct a motivational typology for creative problem solving that can guide future research.*

### **INTRODUCTION**

To develop the new collaborative economy, it is important to understand what motivates individuals to participate in creative problem-solving activities. Online innovation contests represent an important example of the more creative work done within this economy. By analyzing various solver profiles in three different contest environments, this chapter provides a comprehensive motivational typology, allowing us to understand better how to organize creative problem-solving processes in the new collaborative economy.

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## *Creative Problem Solving in Online Innovation Contests*

### **BACKGROUND**

#### **Crowdwork in the New Collaborative Economy**

The ‘new collaborative economy’ remains an ambiguous term to both scholars and the public, with various definitions. Several different terms are also used to describe more or less the same phenomenon, such as “sharing economy” (Frenken & Schor, 2019), “collaborative consumption” (Hamari, Sjöklint, & Ukkonen, 2016), “peer-to-peer economy” (Sundararajan, 2016), or “access economy” (Denning, 2014). However, most terms share a common understanding of an emerging marketplace where consumers rely on each other instead of large companies – giving, swapping, borrowing, trading, and renting both products and services in an online setting. Typically, access is more important than exclusive ownership, which suits Generation Z, assumed to prefer lower-cost options that offer temporary access to different assets, like, for example, home and car sharing (Denning, 2014; Frenken & Schor, 2019; Hamari et al., 2016). Usually, a “web-based middleman” or online intermediary will ensure that the transaction is performed properly, but without directly controlling the consumer interaction (Frankenfield, 2018; Hamari et al., 2016). In addition, these new economic solutions often aim to serve a broader collective purpose or common good, like the alleviation of societal problems, such as hyper-consumption, pollution, and poverty (Hamari et al., 2016). “Green values” are especially important, and many online platforms advertise that they contribute to reducing CO2 emissions. Although the environmental effects remain difficult to measure, sharing is expected to reduce the demand for new goods or facilities (Frenken & Schor, 2019).

Crowdwork is increasingly important in this collaborative economy, allowing thousands of people to work on the same project in an online setting. A large group can now perform separate “tasks” on short-term contracts in ways not previously possible. For example, in Amazon’s Mechanical Turk, workers bid to complete microtasks or very small units of work. A growing number of platforms also offer more complex project work that covers a wide range of professions (e.g. Upwork and Thumbtack) (Sundararajan, 2018). In addition, companies and other organizations increasingly seek external expertise when they are unable to solve problems (Chesbrough, 2017).

#### **Online Innovation Contests**

In recent years, it has become more popular to receive outside help by arranging online innovation contests (ICs). Typically, a solution-seeking organization will attempt to recruit a large number of online “solvers” to join a contest and win prize money, ranging from a few hundred to millions of dollars. Only solvers who provide successful solutions will receive the money, transferring the risk of failure from the organization to the solver. While large companies previously organized these contests themselves, it has now become more common to use innovation intermediaries that support the solution-seeker in hosting the contest. Seekers can be large and small firms, governments, and other organizations. Some intermediaries have existed for over a decade, with InnoCentive (founded in 2001), IdeaConnection (2007), and Topcoder (2001) among the first. They aim to make it easy for a solution-seeking organization to utilize the knowledge of a large and diverse pool of experts worldwide. For example, InnoCentive claims to have access to a global network of over 400,000 solvers, with nearly 60% educated to masters level or above. Topcoder offers both ICs and paid crowdwork to its over one million members. While most platforms are orientated toward research and developmental work, others, like eYeka, focus on marketing. The innovation intermediaries usually offer a “package” of support, like guidance in formulating an

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appropriate challenge, connecting seeking companies with problem solvers, finding relevant technology, or help strengthening innovation networks. Several intermediaries host hundreds of ICs every year for their clients (Agogu  et al., 2017; Terwiesch & Xu, 2008).

Although the ICs are organized in different ways, all intermediaries require that solvers come up with proposals within a relatively short time period. Some researchers claim these online ICs are especially interesting because they showcase a new type of large-scale collective intelligence (CI) made possible by the internet (L vy, 1999; Malone, 2018). While large-scale online collective work arguably represents the next important step in human evolution, we still struggle to organize large groups to produce better scientific, economic, and political solutions. Online ICs demonstrate how a crowd or large group can actually do creative work in the new collaborative economy. However, we know little about what motivates the key persons – the top solvers – who participate in these contests.

The aim of this study is to explore what motivates creative problem-solving in ICs. By analyzing various solver profiles in three different contest environments, this chapter provides a comprehensive motivational typology for creative problem-solving in the new collaborative economy, allowing us to understand better how to organize creative problem-solving in an online setting.

### **Motivation in Online Innovation Contests: A Literature Review**

A search of papers with relevant key terms on Google Scholar (“motivation+innovation contests,” “motivation+innovation intermediaries,” “motivation+open innovation”) identified only four recent publications on solver motivation in online ICs (Hofstetter, Zhang, & Herrmann, 2018; Hossain, 2018; Innocent, Gabriel, & Divard, 2017; Shafiei Gol, Stein, & Avital, 2018). All four studies build on data about the solvers from innovation intermediaries. Shafiei Gol et al.’s (2018) exploratory qualitative study, based on interviews with solvers on the Topcoder platform, found that they are motivated by a sense of psychological safety and autonomy, as well as by self-growth opportunities. Innocent et al.’s (2017) study, based on 93 online interviews with top contributors from three major crowdsourcing platforms, identified learning and social interaction as important motivators. Hossain (2018) analyzed 82 interviews of successful solvers at IdeaConnection, outlining their motivations, challenges, and opportunities. In the only quantitative study, Hofstetter et al. (2018) collected data from another innovation intermediary within creative marketing (Atizo). Initially, experimental data were collected from 301 individuals; next, participatory field data were collected from 6101 individuals in 261 contests (Hofstetter et al., 2018).

Other studies also underline motivational issues as being very important to solvers’ participation in ICs. For example, Bakici & Almirall (2017) find a major tension in online ICs between the use of monetary incentives and non-monetary incentives, like the enjoyment of the task. However, there has been surprisingly little research in IC solvers’ motivations. One reason for this may be that intermediary companies cautiously protect both the problem seekers and problem solvers, making it difficult to access data. Yet most intermediaries publish numerous successful profile stories on their websites, including interviews with top contributors. The studies by Innocent et al. (2017) and Hossain (2018) use these online interviews as data. On the one hand, these stories are a part of a marketing strategy to recruit seekers and solvers; hence, cherry picking and positive bias should make one cautious about assuming they give the full picture. On the other hand, they are narratives that provide valid information about identifiable persons who report what motivates them and why they compete.

In principle, anyone can participate in ICs, regardless of age, gender, location, skill level, education, or experience. For instance, at IdeaConnection, the pool of solvers includes students, retired scientists,

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and scientists in part-time employment. Although most winners are professionals, some are also “amateur scientists” (Hossain, 2018). However, all the interview studies describe solvers with advanced skills, including relevant formal education and working experience (Hossain, 2018; Innocent et al., 2017).

Furthermore, existing studies indicate that solvers are motivated not only by money but also by a complex mixture of motivational factors (Hossain, 2018; Innocent et al., 2017; Shafiei Gol et al., 2018). Nevertheless, the existing motivational models that describe solvers appear too simplistic to encompass this complexity. For example, in his conclusion, Hossain (2018) acknowledges this motivational complexity by mentioning the importance of both intrinsic and extrinsic motivation, but he does not elaborate on specific motivational factors or dimensions, concluding only that “extrinsic motivation is dominant, whereas intrinsic motivation works as a complement to extrinsic motivations” (Hossain, 2018). There have been few other attempts to construct a more comprehensive motivational framework or typology to guide research within this field.

