Chapter 13
Pico-Jobs as an Open Innovation Tool for Utilising Crowdsourcing

Case Study of a Leading Manufacturer of Light System Solutions

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Abstract The Internet enables new forms of crowdsourcing by electronic platforms. Companies can use these platforms for opening up their innovation processes and for integrating customers by small, highly structured paid tasks. We call these tasks Pico-Jobs and illustrate them as an open innovation tool for systematically utilising the creative potential of customers for activities during the innovation process. The characteristics of Pico-Jobs are elaborated by reviewing leading crowdsourcing platforms and the Pico-Jobs offered on these platforms. Overall, companies can use Pico-Jobs for three different purposes: (1) Crowd Wisdom, which allows users of these crowdsourcing platforms to share their knowledge and perceptions with the company, (2) Crowd Creation, which encourages the creation of new content or artefacts on these platforms and (3) Crowd Voting, which involves platform users for the evaluation of product ideas, prototypes or designs. Our real-world case with OSRAM pinpoints these application patterns of Pico-Jobs and their potential for speeding up customer integration for generating and evaluating ideas for innovations.

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13.1 Introduction

In order to improve their innovativeness, more and more companies in various industries are changing their traditional approach of developing innovations (OECD 2009). Opening up the closed innovation development paradigm in order to utilise external resources for innovation activities becomes increasingly important. For this emerging competitive strategy of open innovation, customers are frequently seen as having enormous potential for creativity (Kristensson et al. 2002) and generating innovations (von Hippel 2005).

In conducting open innovation, firms aim to integrate customers along the entire innovation process for various activities. Hence, companies can consider different perspectives of their customers and develop innovative products and services tailored to the specific needs of their customer base more effectively. Thus, utilising the "collective intelligence" or "wisdom of crowds" is an underlying principle of customer integration into innovation processes (Liber and Spector 2007; Surowiecki 2005a, b). Therefore, companies increasingly begin to exploit this phenomenon of collective intelligence in order to change the traditional way R&D departments used to function (Blohm et al. 2010b). Figure 13.1 illustrates the differences between the closed and open innovation paradigms.

Open innovation intermediaries such as InnoCentive, provide platforms on which companies can post R&D problems as challenges that are open to solve for anyone. Further, prediction markets such as the Iowa Electronic Markets capture collective wisdom by creating networks of individuals with special knowledge and thus help companies to solve their most sophisticated scientific problems or provide accurate predictions. For instance, Boeing, DuPont and Procter and Gamble regularly use the InnoCentive platform to find solutions for some of their most ornery product development issues (Dushnitsky and Klueter 2011). On average, more than 30 % of the posted tasks are being solved, which is "30 % more than would have been solved using a traditional, in-house approach" (Howe 2008).

A new type of marketplace for crowdsourcing has evolved on the Internet in order to make the collective intelligence of Internet users usable to companies. Platforms like Amazon's Mechanical Turk (mturk) install a member base third party that can offer small and structured tasks which cannot be solved automatically (i.e. Pico-Jobs) (Blohm et al. 2010b). In this context, we use the Latin term "pico" because it means "small" and emphasises one of the core characteristics of Pico-Jobs. In this chapter, a new method for systematically utilising the creative potential of the users of these platforms for activities along the innovation process is illustrated on the basis of a real case.

This chapter addresses two prevalent research questions in order to investigate the application of Pico-Jobs as a new tool of open innovation. Firstly, what are the characteristics of Pico-Jobs and how can they be used to integrate customers into

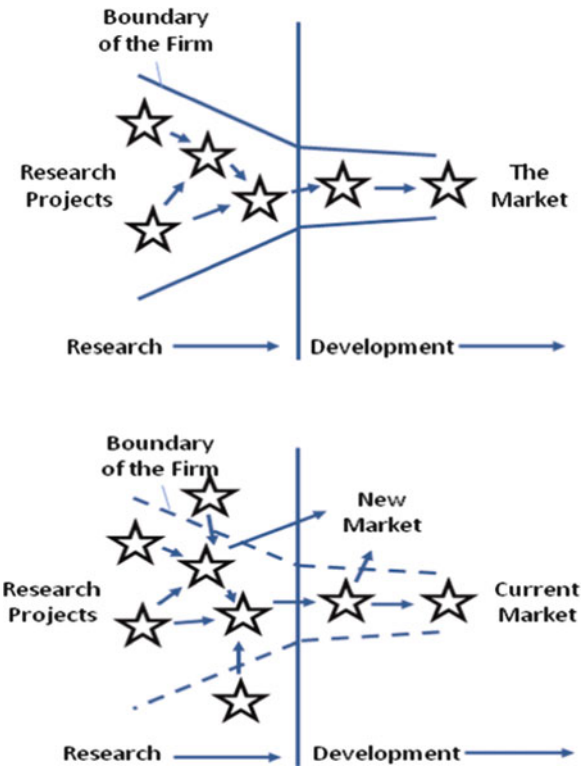


Fig. 13.1 Closed and open innovation. Source: Following Chesbrough (2003)

the innovation process? In the first instance, leading crowdsourcing marketplaces in the German and English-speaking Internet such as mturk have been analysed regarding their size, the offered jobs, the characteristics of task solvers and providers as well as the process of offering jobs. The platforms have been identified by conducting expert interviews and doing Internet research in the German and English-speaking Internet. Included were all platforms that offer paid jobs and act as an intermediary between job providers and solvers. For each platform, 30 randomly selected Pico-Jobs were content analysed and categorised regarding their structuredness, variability and complexity.

Based on this analysis, a case study at OSRAM was conducted in order to analyse and examine the application of Pico-Jobs in an organisational context. OSRAM is a leading manufacturer of light system solutions. In the scope of this case study, several interviews with a German innovation consultancy, Innosabi, were conducted. Innosabi is specialised in open innovation and conducted a workshop for developing new applications of LED light bulbs using Pico-Jobs together with OSRAM. Moreover, the artefacts of this workshop as well as the Pico-Jobs used in this case study were content analysed.

13.2 Integrating Customers and Their Creative Potential

In literature and practice, four core practices for integrating customers into the early stages of the innovation process, where ideas for innovations were generated, are discussed. These are the Lead-User-Method, Toolkits, and Idea Competition and Innovation Communities.

The Lead-User-Method implies systematic identification of single innovative customers, so-called lead users, and their integration into workshops in order to generate ideas and concepts for new products or services together with companies' employees (von Hippel 1988, 2005).

Toolkits encourage users to think about problems with current products or offer applications to modify and configure existing products. They support customers to externalise their ideas and guide interaction between customers and manufacturers (von Hippel and Kats 2002; Jeppesen 2005). Thus, toolkits structure the process of customer integration and provide various means for providing feedback and enabling learning-by-doing (Piller and Walcher 2006).

By conducting Ideas Competitions, companies attempt to collect innovative ideas from customers (Leimeister et al. 2009; Blohm et al. 2010a, b). Ideas competitions is an emerging approach in practice, in order to capture the voice of the customer that becomes manifested in the customer ideas. Therefore, manufacturers reduce their attempts to understand user needs in favour of transferring need-related aspects of product and service development to users themselves.

Innovation communities are a very similar approach to ideas competitions, but are not restricted by time. They build on the principle of user collaboration. Whereas ideas competitions build on the premise of competition in order to stimulate participation and motivation among participants, ideas communities animate customers to collaborate with each other. In such communities, initially developed ideas are picked up by other community members and these ideas are elaborated step by step (Bretschneider 2011). Not only can each participant contribute his/her own ideas but also connect with idea contributors that submitted similar or complementary ideas, and elaborate on ideas in collaboration. Thus, the various networks or teams collaboratively elaborate ideas that might be better, more meaningful and more relevant than those initially submitted (Bretschneider et al. 2008).

In the following, we introduce Pico-Jobs as a new method for integrating customers and their creative potential via crowdsourcing marketplaces over the Internet.

13.3 Pico-Jobs and Their Characteristics

In this section, leading crowdsourcing marketplaces are compared on the basis of their size, the type of tasks offered, the characteristics of task solvers and providers as well as the process of offering jobs in order to work out the characteristics of Pico-Jobs. Table 13.1 gives a brief overview of the platforms.