However, as described in an interesting and highly cited qualitative study, Brabham (2010) interviewed 17 solvers who participate regularly in design t-shirt competitions hosted by Threadless, identifying four primary motivators: making money, developing creative skills, the appeal of freelance work, and love of the community. Hossain’s (Hossain, 2018) empirical findings also point to similar motivational categories, which can be used as a framework for a deeper understanding of creative problem-solving in ICs. In this chapter, six topics mentioned in Hossain’s (2018) study will be discussed in further detail.

*First*, as explored in this chapter’s section “perceived learning as motivation,” previous studies show that learning is a key motivation for IC problem solvers (Hossain, 2018; Shafiei Gol et al., 2018). Although Hossain (2018) does not distinguish between different types of learning, aspects of cognitive learning are addressed in his description of how solvers are drawn to tackling challenges that are intellectually stimulating and can improve their skills. Brabham (2010) also reports that many solvers participate to improve their skills within a supportive community, with some even learning with no previous experience. Although collaborative learning is not explicitly mentioned in any studies, Hossain (2018) notes that solvers’ varied backgrounds provide opportunities to learn from each other. Hossain (2018) addresses transformative learning dimensions specifically only briefly and then in broader terms regarding how solvers grow as professional scientists. Similarly, in Brabham’s (2010) study, one solver claims the participation made him realize he had creative skills, indicating a sense of personal growth.

*Second*, as investigated in the section “being immersed,” Hossain (2018) finds many solvers show related positive feelings like enjoyment, excitement, and pleasure. Likewise, in Brabham’s (2010) study, several participants describe their love of the contest format in Threadless as generating an addictive motivation. Hofstetter et al. (2018) also claim that enjoyment of the task appears to be particularly relevant for ICs that emphasize creative problem-solving.

*Third*, as analyzed in the section “being part of a community,” Hossain (2018) finds that most solvers are motivated by opportunities to interact with other solvers. Likewise, Brabham (2010) finds that the participants enjoy being in community with likeminded art enthusiasts and do not look upon themselves as customers. Many highlight the humorous dialogue in the blog forum as a reason for continually returning to the site. Hofstetter et al. (2018) also suggest that social factors play a role in innovation communities.

*Fourth*, as discussed in the section “being recognized for your work,” some solvers report that they participate in challenges to receive feedback and validate their own level of knowledge; money is less important than contributing to the greater social good and sharing their skills for others’ benefits (Hossain, 2018). Likewise, in Brabham’s (2010) study, some participants specifically mention that they enjoy receiving feedback on their work. Hofstetter et al. (2018) also find that performance feedback, such as

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high rankings, high ratings, or positive comments, is likely to increase one's feelings of competence. Receiving likes from other users also stimulates further participation and creative effort.

*Fifth*, as analyzed in the section “the prize money,” both Hossain (2018) and Brabham (2010) find that the main motivation for most solvers is money, which is typically added to other income. ICs are usually organized with a predetermined reward structure, which either focuses all the prize money at the top rank (e.g. IdeaConnection) or provides multiple prizes to the best solvers (e.g. eYeka and Topcoder). However, Hofstetter et al. (2018) find that the use of multiple prizes more effectively sustains participation across contests because the prize money also symbolizes achievement and increases the solver's self-perception of competence (Hofstetter et al., 2018).

*Sixth*, as examined in the section “the solver personality,” Hossain (2018) finds that solvers enjoy the flexibility of the projects and the freedom to choose what they want to work with. Many different social groups participate, including retired people and students. Likewise, Brabham (2010) finds that Threadless attracts several different groups of solvers that want exposure, both hobbyists and freelancers.

## **THE RESEARCH METHOD**

### **Selection of Online Innovation Intermediaries**

This explorative study maps and describes the most important motivational factors in online ICs, by analyzing why top solvers are motivated to participate in these contests. Today, a significant number of online innovation intermediaries exist and cover a wide range of ICs. Still, few sites provide an overview of this new sector within the collaborative economy. One exception is IdeaConnection, which provides a helpful overview on their website (<https://www.ideaconnection.com/outsourcing/>). Search terms like “Innovation intermediaries” were also used to identify recently published papers on Google scholar that could summarize innovation intermediaries (e.g. Bakici & Almirall, 2017). Using this information, ten innovation intermediaries were identified as relevant. The table below provides an overview with key information.

Using purposeful sampling (Patton, 2002), three intermediaries – Topcoder, eYeka, and IdeaConnection – were selected for closer study according to the following criteria: 1) established more than five years ago; 2) among the top companies concerning revenue; 3) provide solver data. These intermediaries offer different contest formats regarding how and what type of work is to be done. IdeaConnection is orientated toward challenges that require cross-disciplinary research, while Topcoder covers challenges within IT. eYeka is different from Topcoder and IdeaConnection because it focuses only on ICs within graphic creation and content marketing. There is also significant variation concerning the prize money amounts and how the contests are organized. Topcoder is largely a crowdwork platform that focuses on complex projects and requires skillful, creative workers for projects in which there is a greater likelihood of winning smaller amounts of money than with IdeaConnection and eYeka. IdeaConnection, on the other hand, emphasizes teamwork and larger, collective problem-solving events, like Idea Rallies. Examining these three intermediaries, the study aims to generalize findings on motivation that are important for all types of online ICs.

**Creative Problem Solving in Online Innovation Contests***Table 1. Key organizational information about online innovation intermediaries*

	<b>Founded</b>	<b>Headquarters</b>	<b>Challenges</b>	<b>From zoominfo.com (checked 02.01.2020)</b>	<b>Information about top solvers</b>
Agorize	2011	Paris, France	Cross-disciplinary Startups challenges Students challenges Online hackathons	Revenue: 25M (Employees: 130)	No
Ennomotive	2014	Madrid, Spain	Engineering challenges	Revenue: 400K (Employees: 2)	No
IdeaConnection	2007	Victoria, British Columbia, Canada	Cross-disciplinary R&D challenges	Revenue: 6.1M (Employees: 32)	Yes
InnoCentive	2001	Waltham, Massachusetts, United States	Cross-disciplinary R&D challenges.	Revenue: 10M (Employees: 79)	No
eyeka	2001	Paris, France	Product design challenges (marketing)	Revenue: 13.1M (Employees: 68)	Yes
Topcoder	2001	Indianapolis, Indiana, United States	IT	Revenue: 34.5M (Employees: 180)	Yes
HeroX	2013	Valley Cottage, New York, United States	Cross-disciplinary R&D challenges	Revenue: 5.4M (Employees: 28)	No
Hypios Crowdinnovation	2015	Paris, France	Cross-disciplinary R&D challenges	Revenue: 4.8M Employees: 25	No
Jovoto	2007	New York City, United States.	Product design challenges (marketing)	Revenue: 8.3M (Employees: 38)	Yes
Mindsumo	2011	Durham, North Carolina, United States	Product design challenges (marketing)	Revenue: 13.7M (Employees: 63)	Yes (video)

**Solver Profiles**

The data consist of solver profiles, such as interviews or stories, on the websites of three different intermediaries: eyeka, IdeaConnection, and Topcoder. In total, 33 solver profiles were included in the data corpus with approximately 10 stories from each intermediary. Note that 10 of 17 profile stories in Topcoder and 13 of over 80 profile stories in IdeaConnection were randomly selected. All the solvers in the data corpus have won a contest, so they are not representative of the large member database, which includes many who have not won any contests. As the profiles only include winners, there is a potential bias in not including the larger majority of non-winners, who may have different motives. The table below provides an overview of the solver profile data.