Table 13.1 Investigated crowdsourcing marketplaces

	Origin	Online since	members	Team for job solver	#jobs
Mturk	USA	2005	>400,000	Mechanical Turk Worker	>100,000
Clickworker	Germany	2009	>4,000	Clickworker	>1,500
Bitworxx	Gremany	2008	>10,000	Bitworker	n.a.
Shorttask	USA	2009	>20,000	Solver	>15,000
Liveops	USA	2009	>53,000	Agent	>50,000
Klickwork	Austria	n.a.	n.a.	Webworker	<100

Source: http://www.mturk.com; http://www.clickworker.com; http://www.bitworxx.com; http://www.shorttask.com; http://www.liveops.com; http://www.klickwork.com (retrieved on February 22, 2012)

Fig. 13.2 Exemplary task posted on Mturk. Source: http://www.mturk.com (retrieved on February 22, 2012)

The jobs on these marketplaces comprise a high thematic variability ranging from tagging and categorising photos, any kind of content creation, market research and translations to responding surveys. Tasks can generally be characterised by their structuredness (degree to which tasks can be broken down into independent solution steps required to solve a task), variability (amount of changes required to solve a task) and its complexity (amount of decision problems and decision variables that have to be taken into account in solving a task). A typical job that can be found on the crowdsourcing marketplaces is categorising content such as products (cf. Fig. 13.2).

As shown in this example, most jobs consist of only one or very few steps in order to get successfully completed: the jobs are therefore highly structured. Moreover, the job solvers have to repeat the same task very often to accomplish the job. Thus, variability of the jobs is rather low. The results of the jobs are generally well defined because of the high structuredness and the low variability. The task's target groups vary vastly. Whereas some tasks address only a single person or a small group of persons with very specific skills (e.g. in the case of English–Chinese translations of technical manuscripts), others address a large crowd of task solvers (e.g. in the case of tagging photos). Task complexity is strongly depending on the platform on which the jobs are posted. On mturk most tasks have a low degree of complexity. However, on platforms such as liveops, task specificity and complexity are higher with tasks from auditing, healthcare or legal domains.

The *process* of solving jobs is quite similar on all platforms. Generally, all job solvers can pick the jobs they like to process from a central ideas pool in which all

Table 13.2 Characteristics of the jobs posted on crowdsourcing marketplaces

	Structuredness	Variability	Complexity	Type
Mturk	high	high	low – medium	market based
Shorttask	Medium	Low	Low	market based
Klickwork	medium	low	low – medium	market based
Clickworker	medium -high	low	medium – high	service based
Bitworxx	medium -high	low	low – medium	service based
Liveops	high	low	high	service based

Source: http://www.mturk.com; http://www.clickworker.com; http://www.bitworxx.com; http://www.shorttask.com; http://www.liveops.com; http://www.klickwork.com (retrieved on February 22, 2012)

open jobs are stored. The same tasks are generally processed simultaneously and independently by several job solvers. For each successful completion, job solvers get money or points equalling money credited to their user accounts. When a certain amount is reached, e.g. US$10 in case of mturk, the money can be transferred to the user's bank account. Usually, the job solvers receive a couple of cents for each task—money is earned due to repeating the same tasks very frequently. In the above-mentioned example in Fig. 13.2, the job solver receives US$0.01 for each item that has been categorised correctly.

All platforms employ a quality assurance system consisting of an approval rate and qualification tests. Job providers can require job solvers to have certain qualifications that are needed in order to process a job. On mturk there are 3,088 different qualifications that job solvers can achieve such as *automotive categorisation qualification test, BTTS English/French fluency—L1 translator or audio transcript verification* that is defined as "a qualification for correctly rating the quality of an audio clip and its transcript for use in speech recognition training" (mturk 2010). Job solvers have to pass well-defined qualification tests in order to achieve these qualifications. Job providers can rely on already existing qualifications or define new qualifications they want their job solvers to have. Moreover, job providers can reject the results of the job solvers after job completion in case the work is of poor quality. An approval rate that is usually defined as the ratio of successful job completions is calculated for each job solver. Besides qualification tests job providers can require a minimum approval rate for the employed job solvers.

Table 13.2 summarises the characteristics of the jobs posted on different crowdsourcing marketplaces. On each marketplace we analysed the 50 most recent jobs and evaluated them according to their structuredness, variability, complexity as well as type (cf. Sect. 13.2). By structuredness we mean the variance of the task solving process. The lower the variance of the steps required for solving the job, the higher the structuredness of the job. Variability was evaluated by the variability of different jobs on the marketplace. The complexity of a job is defined by the number of different steps that are required in order to finish the job and by the requirements on the job solvers' qualifications.

Regarding posting jobs, two major types of crowdsourcing platforms can be identified (cf. Fig. 13.3). Some platforms offer forms which contain a job

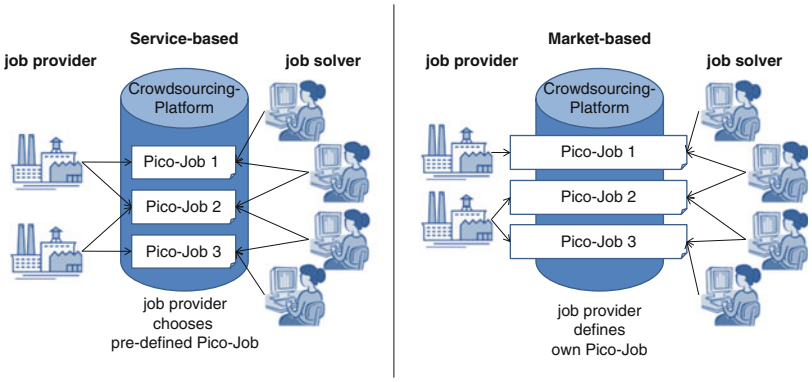


Fig. 13.3 Two types of crowdsourcing platforms

description, required qualifications, the job solver's remuneration and other job-related information. This type is called market-based because the platform is organised as a marketplace. On these platforms job providers have no constrained solution space so that the task can be defined totally freely by the job providers.

In contrast, other platforms offer a set of well pre-defined tasks to job providers. In this regard, this platform is more comparable to a traditional service company that sells pre-defined services that are delivered by the job solvers. This type is called *service-based* because job providers can only choose from pre-defined jobs of the platform.

The *job solvers* are usually private persons. According to Villaroel and Andrei Tucci (2009), mturk members are predominantly female (about 59 %), employed (about 71 %) and well educated: 64 % of respondents have a college degree or higher. Their professional background spans various industries, e.g. ranging from scientists, to lawyers, engineers and teachers. According to mturk, about 46 % of job solvers are Americans and 34 % are Indians. Most job solvers are motivated by fun and earning money. Another reason for participation is spare time (Villaroel and Andrei Tucci 2009). However, another interested target group is reached by the German platform Bitworxx: besides private persons the jobs are offered to call centre employees in order to utilise over capacities.

The *job providers* mostly comprise enterprises and freelancers. Private persons post jobs only occasionally. The content analysis of the jobs revealed that job providers span various industries, albeit IT-related industries, which are dominating.

Summing up the analysis, three major characteristics of the jobs offered can be defined (Blohm et al. 2010b):

1. The jobs are small, highly structured, repeatable and yield a well-defined result.
2. The jobs are processed asynchronously and distributed for remuneration.
3. An online platform acts as financial and operational intermediary between job solvers (usually private persons) and job providers (usually corporations) and defines the process of cooperation.

Synthesising the three major characteristics of the jobs posted on crowdsourcing marketplaces, *Pico-Jobs* are defined as (Blohm et al. 2010b): small, highly structured and repeatable tasks that are processed asynchronously and distributed for remuneration via crowdsourcing marketplaces on the Internet.

13.4 Categories of Crowdsourcing

Pico-Jobs are a tool for using crowdsourcing in order to integrate external knowledge into innovation processes, from problem definition, ideas generation as well as idea and concept evaluation.

According to Howe (2008), the notion of crowdsourcing encompasses a number of different approaches, which vary according to the nature of contributions made by the crowd. For this reason, the choice of an appropriate model or a combination of models primarily depends on a company's needs and goals to be achieved via a crowdsourcing initiative. Crowdsourcing activities can be subdivided into crowd wisdom, crowd creation and crowd voting.

The major idea driving crowdsourcing and in particular its *Crowd Wisdom* model is that groups of people accumulate more knowledge than single individuals. "The crowd possesses a wide array of talents, and some have the kind of scientific talent and expertise that used to exist only in rarefied academic environments" (Howe 2008). Crowd Wisdom implies that the crowd is a source of creative energy and thus can be highly useful for activities such as articulating needs or experience. The phenomenon of interest in Crowd Wisdom is the job solver as potential customer and knowledge carrier. Pico-Jobs for utilising Crowd Wisdom allow companies to gather customer inputs, consolidate and evaluate these inputs very fast, in order to flow those findings back into further Pico-Jobs. Companies can use Pico-Jobs to react very fast to dynamics in innovation processes by many, short feedback cycles, e.g. for generating an understanding of customer perceptions or identifying applications for new technologies. For improving an existing product, companies can, e.g. ask customers for an emotional evaluation of the existing product, how they actually use the product and for ideas of novel applications. In every step, inputs from the previous step of all participates—the so-called crowd—can be recognised.