**Creative Problem Solving in Online Innovation Contests***Table 2. Solver profile data*

Solver profiles	Number of profiles
Topcoder (TC) – stories written by the solvers with their usernames.	10 of 18 profile stories (7500 words)
eýeka (ey) – testimonials written by solvers with their usernames.	All 10 profiles on part of the website (2100 words)
IdeaConnection (ID) – interviews of top solvers who are referred to by personal name. Written by IdeaConnection	13 of over 90 profiles (11900 words)

The solver profile data are presented in slightly different formats, as essays, interviews, or testimonials, but they all report on the solvers' personal motivations to participate, the challenges they face, and the benefits they receive by participating in ICs. The data are biased in the sense that they downplay the negative aspects of being a solver or seeker; on the company website, the emphasis will naturally be on the success stories to recruit new members to the site. However, because many of the profile stories display authentic names or usernames, there is no reason to believe that the published content is untrue. As this chapter's aim is to establish a comprehensive motivational framework and not to map inhibitory factors, potential bias in the data is less problematic. The data are primarily included to provide rich descriptions of motivation that can provide the foundation for a complex, tentative, motivational typology.

At Topcoder, a large majority of solvers are male (seven males and two females) and all are young adults in their twenties. Five of six solvers report being college or university students when joining TopCoder, while only one was in a full-time job. All the solver profiles were published between 2010 and 2014, with the solver participation then ranging from one year up to 10 years. The length of the profile stories vary from 500 to 1289 words, with a total of 7500 words comprising the Topcoder data.

Of the 10 solvers at eýeka, eight are male and two are female. Five are young adults around 30, while two are middle-aged. All have been participating in the contests for several years. Three report being freelancers, while two of five are art directors. The profile stories are quite short, varying from 126 to 340 words, with a total amount of 2100 words.

At IdeaConnection, the demographic background is quite similar. All thirteen solvers are male. The majority, nine are middle-aged, while two are young adults and two are seniors. Almost all the solvers are highly qualified experts, with eight claiming a research background and six currently working as researchers. Four work as managing directors and are independent consultants. On this website, the interviews are longer, ranging from 588 to 1289 words, comprising a total of 11900 words.

Comparing the profiles across the three intermediaries, we see that both Topcoder and eýeka have solvers who are primarily young adults, while IdeaConnection's solvers are largely middle-aged. At Topcoder, several of the solvers began to participate when they were students, while at IdeaConnection, individuals began when they are already working as researchers or had become experts in a field. A large majority of the solvers are male at all the intermediaries, indicating that this may be a typical characteristic of most online ICs.

**Data Analysis**

The profile data were copied from the websites in November 2019 and constitute the complete data. Following the systematic procedure of Yin (2009), this explorative case study comprised two distinct,

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analytical steps. In the first step, the researcher read the 33 solver profiles and coded them inductively according to what the solvers stated motivates them to participate in online ICs, including both explanations of why they participate and what they enjoy about this work (Elo & Kyngäs, 2008; Mayring, 2004). Here, an open coding approach was used, creating tentative themes that describe different motivational factors (Marshall & Rossman, 2011: 214-215). As part of this initial coding, themes were produced and compared. The analysis focused on identifying similarities, rather than differences, between solvers in the different intermediaries in an attempt to locate the general motivations that characterize top solvers. This first step is an inductive, or data-driven, explorative approach, where the coding is performed separately from matrixes or predetermined analytical categories (Yin, 2009).

In the next phase of the data analysis, the categories from the review were used as a framework to reorganize the data. The data themes were compared with the initial categories from the review and adjusted to better fit the concepts from the literature review (e.g. Marshall & Rossman, 2011). The themes were important in the formulation of the motivational framework's sub-dimensions. Both data and theory are important in capturing a larger variation of motivational factors that influence solvers. This interplay builds on abductive reasoning (Van de Ven, 2007), with an emphasis on using both data and relevant studies to develop appropriate categories.

In the discussion, the six major motivational dimensions are described as part of a comprehensive motivational typology and are analyzed in relation both to other empirical studies of the new collaborative economy and to broader motivational theories (e.g. Csikszentmihalyi, 1990; Maslow, 2013). This composite typology is key as most solver profiles reveal a complex motivational mix that drives online IC participation. Various quotations from the profiles are included in the analysis because they represent rich, informative statements, illustrating the complex solver motives. As these quotations are often informal statements, they frequently contain grammatical errors; the statements are copied in their original form into this study. Note that some of the statements about motivation have been left out in the final report because they are redundant and do not offer new information regarding the motivational framework.

## **MAIN FOCUS OF THE CHAPTER**

### **Perceived Learning as Motivation**

#### **Cognitive Learning as Motivation**

In accordance with the findings from the literature review, this study shows that many solvers underline learning as a motivational factor, indicating the importance of *improving their own cognitive learning*. For example, one solver at IdeaConnection explains how participation improves his problem-solving skills, "The process of attempting to solve the problems is shaping my ability. So I have been honing my talent and making myself better at solving problems for a long while". A solver at Topcoder similarly claims that the "extremely high standards will permeate from the competitions you work on into other projects as well, making you a much more valuable engineer and worker". Even without winning the contest, this way of working and solving problems will benefit your ordinary work. According to another solver at Topcoder, you become a better programmer because you work with much harder problems, "I think one of the major reasons is because we are challenged to solve much more difficult problems than what we usually solve in our day jobs. When you start solving those problems, the easier problems you



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encounter on a day-to-day basis seem to get a lot easier”. A study of Innocentive similarly shows that solvers report learning new skills (Innocent et al., 2017). Learning is very important as the solvers know that they will often not receive any payment. Likewise, in another Topcoder study, a solver is motivated by challenges he has never met before and learning about new technologies (Shafiei Gol et al., 2018), suggesting that the technological challenges develop the solvers’ competence in a way that it is helpful for their professional work. Another solver highlights that learning happens all the time:

*There’s always a learning curve and we keep on learning. I used to tell my students that every scientist and every researcher should think of themselves as a student. If I don’t think of myself as a student then I can never be a scientist. (ID)*

The solver has a profound view of learning in which even the expert learns all the time. Knowledge is never a waste, and may be relevant on another occasion:

*The way I look at things is that if people lose a particular challenge, instead of saying ‘I lost’ they should focus on what they have learned. For example, they may have learned what not to do or how to do something better the next time. (ID)*

At one level, most solvers acknowledge that they acquire new skills through participating in different online contests. For example, one solver at Topcoder claims that his motivation for competition prompted him to learn most of his technical skills. Another solver claims that the programming competitions help improve your programming skills, which is especially important when writing code because after some time one will otherwise often stop improving (TC). As one solver states, “For example, with the introduction of wireframe contests, I learnt how to make prototypes in Axure completely from scratch, constantly looking up resources online, if only to keep up with the competition” (TC). The learning process, which in this case starts from scratch, happens under strong time pressure to keep up with the competition. The solver is also excited about being able to join a project at any stage, anywhere (TC), indicating a strong degree of task self-selection.

A solver at eYeka states that he has struggled to find his personal creative style, but participation in eYeka helped him to decide to specialize in stop-motion paper animation; today, this choice allows him to design various creative products (ey). On the other hand, some solvers highlight the development of a broader set of skills. For example, before joining eYeka, a certain copywriter did not care much about his layout abilities, but participation in various contests made him think further about good product designs and so expanded his creative repertoire. A solver at IdeaConnection also underlines that this type of problem-solving forces you to practice your knowledge and test it actively, helping you not to forget it (ID).