While the Crowd Wisdom model focuses on opinions and experiences of the job solvers, *Crowd Creation* "involves cultivating a robust community composed of people with a deep and on-going commitment to their craft and, most important, to one another" (Howe 2008). In this category, job solvers create new content or artefacts, or enrich an existing artefact and deliver it to the job provider via the crowdsourcing platform. Examples of Crowd Creation with Pico-Jobs are language translations, producing effective TV commercials, adding metadata to product descriptions as well as describing and tagging pictures. Phenomenon of interest is the new content or artefact.

Crowd Voting is another category of crowdsourcing, which "uses the crowd's judgments to organise vast quantities of information" (Howe 2008). Evaluations of alternative ideas, concepts or designs represent examples of Pico-Jobs for crowd

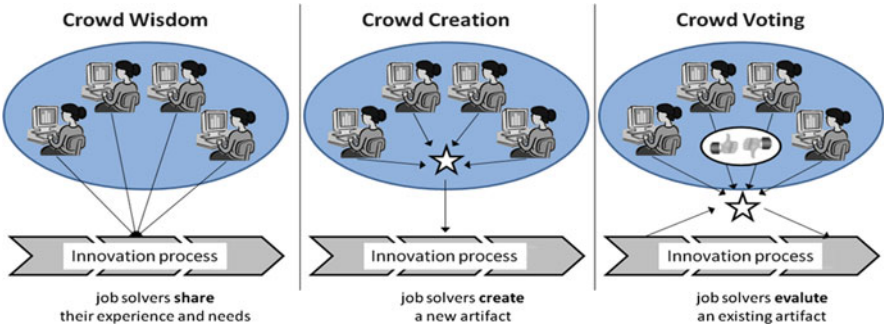


Fig. 13.4 Three categories of Crowdsourcing and related Pico-Job

voting. Compared to Crowd Wisdom, in this category the job solvers evaluate an existing artefact instead of sharing their own experiences or needs. The phenomenon of interest in Crowd Voting is the evaluation of an existing artefact.

In Fig. 13.4, all three categories of crowdsourcing and related Pico-Jobs for integrating customers across the innovation process are illustrated.

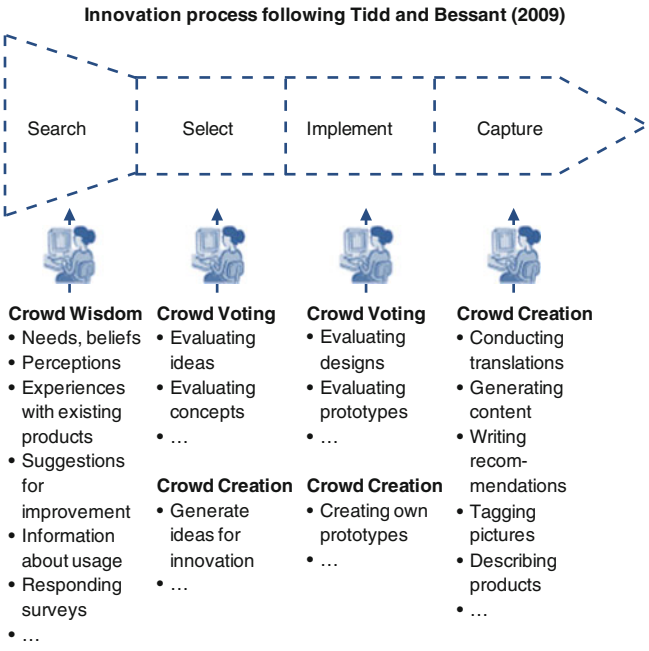
13.5 Crowdsourcing-Related Pico-Jobs in the Innovation Process

Crowd Wisdom, Crowd Creation as well as Crowd Voting can be utilised by Pico-Jobs for innovation processes. We suggest analysing each phase of the innovation process in order to identify opportunities of using crowdsourcing with Pico-Jobs. Our analysis is based on the innovation process of Tidd and Bessant (2009), which consists of four phases:

- Search—how can we find opportunities for innovation?
- Select—what are we going to do–and why?
- Implement—how are we going to make it happen?
- Capture—how are we going to get the benefits from it?