### **Collective Learning as Motivation**

The findings also suggest a *second perspective on learning by motivation*. As IdeaConnection is centered on team work, several of the solvers highlight the value of *collective learning*. For example, one solver highlights the value of learning something from other team members “and using other people’s knowledge to increase my own” (ID). Knowledge sharing in the team happens during the problem-solving process. Another solver underlines that everyone learns from everyone in the team, “Everybody came from a

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different background, and so we all learnt from each other about lots of different aspects. And I think everybody felt that way” (ID). The multidisciplinary teams create a feeling of learning through diversity because each member brings a unique contribution. A third solver highlights the value of observing the contributions of people from other areas:

*I think it was interesting from an intellectual perspective to see some information from other people’s areas. It gave me some extra depth in an area and I actually came up with a potential invention which was in a related field. So that was an unexpected benefit. (ID)*

Here, the solver acquires “some extra depth in an area” or a deeper understanding of the problem through the diverse contributions, which also helped him at a later occasion. At Topcoder, several solvers also highlight the learning value of accessing how others have tried to solve a similar problem. One solver says, “After the match, I saw chokudai’s spreadsheet. It had all local testing result from his methods. It struck my head immediately and seemed to light my way forward – I’m still using this methodology when doing every MM” (TC). The phrase “struck my head immediately and seemed to light my way forward” indicates that deep learning can happen by seeing others’ solutions, which can strongly impact on the solver’s future work. Likewise, another solver is explicit about the learning value of observing other solutions:

*One thing that really helped me was the ability to see other people’s solutions to the problem. When I would finish coding my problem, and look at the other solutions to the problem, I would always find new ways of using some of the base language or library features that had never occurred to me. (TC)*

By observing alternative solutions, the solver almost immediately receives new ideas. A bonus with Topcoder is that the final competitors have the opportunity to see the designs and the codes of the other finalists; this is part of the award and helps competitors to keep improving (Shafiei Gol et al., 2018).

Regarding team skills, another solver describes how this work has improved his ability to work in multidisciplinary and multicultural teams, “Actually I gained a lot of experience in how to work in this kind of team with people from different backgrounds and different cultures” (ID). All these solvers share a conception of team work as integral to an informal learning process, where learning also takes place through problem-solving.

Furthermore, at Topcoder, solvers describe the learning that happens in the online community. One solver says, “The forums were a place to ask questions, and I was encouraged to read up further and look up interesting new technologies and design trends” (TC). In the forums, people motivate and help each other, and some solvers also share a large amount of their work on their own blogs (TC). This coincides with another study of Topcoder solvers, showing that learning opportunities and feedback on their work are considered important (Shafiei Gol et al., 2018). Furthermore, solvers in the present study report that participation in the online community helps to establish professional networks with people outside the contests (TC). Although the environment is competitive, there is a sense of knowledge sharing and helping.

### **Transformative Learning as Motivation**

In addition, the findings indicate the presence of a *third perspective on learning by motivation*, here labeled as transformative learning. Several solvers describe experiences that expand their human capabili-

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ties and help fulfill their personal potential. Mike, a solver, explains how winning awards at eýeka have changed his life in many ways. Winning prizes has influenced how he views himself and transformed his life skills in a positive way:

*That has changed my life in many ways. Especially in the perception of the challenges and overcoming problems. Nothing is impossible, fight with all possible disadvantages and do not give up. If you use all your strength to move forward, you arrive where you want. To this day, I am still competing, and I press on. (ey)*

With the phrase “nothing is impossible,” Mike signals that he is no longer afraid of facing difficult challenges in other areas of life. His personal character is strengthened and able to endure resistance. The formulation of “you arrive where you want” points to a goal-seeking activity and an emphasis on daring to follow your dream and becoming who you want to be. Likewise, another solver thinks that winning a contest has been important for his personal development:

*I won the Marathon finals. I definitely didn't feel like a contender for a champion title, so I was both very happy and surprised with the result. This was also the last finals where there was no close race for the first place. So why was this so important for me? It marked the point in time, where I finally started to believe in myself — for quite a long time I thought that I'm able to get decent results in Marathons because I put a lot of time into them, way more than anyone else. (TC)*

Winning the Marathon final marked the point when the solver began to believe in himself. His description of receiving a champion title resembles how winners are acknowledged in sport events, boosting their self-confidence to new heights. Not so differently, a solver at eýeka explains how the contests have made him constantly improve and challenge himself:

*Eýeka also gave me opportunities to push my limits further when creating a video: when you have to make a video for high standing brands, who require high quality videos, you have to meet great persons, you have to find the best places to shoot, you have to ask professionals to shoot with you... you go further... you become better, with some difficulties sometimes, but that's what makes you stronger. The most important thing is not the destination, but the journey. (ey)*

The solver has raised his production standards and work quality through the advanced requirements in the ICs. By emphasizing the journey and not the destination, he places a focus on pushing limits and trying to improve all the time.

A solver explains that eýeka “brought me back on the right track,” by revealing the type of work he is really passionate about after winning a contest (ey). Another solver talks about a new desire to do the work that now influences his life, “I need this. This is what makes me alive. This has become an evidence. I can't do without this now” (ey). The phrases “I need this” or “I can't do without this now” describe the work as becoming a basic need, suggesting an addictive, almost obsessive motivation. In describing the work as what makes him alive, the solver illustrates how the contest has touched him in a fundamental way, giving new meaning to his life. Another solver emphasizes the transformation of realizing that he is a creative person, “eýeka gave me the opportunity to prove myself that I am a creative person. I learned that no matter what everybody tells you, you got to follow your gut and just do

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what makes you happy” (ey). His description suggests a personal growth that is both about becoming independent and finding yourself

These solver narratives illustrate that winning an IC can trigger a personal transformation that changes the perceived life journey and self-perception and creates a sense of fulfilling one’s personal potential.

### **Being Immersed**

Many solvers describe being immersed when they face difficult problems. One eýeka solver states, “I missed that moment in which you have to think and break your head to come up with a good idea.” The phrase “break your head” illustrates the substantial mental energy required to solve the problem she needs to work with. Another solver explains how this work pushes him to the boundaries of his own creative capabilities, “Don’t even get me started about how much eýeka has made my brain explode in the creative category.” Both the “breaking of a head” and the “brain explosion” provide vivid descriptions of how solvers meet the toughest problems with enthusiasm and fearlessness. Likewise, another study of IdeaConnection shows that solvers actually want the worst problems and dive into the challenges (Innocent et al., 2017).

This state of mind fuels large amounts of motivation. For example, another solver in the present study explains how he continuously works on the same problem:

*I would say that it’s the process that I enjoy the most, the process I have to go through. The brain keeps working and going off in different directions and tries to look at things from different perspectives which are needed to come up with a brand new solution that appeals to a seeker. I find this process really amazing. (ID)*

The solver seems almost not in charge of his own thinking; the creative process does not rely entirely on intentional control but takes unexpected directions, amazing the solver. By loosening his reflective control, he is more open to “free associations.” Under these conditions, even hard and exhausting work is perceived as enjoyable. Similarly, another solver recounts how he thinks about the problem every day:

*I participated almost every day, right up until the last moment when I was occupied with my niece’s wedding. Up until then, I was working almost around the clock, not sleeping much and waking up with ideas. It was enjoyable and tiring sometimes but you know when something is really enjoyable you just forget about all your tiredness. (ID)*

Because the work is perceived as enjoyable, the solver does not notice that he is tired. By working “around the clock” and “waking up with ideas,” he shows a strong level of immersion—almost to the level of obsession—that makes an extraordinary effort possible. On the other hand, there are also solvers who scan challenges and only work on problems they think they can solve quickly because they already have the appropriate expertise. Likewise, in a study of Innocentive, another intermediary, solvers highlight the intellectual freedom of the problem-solving process and the fact that there are no limitations or restrictions on how you approach the problem (Innocent et al., 2017). The contest offers the freedom to choose the problems you want to work with according to your interests.

Furthermore, the findings indicate that solvers become immersed because of the contest format. At eýeka, one solver claims that the contests make your brain produce more creative work than usual,

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as if the contest triggers an arousal that makes him more creative. One Topcoder solver reports being attracted to the contests because they are really fun. A second Topcoder solver describes participation in programming contests as being a “hell of a lot of fun”, with the contests quickly becoming his new hobby. Here, strong passion for the work is closely connected to being part of a contest.