In the phase, *Searching*, companies are scanning their internal and external environment for relevant signals about threats and opportunities for change. Pico-Jobs can therefore help to use crowd wisdom to identify these signals by asking corresponding questions about needs, beliefs or change of customers' behaviour. In addition, information about usage of, and experiences with, existing products as well as suggestions for improvement can be used by companies as signals. All information can be gathered by Pico-Jobs. Furthermore, companies can use Pico-Jobs to find people around the world to research for specific, especially local, information. Crowd creation and voting are not yet applicable in this innovation phase because companies do not even know what they will innovate. The main contribution of Pico-Jobs in this innovation phase is to understand the customer.

Table 13.3 Possible applications of Pico-Jobs as a tool for open innovation



In the next phase, *Select*, companies decide on the basis of their strategic view which of these signals to respond to. Here again Pico-Jobs can utilise collective intelligence for generating and evaluating possible innovations. On the one hand, Pico Jobbers can generate their own ideas for innovations, and on the other hand, they can evaluate or comment ideas. Crowd voting is a great possibility to get feedback from Pico-Jobbers about innovation ideas and concepts, and to support the selection process during the Select phase. The focus is placed on interaction with customers.

Implement is the third innovation phase and contains translating the potential in the trigger into something novel and to launch it. The biggest potential for Pico-Jobs in this phase is crowd voting. Pico-Jobbers can vote and comment on designs and prototypes. In summary, companies can provide customers the possibility to participate in decision making about the solution.

The last phase of the innovation process is called *Capture* and focuses on how companies are going to get the benefits from the innovation. In this phase, Pico-Jobbers can mostly contribute through content creation. The innovation is already launched and must be enhanced continuously. Pico-Jobbers can help, e.g. with translations, generating content on websites or forums, writing recommendations of products or tagging pictures.

Table 13.3 summarises the opportunities of Pico-Jobs across all phases of the innovation process.

13.6 Using Market-Based Pico-Jobs in Practice at OSRAM

In the case, Pico-Jobs were applied for developing new applications for light emitting diode (LED)-based light bulbs at OSRAM, a leading manufacturer of light system solutions (Blohm et al. 2010b). In contrast to traditional incandescent light bulbs, LED bulbs do not create light by a glowing wire. LED light bulbs have a common shape but consist of several LEDs on the inside. The LED technology results in longer lifetimes and smaller energy consumption. Moreover, LED enables wholly new lighting applications such as smart light applications adapting to their environment. However, developing new applications for light bulbs is difficult as customers are very price sensitive and alternative lighting solutions as energy saving bulbs are frequently suffering from a bad image.

For these reasons, OSRAM engaged in integrating customers into the development of new applications for LED-based light bulbs. In the first instance, Pico-Jobs were used to get a deeper understanding of how customers use light bulbs in general and how different types of light bulbs are perceived. Therefore, Pico Jobbers were asked to describe situations in which they directly interact with light bulbs. For solving these Pico-Jobs an approval rate of 98 % was rewired as qualification. In return, Pico-Jobbers earned between US$0.10 and 0.50 for each completed Pico-Job. Moreover, Pico-Jobbers were rewarded with a bonus of US$0.50 for outstanding work. Due to this surplus, fast response times and high quality of results could be warranted.

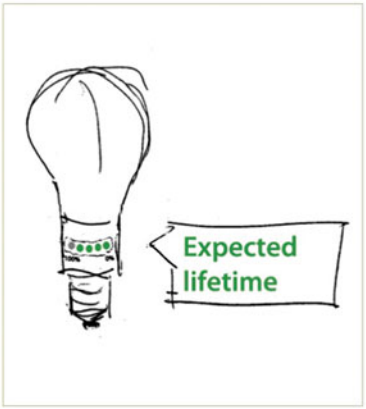
The results of these Pico-Jobs were content analysed and used to deduct assumptions about usage patterns of light bulbs. These assumptions were again translated into Pico-Jobs and placed on mturk. Using this storytelling approach with a magnitude of iterations, a holistic comprehension of the needs and the associations of light bulb users could be gained (Zaltman 1997). Altogether, about 150 Pico-Jobs for Crowd Wisdom were posted and 1,889 responses were gained. A model for explaining usage behaviour and perceptions of lighting bulb customers could be gained by content analysing these responses. Based on this model search areas for new LED applications were defined. For instance, a magnitude of customers stated that they are frustrated with light bulbs breaking, because light is generally needed in the moment the light bulb burns out.

In a second step, these search areas such as “avoiding customer frustration” were used as a starting point for a brainstorming workshop with marketing and R&D employees of OSRAM in order to generate new product ideas that highlight the benefits of LED bulbs in terms of Crowd Creation. For instance, several ideas for light bulbs displaying the light bulbs remaining life time were developed. During the workshops, all ideas developed were instantly evaluated using Pico-

Jobs as Crowd Voting, resulting in 50–100 evaluations for each idea. These validated ideas then were used as stimuli for refining the ideas and generating new ones (cf. Table 13.4).

According to OSRAM, the results developed with this Pico Job approach (cf. Fig. 13.5) provided high value for the entire new product development process and allowed an effective integration of a magnitude of customer responses.

Table 13.4 Example of a Pico-Job and corresponding answers

Pico-Job	**Now here we go:** • **Please take a look at the drawing of an innovative light bulb.** • This bulb has a **signal** at its base that shows the life expectancy of this lamp, the time left until it is going to fail. • Please let us know your opinion about this idea! Would you use this kind of bulb? Please give a reason to your answer. What would you change about this kind of bulb? Would you be willing to pay more for this kind of lamp? If yes, how much (compared to the bulbs you buy regularly)? 
Answers	*"OMG!! I would love this bulb. I am caught without bulbs sometimes and I think this would actually make me remember to get some." (anonymous Pico-Jobber)* *"Maybe a visual change in colour that the light bulb emits when it is getting close to expiration would be better" (anonymous Pico-Jobber)* *"Why would I want to grab a ladder, remove a fixture cover, and check my bulbs on a regular basis when it's much easier to wait until one needs attention?" (anonymous Pico-Jobber)*

Source: following Blohm et al. (2010b)

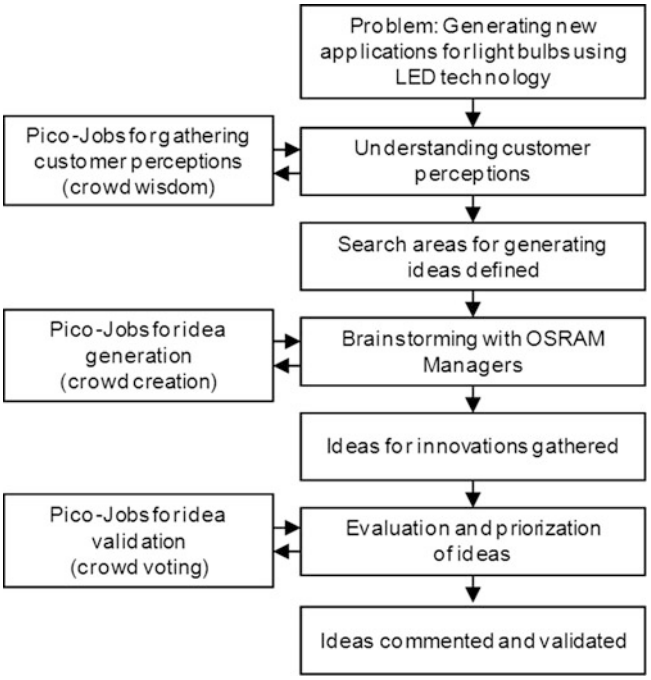


Fig. 13.5 Application of Pico-Jobs at OSRAM. Source: following Blohm et al. (2010b)

This approach combines all three categories of Pico-Jobs—Crowd Wisdom, Crowd Creation and Crowd Voting—in order to define search areas based on valuable feedback from customers, generate appropriate ideas as well as comment and evaluate the ideas.