Reaching the finals appears to trigger even more motivation. In one example, two groups are selected for the final round, “Yes, that’s exactly right. They let us know they had selected two groups, ours and another and gave us a few questions which gave away more about what they were looking for and so we hit those questions really hard.” (ID) When the contest includes a final round, with only two groups left, the likelihood of winning is much higher, thus intensifying the race. The almost addictive motivation to participate in contests is vividly described by a third Topcoder solver:

*I got hooked on Algorithm contests immediately. The sweet anticipation of Coding Phase? (...), the adrenaline rush of coding against the clock, the frenzy of Challenge Phase and the wearing wait for the final results... After the first couple of matches I was addicted. Between the competitions I’ve read every feature article on the site and every thread in the forums, and still it was not enough to satisfy my addiction. A bit later bimonthly Marathon Matches were introduced for people who need more than two hours of competing per week, and they turned out to be even better than SRMs – less adrenaline-filled but more exploratory. (TC)*

The match concept indicates a strong degree of gamification with tight deadlines, leaderboards, and a race against the clock. To some solvers, this is highly motivating, and some report dedicating a large amount of time during the contest period. For example, one solver describes the final rounds as requiring non-stop work, with solutions being submitted all the time (TC). As one solver describes:

*Over time, participating in Design Studio contests instilled in me a strong sense of discipline and precision. The tightly defined specifications and instructions, the rush to submit mere minutes before a deadline, that facepalm feeling when you fail screening for simple mistakes in font declaration, the anticipation while checking tournament leaderboards, the recognized faces in the forums, the grogginess from staying awake working for ten hours straight on contest after contest, that final thrill of seeing that your submission has won -These are all things that are endearingly familiar and common to any Design Studio competitor. (TC)*

Here, the solver describes a contest that create a strong sense of discipline and precision in his work, partly due to time pressure and the need to finish before close deadlines. During the contest, the leaderboard scores also create sustained excitement, as the solver reports working for ten hours straight on contest after contest.

Moreover, several solvers highlight how the collaboration and diversity of the team has positively influenced their motivation. One IdeaConnection solver emphasizes three benefits of being in a team, “The first is that you get different cultures, people from different backgrounds. Second, you get different perspectives. And third is the sharing of the workload and responsibilities” (ID). Concerning diversity, the solver underlines the value of being on a team with both a multicultural and multidisciplinary background. The multidisciplinary diversity also helps avoid “free riders” because all members are assigned a specific role in the team. One solver reports that it is not a problem when the team members are strangers to each other because they all bring unique experiences to the table. When everyone can make a contri-

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bution, it helps the team work (ID). Another solver, who also enjoys the diversity in the team work, also distinguishes between multicultural and multidisciplinary diversity, indicating the value both in working with “people from different disciplines” and people from “different parts of the world” (ID). Likewise, another solver highlights the fun and interest of being in multidisciplinary groups:

*When a single person works on something you may only get one idea. But this rally which was about chemistry also attracted biochemists and biologists and people from a biotechnology background and so on. Each one viewed the challenge from their own perspective and that’s the whole fun and interesting thing because your angle is going to be different from another person’s angle. When you start getting different angles you receive a fuller picture. (ID)*

As the solver observes, with “different angles you receive a fuller picture,” increasing both the benefits of team work and the quality of the solution. In addition, other solvers highlight the value of multicultural diversity between team members, “It is very interesting to work with people who have different talents and who think differently from you. It is great to discuss ideas with other people around the world and figure out a solution” (ID).

However, the team diversity makes several solvers underline the importance of having a facilitator who can help organize the group work (ID) and follow a clearly planned schedule with weekly meetings (ID). One specific challenge is to ensure equal participation and prevent people becoming too aggressive concerning their own ideas (ID). The facilitator often also helps the team in writing down the final solution (ID). At Topcoder, there is no facilitator because of the lack of teamwork, but there is a co-pilot who helps organize the contests and communication with the client (TC).

### **Being Part of a Community**

Several solvers mention the value of being part of a community as a motivational factor. One Topcoder solver reports having met many exceptional people, resulting in long-term friendships. Another solver says, “This is what I want to do. This makes me feel happy. It was then when I realized I had built significant relationships with talented people all around the world thanks to Topcoder.” His network of friends make it possible to have at “least one available couch on every continent” (TC). At Topcoder, some individuals underline the establishment of tight social connections, like friendship. At IdeaConnection, solvers are more focused on the quality of relationships during the teamwork:

*I also enjoyed the comradery of the group. There was a young person from Nigeria and he and I linked up via this Idea Rally and we got to make a good personal connection. I also encouraged the community spirit of people working together. There were several who collaborated and contributed ideas as part of a group. It was a good feeling to be connected with people from all over the world that you might not otherwise have met. (ID)*

Here, the solver highlights the comradery and community spirit of the group working on the same problem. Although the group of solvers does not necessarily become friends, good personal connections in the group allow good discussions.

Furthermore, an important part of being together in a community often involves arranging meetings. One IdeaConnection solver states that successfully reaching final rounds has given him the opportunity

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to travel to places like Massachusetts Institute of Technology (MIT) and Oak Ridge to compete and “that was great seeing those historic locations.” By traveling to compete at a special location, the solver feels that he is part of something important. Another Topcoder solver reports being very motivated to participate in onsite programming tournaments finals, “being in the same room with some of the smartest Topcoders working on the same problems is humbling, exhausting and inspiring at the same time.” Brought together with other coders, the individuals experience a stronger sense of community. A Topcoder solver explicitly underlines that these meetings help establish close relations between community members and staff, describing all of them as a “big global family.” The contest is not only about the challenge, or growing your skills, “but above all – to make great friends” (ID).

Another Topcoder finalist underlines the joy of informal social events at these tournaments, like parties with other developers, where one can share stories and drinks, and of having time off to walk around downtown in the tournament city (TC). The motivation is less about winning the contest than meeting interesting people and enjoying foreign cultures. As one solver explains:

*But the biggest lesson I learned was that I absolutely love those onsite events. You get to travel, meet many interesting people, take part in thrilling contests and enjoy foreign culture. The only sad moment is when everything ends and you have to return to your normal life. So, naturally, my goal was to qualify for as many events as possible. Like a child, I wanted to have as much fun as I could and this was the best way to do it. (ID)*

The onsite finals trigger motivation when the solvers feel that they are part of an exciting community, can travel around the world, and share experiences with likeminded others.

### **Being Recognized for Your Work**

Solvers report being proud and more self-confident after winning contests. One solver at eýeka states, “Thanks to eýeka now I believe in my strengths and talent even more. It encourages me to participate in online contests and develop my skills.” Believing more in his own strengths indicates a positive change in his self-esteem. Another person even joined an eýeka contest to prove to himself that he was actually a creative person because he was not acknowledged at his old job. In Topcoder, a solver explains that he entered the contest to improve his pride and self-confidence:

*Me, some idiot who hardly feels like I know what I am doing managed to take second place in a contest between some of the more prominent programmers in the cloud computing arena. I felt validated. Maybe I could do this? Maybe I am good enough? I told my boss that I had placed. He sent an email to the company letting them know. All day I received congratulations and pats on the back. I was hooked. (...) That is why I compete. It's not about the money. It's not even really about the technology. For me it's a form of validation. To know that I can run with some of the best. That I can solve problems others can't. To know that I am at the cutting edge and pushing it further.*

The phrase “I felt validated” indicates a boost in his self-confidence, reinforced by the acknowledgement he receives from his work colleagues. The competition is about trying to test his own skills and being able to compete with some of the best. It illustrates how closely connected self-esteem is with the recognition one receives from others. Although not all contestants win prizes, it can be enough for some to

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be briefly on the leaderboard. One solver reported that the most memorable moment of an online contest was when he was temporarily in first place—a unique experience that gave him some confidence (TC).

For some solvers, the financial reward is not very important in itself, but it signals appreciation of the solver's solution (ID). Some also experience these contests as fairer and less about internal politics than their other work. Because “it all depends on your creativity” (ey), the contests are perceived as a more objective measure of how creative you are.

Furthermore, solvers include their awards on their CVs, displaying their reputation from such contests when they apply for normal paid work (ey). For example, a solver at Topcoder states that her merits got her several job interviews with companies she would have never dared to apply to otherwise. Another solver, describing programming as his hobby and passion, eventually acquired a job as a software developer after one and a half years of work at Topcoder (TC). Likewise, another study reports that individuals join Topcoder to build a reputation (Shafiei Gol et al., 2018).

Moreover, the social impact of winning a contest can also be an important motivation. One eýeka solver was proud when the winner video was shown on national television:

*“I was one of the happiest men on this planet!! A friend called saying to me: Man!!! This is what we’ve made both together!!!! And we can see it on the big screen!!!! Wow!!! Watch your TV right now!!! My wife was proud of me... I saw it in her eyes. Magic moment.” (ey)*

The solver's intense feelings of pride are closely connected to the public recognition of his work, creating a feeling of personal accomplishment closely attached to its societal impact. In addition, his own pride increases when he observes that his wife is proud too, illustrating how self-esteem is closely tied to the desire for respect from significant others.

### **The Prize Money**

Although the size of the prize and the number of winners vary, most ICs offer prize money to the winners. In this study, all the solvers have won financial rewards. However, the economic motivation differs significantly, ranging from being vital to personal income to being a bonus. A solver at eýeka made a dream come true by using the prize money to finance a study abroad, covering one year of tuition fees in Europe, “I am very happy and still cannot believe it!” In some countries, the economic rewards provide opportunities that may be difficult to obtain otherwise. Several solvers also recount how the award was important income in a difficult life situation. One eýeka solver explains how the work gave her independence after she began to work by herself; eýeka provided extra income, and the prize money from the contests made it possible to buy a new car and move to a new house. Another solver explains how eýeka provided important extra income when she stopped working to be with her daughter when she was one year old. In Topcoder, a solver would also like it to be more prize receivers because this would increase the participation and engagement (TC).

### **The Solver Personality**

Some solvers report having a special personality with a particular interest in solving problems. These people are in search for a context where they can use their talent, and online ICs represent one such area. For example, one solver explains that he is interested in almost every area of science and engineering,



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being a “real science geek” (ID). He has always wanted to be a freelance inventor, having many ideas and being good at solving problems. However, he struggled to find what needs to be invented; but now, at IdeaConnection, “people are coming to me with problems that I can then try and solve”. By describing himself as a “real science geek”, he also signals that he has a strong intrinsic motivation to solve any kind of scientific problem. Another solver describes this personality as having an “instinctive” urge to solve problems:

*I have more of a background in physics than chemistry but the methodology of solving problems is natural and instinctive to me. So when I see a problem my brain just naturally finds a way to solve it. I searched and read some information related to the challenge and I immersed myself in it to come up with a solution. (ID)*

Here, the solver describes the problem-solving process as something that happens automatically without being forced, indicating a strong intrinsic motivation.

At IdeaConnection, which requires team work, several solvers describe themselves as having collaborative personalities in similar terms:

*IdeaConnection is a platform where I can use my knowledge to solve the challenges. I know there are websites where you can do this alone but the beauty of IdeaConnection is to do it together in a team. For me, from my childhood onwards I have always worked with a team so it was a good match for me (...) I'm a people person so I like working with strangers. Out of the 16 people I have worked with I'm still friendly with 15 of them. They don't remain as strangers after one week or so. That's a good part of working on the challenges. (ID)*

This solver describes himself as someone who has wanted to work in teams since he was a child. Working with unknown others motivates him, and he finds that the team relationship improves during the work.

Another characteristic of the online ICs is that many people are allowed to do creative work. One solver at eYeka works as a professional wedding photographer, but by participating in the ICs, he has realized that his passion is capturing moments in real life. Here, the online setting offers him a different type of work that he is passionate about. The challenges are more creative or advanced than those of his daily work. Similarly, another solver finds that eYeka offers him new types of creative challenges, “For the first time in my career, I have the opportunity to think about product innovations and meaningful package design to my personal creative limits” (ey). At Topcoder, a solver notes that he has had incredible opportunities, working with world-leading organizations like NASA or companies like Facebook and Google, which he would have never imagined before joining Topcoder. Another solver recounts being totally uninterested in his university studies because he could not realize any of his ideas. By joining Topcoder, he had the opportunity to begin relevant work while still a student. Another solver states that eYeka has helped to boost his professional career:

*I am creative audiovisual, but I work as a security guard at night. (...) I never had the chance to show my ability. I've been trying to make what I like in my work for many years. A year ago, when I took for granted that it would be impossible to make a great commercial for a prestigious brand, I was encour-*

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*aged to participate in eýeka. Till today I have won 3 international awards staying in 1st place for brands such as Close-up. That has changed my life in many ways. (ey)*

The solver underlines that he had not been given the chance to “show his ability” and that this is what the ICs permit. Consequently, he won several awards, exceeding the limits of what he previously thought was possible for him to do.

Furthermore, solvers highlight the work autonomy that these ICs provide. One solver at eýeka likes that he can decide which problems to work on and sometimes even the clients (ey). A solver at Topcoder enjoys that he can work from home and also travel often because the online work is location independent. Another solver reports:

*Working for Topcoder has given me immense freedom in terms of how my life can be structured. I have the freedom to work whenever and wherever I want (as long as I have an internet connection), and I can work as much or as little as I want to as well. I get paid more than I ever could in a “normal” job in my geographic area, and the financial freedom has allowed me to travel and do things I wouldn’t have been able to do otherwise. (TC)*

The solver explains that he can have a much more flexible work schedule compared with having a normal job at the location where he lives. Now he is free to choose where and when he wants to work, making it possible to move to a warmer place in the cold winter climate where he lives. Other solvers have retired, but still want to make societal contributions:

*I was bored. The Internet has been a godsend to me being an information freak and living in the less populace west where I don’t have the big university libraries next door anymore. (...) One of the real attractions to me as a problem solver is that I can sit here in my little place in New Mexico and enjoy my quiet lifestyle and yet through IdeaConnection I am working with some of the best brains in the world to solve these problems. (...) Being retired I miss the connection with the really active research world. So this gives me the satisfaction of knowing that I’m still helping to contribute to solving some of society’s problems. (ID)*

As a senior citizen, he misses his active life as a researcher, labeling himself as a bored “information freak.” The ICs have given new meaning to his life, and, because he lives in a remote area, this work would not have been possible without its online setting. The solver highlights the opportunity to collaborate with other highly skilled persons, the “best brains in the world.” In the phrase “I’m still helping to contribute to solving some of society’s problems,” one senses the feeling of being important again.

## **SOLUTION AND RECOMMENDATIONS**

### **A Motivational Typology for Creative Problem-Solving**

In conclusion, the six motivational dimensions presented in this chapter provide an overview of the complex motives that drive creative problem-solving in online ICs. The table below summarizes the

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empirical findings and provides a tentative, comprehensive motivational typology for such problem-solving, showing categories, themes, and other relevant motivational theories.