13.7 Practical Advice

The case illustrates Pico-Jobs as a new tool for open innovation. On the one hand, several advantages emerge for companies and job providers. First, the amount of time used in product development could be radically reduced. In comparison to web-based ideas competitions (Blohm et al. 2010a; Ebner et al. 2009; Leimeister et al. 2009) or surveys, only very little amount of time and costs for pre- and post-processing incur for the job provider. Second, the job provider gets the results quickly due to a very short response time of the job solvers. In our case, more than 100 answers could be gathered within a couple of hours. Third, Pico-Jobs reduce the cost risk to a minimum, because no overhead costs incur for the job provider and one only has to pay for useful inputs exceeding a minimum quality defined by the job provider. Fourth, the job providers do not have to reveal their identity and the single Pico-Jobs are fragmentised so that third persons cannot estimate what subject the job provider is working on. Due to this reason as well as the remuneration, intellectual property can easily be transferred to the job provider. Furthermore, job providers get access to a large group of customers, which results in a variety of inputs from many different perspectives; this is especially interesting since those customers feel an intimacy, which allows a deep understanding of their real needs and pains with a product or service. This could not be achieved with less anonymous methods. On the other hand, a high variance of input quality resulting in high efforts for data analysis and self-selection effects of job solvers seem to be limitations of Pico-Jobs. In particular, Pico-Jobs for crowd wisdom bear the risk of imprudent and untrue answers because, on the one hand, it is difficult to verify them and, on the other hand, Pico-Jobbers are interested in solving as many jobs as possible to maximise their remuneration.

There are also some disadvantages for the job solvers. They often can only choose from simple and click-based tasks and are sometimes poorly paid. On the other hand, Pico-Jobs also offer advantages for job solvers. They get the opportunity to work from home, choose their own working hours, get paid for doing good work and can choose from many different tasks. We could observe high intrinsic motivation to solve product development tasks—despite external motivation by a payment. These kinds of tasks differ from the majority of tasks offered like picture tagging or research of addresses that represent examples of crowd creation. Comments show that product development tasks are more fun for the participants and are therefore chosen over other kinds of tasks.

Table 13.5 summarises the most important advantages and disadvantages for both job providers and solvers.

Table 13.5 Advantages and disadvantages of Pico-Jobs as a tool of open innovation

Advantages for job provider	**Advantages for job solver**
short preparation time	work from home
Cheap	choose own working hours
fast response time	get paid for doing good work
Anonymity	big variety of different tasks
variety of inputs	earn money "in the meantime" with small tasks
Disadvantages for job provider	**Disadvantages for job solver**
high variance in input quality	sometimes bad paid
limited types of tasks	often only simple tasks
sometimes high effort for evaluation	remuneration is dependent on quality of results (no guarantee)

Bonabeau (2009) emphasised various biases that can be reduced by the use of crowdsourcing applications: On the one hand, people tend to seek information that confirms their assumptions and to maintain those assumptions even in the face of inconsistent evidence by generating solutions. On the other hand, in matters of the evaluation of solutions, people tend to perceive patterns where none exist and to exorbitantly influence by the presentation of the solution. The case shows that Pico-Jobbers mitigated those and further biases, e.g. by obtaining diversity of assumptions, anchors and beliefs.

Practical Tip

We derived some success factors from the case for successfully applying Pico-Jobs for integrating customers in innovation activities:

Define a clear task statement because of limited options for job solvers to ask questions for clarification. Job solvers will not even realise that they do not solve the job in an appropriate way.

Provide examples for valid as well as invalid results to support job solvers with solving the job.

One Pico-Jobs—one task. Offer multiple simple rather than complex Pico-Jobs. That makes it easier for job solvers to find an appropriate job and solve it properly, and for job provider to evaluate the results and calculate the remuneration.

Provide a structured template in order to minimise the variety of result representations.

Use low costs of Pico-Jobs for quality control through the comparison of the same results generated by different job solvers.

Offer fair remuneration. The higher the remuneration, the more job solvers will try to solve the job despite their qualification and ability. The lower the remuneration, the less job solvers will recognise the job in the pool of Pico-Jobs.

Do not underestimate the time for evaluating and post-processing the results so they can be used in the innovation process.

Design the job as interesting as possible. If suitable and useful, use multimedia or other entertaining elements to motivate the job solvers and support them with generating high quality results.

13.8 Implications for Research

This research shed light on the phenomenon of jobs offered on crowdsourcing marketplaces which we call Pico-Jobs. We also described their application in innovation processes for the first time. The case demonstrated the applicability and practicability of Pico-Jobs as an open innovation tool. However, there are still open issues to be solved. The following research questions refer to some different aspects of Pico-Jobs that are still unsolved and need to be researched in the future:

Which types of task are applicable for Pico-Jobs and why?
How should tasks be broken down for Pico-Jobs?
What may concepts, methods and tools for quality management look like?
What are suitable incentives for motivating customers to participate in Pico-Jobs?
Which theories could be used and extended?
What may an overall management concept for Pico-Jobs look like?

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