Table 3. A motivational framework for creative problem-solving in ICs

Main categories (dimensions)	Sub-categories	Themes	Relevant motivational theories
1. Learning as motivation	1.1 Cognitive learning	- Problem-solving skills - New professional skills	Metacognition (Flavell, 1979)
	1.2 Collective learning	- Learning from other team members - Teamwork skills - Learning by observing others - Learning by sharing knowledge - Learning through informal feedback from the community	Situated learning (Lave & Wenger, 1991)
	1.3 Transformative learning	- Resilience - Self-discovery	Self-actualization (Maslow, 2013)
2. Being immersed	- Individual flow - Contest flow - Collaborative flow	- Complete absorption in the work - Strong pleasure and joy - Excitement to be part of a contest - Appreciation for diverse contributions - Need for a facilitator to control the teamwork	Flow (Csikszentmihalyi, 1990)
3. Being part of a community	- Good team relationship - Togetherness at onsite gatherings	- Good professional relations - Friendly relationships - Sharing onsite experiences	Love and belonging (Maslow, 1981)
4. Being recognized	- Pride in creative work - Recognition for creative work	- Pride from being acknowledged as the best among peers - Reputation building - Pride in the societal impact of the work - Recognition from significant others (peers, colleagues, friends)	(i) Esteem for oneself (ii) Desire for reputation or respect from others (Maslow, 1981)
5. Prize money	- Variation in the prize amount and the number of winners - Huge variation in economic motivation	- Important income with high economic value (for those in the Global South and freelancers) - Bonus to sufficient salary	- Safety and physiological needs (Maslow, 1981) - Achievement motivation (Wigfield & Eccles, 2000)
6. The solver personality	- Being a problem solver - Inclusion in creative work	- Collaborative personality - Equal opportunity to solve problems (for students, outsiders, seniors)	Self-actualization (Maslow, 1981)

### Learning as Motivation

First, the section on *learning as motivation* shows that solvers are motivated by at least three different types of learning: cognitive learning, collective learning, and transformative learning. As the review has shown, several studies find that participants in online ICs are generally motivated by learning. Further research should address these three specific views on learning in more detail.

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The findings show a significant *perception of cognitive learning as motivation*. Several solvers are strongly aware of how creative problem-solving improves their individual learning. Many attempt to overcome their creative limitations and expand on their present professional and cognitive skills. On the one hand, some solvers learn new skills from the beginning, indicating strong self-regulated learning motivated by the contest format. In the contest, solving advanced problems often requires the development of new professional skills. Hence, the solvers do this work to broaden their expertise or skill sets. On the other hand, solvers with substantial expertise participate in the contest to keep their existing skills up-to-date.

Other solvers underline how the contests improve their general abilities to solve problems, with the challenges being more advanced than those they are used to. This training is valuable when they attempt to solve problems in their regular professional work, thus indicating that metacognition or an awareness of how learning to learn can be a motivational factor (Flavell, 1979).

Moreover, among the solvers, there is a significant degree of *perceived collective learning as motivation*. Solvers describe learning that motivates and is different from pure individual learning. Some solvers are excited about learning together in new ways in a team environment. They also discover that learning is motivated by transparent knowledge sharing. For example, solvers at Topcoder are motivated to access to winners' solutions to problems they tried to solve or to discuss problems in online forums. This perception of learning resembles situated learning (Lave & Wenger, 1991), which describes the importance of observational learning at work and how people help each other through near-peer learning.

Furthermore, several solvers describe *perceived transformative learning as an important part of their motivation*. Two personal qualities stand out as essential for motivation. First, the solvers feel that they have become more resilient by pushing themselves to become better and to never give up in the contests. Second, winning the contests has had a large impact on them, helping them discover that they actually are creative people. Some stories show signs of a profound personal awakening, not so much about becoming a solver but about becoming who they are as a person. These transformative learning processes resemble what Maslow described as self-actualization, with an emphasis on realizing personal potential and seeking personal growth (Maslow, 2013). Note that although the solvers in the present study highlight different aspects of learning as motivational factors, they all share a strong awareness of how they learn as solvers.

This finding differs from other studies of motivation in the new collaborative economy, where there is little focus on learning processes. For example, Hamari et al. (2016) highlight enjoyment but do not link it to learning. Although there is a significant focus on sustainability and the adoption of green values, participants are usually assumed to have acquired such values already (Hamari et al., 2016). There is less emphasis on how participation can lead toward more sustainable behavior. The present study also provides no information about sustainable learning because few of the solvers worked with this issue. Here, solvers' perceptions of transformative learning are primarily about individual empowerment, and it is unclear whether this will lead to the adoption of green values in the future.

### **Being Immersed**

*Second*, in the section on *being immersed*, solvers state that they were completely absorbed in the problem-solving process. They note a strong sense of pleasure from overcoming difficult challenges and that during the experience, "the brain keeps working." These reports match the following statement by Csikszentmihalyi about flow, "The best moments in our lives are not the passive, receptive, relaxing

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times . . . The best moments usually occur if a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile" (1990: 3). This flow occurs in complete concentration on a task, its intrinsically rewarding experience, and the feeling that time is transformed while the solver is immersed.

In addition, there is an element of "contest flow," as the solvers report "the thrill of a contest" and their work being spurred by the game features. Solvers want to be on the leaderboard and push their limits to finish the work within the deadline. If they reach the finals, they work even harder. Although flow describes a balance between skill level and the challenge, these contests appear to push the solvers' skills to a higher level because the difficulty of the challenge is greater than the solver's initial skill level. At IdeaConnection, there is also a "collaborative flow." Both multidisciplinary and multicultural diversity trigger interest and joy, strengthening the immersion with others into the shared group work. In these teams, the facilitator keeps control over the task to ensure the team's creativity.

Likewise, surveying why people participate in the collaborative economy, Hamarai et al. (2016) find that enjoyment is the strongest determinant, characterized as an intrinsic motivation that emerges through the activity itself. It is associated with pleasurable and communal activities and is typical in open-source projects and online information sharing. Here, there are obvious similarities with the solvers' feelings of being immersed in challenging work. However, in the ICs, the pleasure is not related to a simple trading of goods but with the positive feelings of a struggle, which is often a time-consuming, exhausting challenge. Further studies should be conscious about the significant variations in what enjoyment can be in the new collaborative economy.

### **Being Part of a Community**

*Third*, the section on *being part of a community* shows that most solvers want to be part of a community with good relationships between members. Although the need for friends is not as important as teamwork at IdeaConnection, some solvers still report that they made friends, while others report that they established professional networks. Solvers at Topcoder also highlight the importance of attending onsite meetings to motivate stronger feelings of belonging to the same community, thus increasing the likelihood of establishing long-term professional networks and friendships. This motivational dimension is similar to the love and belongingness needs identified by Maslow (1981).

Similarly, researchers have suggested that the new collaborative economy will replace hierarchies and foster personal ties between users and suppliers (Sundararajan, 2016). Many platforms underline the extra benefit of meeting people, making friends, and getting to know others. For example, some Airbnb hosts engage in social activities with their guests, and, at TaskRabbit, some participants build new social networks and meet people they would not otherwise have met. However, while earlier adopters seem more open to social connection, this motivational factor is now declining as more people participate for economic reasons (Frenken & Schor, 2019). The present study also reveals tensions between solvers who participate to gain friends and partake in a community of likeminded people (e.g. Topcoder) and those who establish relations to increase the likelihood of winning a contest or creating professional networks (e.g. IdeaConnection).

This interaction with strangers is perhaps the most important aspect of the collaborative economy. Historically, people have usually not shared anything with those outside their trusted social networks of family, friends, and neighbors (Frenken & Schor, 2019). While the intimacy of sharing a home or car entails a high degree of risk, participating in ICs is much less risky as it is often done anonymously online.

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As the emphasis in online ICs is increasingly orientated toward teamwork, the ability to collaborate with unknown others in an efficient way will become more important. For example, at IdeaConnection, the team members do not know each other in advance and are only together in an online setting for a limited amount of weeks. In addition, the solvers often communicate anonymously with the seeker.

### **Being Recognized for Your Work**

*Fourth*, as discussed in the section on *being recognized for your work*, several solvers report being proud and more self-confident after winning contests. Winning a prize often produces a feeling of validation of a person's professional skills in comparison with other highly skilled peers. Therefore, the award can be important for a person's professional identity and self-understanding as a creative person. Awards often build reputation and can be included on a résumé. In addition, the examples show that the boost of pride and self-esteem is closely intertwined with the recognition one receives from others through the contest and praise from significant others, such as colleagues, friends, and family. Another type of recognition is the work's value; if the work has a societal impact, this increases motivation. Such motivation resembles Maslow's identification of esteem needs, which includes both the need for self-esteem and the desire for reputation or respect from others (Maslow, 1981).

Likewise, individuals in the new collaborative economy are often motivated to share information to enhance their personal reputation or status as a part of a self-marketing process (Hamari et al., 2016; Sundararajan, 2016, 2018). However, the primary purpose is not to strengthen motivation, but to establish trust between participants. Rating systems aim to make stranger sharing in trade less risky by indicating how users have behaved previously. Although the ratings are not necessarily very accurate, they have been sufficient to entice many people to engage in new economic activities (Frenken & Schor, 2019). Any specific type of collaborative economy is reliant on the trusted exchange of goods and services, primarily done by integrating social ties into commercial exchange. This is possible both because of all the automatically stored traces of online activities and the increased use of online reviews (Sundararajan, 2016, 2018).

In some innovation intermediaries, like IdeaConnection, reputation is important in selecting team members. However, in the ICs, reputation largely involves demonstrating your skills and receiving acknowledgement, which can help build a personal and professional identity and is useful to becoming an important member in an online community. The present study indicates that the motivation of being recognized both serves individual needs and builds a reputation system, making it key for establishing trust in the collaborative economy.

### **The Prize Money**

*Fifth*, the section on *prize money* indicates that the value of money differs greatly depending on where a person lives. In the Global South, solvers use the money to buy a house or receive an education. For these solvers, everyday safety and physiological needs provide motivation (Maslow, 1981). For several solvers from Europe and the United States, however, the prize money is just seen as a bonus. Yet some are also freelancers and view the prize money as paid work and an important source of extra income. They more carefully assess the probability of being able to solve the problem and win the contest (Wigfield & Eccles, 2000). However, economic benefits cannot be the only reason for participating as most participants, including the top solvers, often receive no prize money. Hence, the motivation of an enjoyable learning

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process is important. Similarly, Hamari et al. (Hamari et al., 2016) claim the collaborative economy is less about economic benefits and more about enjoyment and adhering to important societal values.

However, concerning economic gains in the new collaborative economy, there are usually few disadvantages for lenders because the person does not need the product during the lending period, whereas the borrower gains access to it without charge. Hence, the transaction costs are lowered (Frenken & Schor, 2019). Similarly, the terms for the seeker in online ICs are very good because payment is often only necessary if the provided solution is regarded as satisfactory. As a “borrower” of expertise, the transaction costs for the seeker are low because it is not necessary to use time identifying relevant external expertise. Instead, the solvers will attempt to “lend” their expertise to the seeker, providing several possible solutions to choose between. Just as transaction costs in goods lending are reduced in the collaborative economy, the seeker in online ICs incurs less costs in identifying a solver who can provide a solution.

### **The Solver Personality**

*Sixth*, the section on *the solver personality* highlights that some individuals solve problems as a hobby. While some like to solve problems alone, others have collaborative personalities and enjoy working with others. The online ICs offer new opportunities for such people, making it easier to access authentic problems and practice their hobby.

At a macro level, these contests challenge traditional divisions of when one can and cannot make a valuable contribution, by including students and seniors. In many of the challenges, anyone can join. Instead of allowing society to decide when a person has to work or stop working, this becomes an individual decision. This inclusivity gives people equal opportunities to solve interesting problems. For example, one solver, who is retired, lived a “boring” life in a remote area until his participation in online ICs. He feels valuable and important even though society has defined him as nonvaluable. Other solvers participate to pursue their hobby or passion. These different solver narratives illustrate that the contest contributes to richer and more varied lives. Online ICs represent an important democratization of creative work opportunities. They also give more people access to motivation for self-actualization (Maslow, 1981), allowing them to choose how they want to live and to pursue a meaningful life in which they can reach their full potential.

In relation to the collaborative economy, one could claim that these individuals desire to utilize more of their personal potential by solving more problems than they are currently doing. As mentioned by Frenken et al (2019), this notion of underutilization is key to understanding the new collaborative economy. However, this issue typically refers to increasing the use of physical assets through home-sharing platforms, such as Airbnb. When a houseowner is away, the asset of an unoccupied house is not utilized, creating a temporary idle capacity (Frenken & Schor, 2019). In contrast, the ICs aim to harvest underutilized non-physical assets, which, in this case, is a solver’s capacity to perform creative problem-solving for difficult challenges.

Furthermore, the solver profiles show that a significant number of solvers are independent workers. In the future, it is expected that a larger percentage of the workforce will be freelancers and participate in different types of crowdwork (Sundararajan, 2016, 2018). Note also that several solvers at IdeaConnection participate in addition to their full-time paid work, blurring the lines between personal and professional and between fully employed and casual labor (Sundararajan, 2016, 2018). Therefore, it is important to understand the personality traits of these individuals, who are early adopters of the future of work, and how their motivation corresponds with how different ICs are organized.

**Creative Problem Solving in Online Innovation Contests****CONCLUSION AND FUTURE RESEARCH DIRECTIONS**

Further studies should continue to address how we can analytically conceptualize and empirically assess motivation in the new collaborative economy. First, the findings in the present study illustrate that the collaborative economy is evolving in various sub-sectors, making it more difficult to describe motivation within the framework of a few core dimensions. For example, in the most cited article (Google scholar) on motivation in the collaborative economy, Hamari et al. (2016) propose four important motivational factors in this new economy, namely sustainability, enjoyment, reputation, and economic benefits. In contrast, the present study suggests the use of six motivational factors, including several sub-dimensions.

Second, the solver profiles in the present study provide evidence that in some sectors, motivation needs to be investigated as a complex mix of complementary rather than mutually exclusive factors. For example, none of the IC top solvers are motivated by the prize money alone but describe various important motivational factors. One should, therefore, be careful of proposing motivational dichotomies, as do Hamari et al. (2016) in pitching altruistic (sustainability) against individualistic (economic benefits) motivational factors. Consequently, future studies should consider measuring the presence of different motivational factors in both ICs and other sectors of the new collaborative economy. It is also important to investigate the motivation of all solvers, not only the top solvers. We know little about the large majority of solvers who have not won any prizes. A survey could map the relative importance of different factors in the proposed motivational framework and provide more demographic information about the group. Here, accessing user data will be an important issue, as platforms are often restrictive about giving such permissions (Frenken & Schor, 2019).

Third, the present study shows that motivations are quite different when trading creative services compared with trading goods or services that require simple skills. There is a need for further theoretical discussions and a better understanding of how online ICs stimulate motivation in different ways. As previously mentioned, we must explore not only our conceptual understanding of enjoyment in the new collaborative economy but also other motivational factors that can supplement economic motives.

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### **KEY TERMS AND DEFINITIONS**

**Collective Intelligence:** Group problem-solving, which includes large-scale collaboration in an online setting.

**Creative Problem-Solving:** The process of solving complex, open-ended problems.

**Intermediaries:** Companies that organize innovation contests for seekers. They provide services that make it easy for a solution-seeking organization to use the knowledge of a large pool of solvers.

**Motivation:** The reason(s) for acting in a specific way, for example, individual needs, desires, wants, or drives.

**Online Innovation Contests:** A contest hosted by an organization seeking help from outsiders to solve an internal problem. A large number of individuals are invited to join online, and the persons who solve the problem win prize money.

**Seeker:** Any solution-seeking organization that has a problem and tries to solve it through an innovation contest. Seekers can be both large and small firms, governments, and other organizations.

**Solver:** Any person who participates in an innovation contest and attempts to solve a problem formulated by the seeker.