

Debate About the Concept of Value in Commons-Based Peer Production

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Abstract. We describe a new model of collaborative production called Commons-based peer production (CBPP). This model is frequently supported by digital platforms characterized by peer to peer relationships, resulting in the provision of common resources. Traditionally, it is associated with cases such as Wikipedia or Free Software, but we have recently observed an expansion into other areas. On the basis of an extensive empirical work, we enquired -How does CBPP apply value? and How does value creation function in CBPP? We present an updated version of the meaning of value and sustain the relevance of this debate. After that, we propose how to measure value. We formulate what we call internal and external indicators of value. The first are linked to the internal performance of the CBPP and the second relates to its social value and reputation. Finally we highlight the main features of value that we identified and discuss the limits that we found developing and implementing the proposed diversity indicators.

Keywords: Commons-based peer production · Collaborative economy · Peer to peer production · Value production · Crowd-sourcing

1 Introduction

Several authors have defined CBPP, most importantly Yochai Benkler [8], who partly relying on the work on the traditional commons developed by the 2009 Nobel Laureate Elinor Ostrom [19] systematized a new concept aimed at grasping an emerging and distinctive model of production: Commons-based peer production (CBPP) [7, 8]. Benkler created the term CBPP to describe forms of production in which, with the aid of the Internet, the creative energy of a large number of people is coordinated into large, meaningful projects without relying on traditional hierarchical organizations or monetary exchanges and rewards [8].

But apart from Benkler's initial work, the CBPP concept is still theoretically underdeveloped and is almost nonexistent as an empirically supported theory. After reviewing the previously mentioned characteristics of CBPP, through a questionnaire given to

experts, we have come up with a set of criteria in terms of the delimitation and classification of CBPP (see an extended presentation in “Criteria of Delimitation” [10]). These criteria also define our unit of analysis.

This collaborative production model is frequently enforced or supported through a digital platform, resulting in the provision of common resources. It agglutinates a set of diverse areas of activities and cases that tend to be characterized by peer to peer relationships (in contrast to the traditionally hierarchical command and contractual relationships, with limited mercantile exchange), and/or results in the (generally) open access provision of commons resources that favor open access, reproducibility and derivativeness.

Traditionally, it is associated with cases such as Wikipedia or Free Software, but we have recently observed an expansion into other areas of this production model. For instance, on platforms dealing with car sharing, house sharing, apps exchanging and selling second hand objects or sharing specialized knowledge and notes among university students.

The proliferation and diversity of collaborative platforms is creating significant problems for traditional conceptions of productivity and value. First, because of the growing economic relevance of these types of platforms [4], and secondly due to the problem of how to regulate and reward activities that presently have no market value (e.g. the externalities produced by Free Software for the software industry).

In this vein, the paper addresses these central questions. **How does CBPP apply value?, How does value creation function in CBPP? And what type of value is created?** To answer these research questions, the paper presents the following sections: first, we make a short review of the latest value studies on CBPP and we debate about the relevance of value indicators beyond traditional monetary indicators. We approach the construction of a framework to investigate value within CBPP, providing a set of dimensions of value and applying them empirically. Next, we explain the methods on how we built -to the best of our knowledge- the biggest CBPP database in order to answer, with strong empirical support, our research question. In this section, we also explain the type of statistical analysis that we ran to identify patterns on how CBPP generate value. In the results section we indicate the multiple dimensions of value we developed and test if they are correlated between them. When we present the dimensions of value, we talk about what we called indicators of internal and external value. Finally, we discuss some preliminary conclusions about the generation of value in CBPP and we present further lines of research.

2 The Debate About Value and the Need to Build Value Indicators

The proliferation of collaborative communities is creating significant problems for traditional conceptions of productivity and value. As far back as the 1980s, new forms of collaborative knowledge work were challenging notions of white-collar productivity, rendering the measurement and management of knowledge production problematic [1]. Since the 1990s, questions about the meaning and measurement of value have been

raised due to an increasing reliance on socialized forms of collaborative knowledge production in the creative industries [9, 21], in the creation and maintenance of reputation in brand communities [3], in various forms of user-driven innovation [24] and in shared, open, and free forms of productive relations [6, 14, 18]. The ability to measure and define valuable intangible assets—such as brands, intellectual capital and organizational flexibility—remains a pressing problem given the increasing importance of these assets, which are estimated to account for around 70 % of the market value of S&P 500 companies [4]. New definitions of value are necessary to evaluate the contribution of the wide diversity of productive activities.

However, the question of value in collaborative communities is not only an economic one, but also a question of justice. The problem of how to regulate and reward activities that have at present no market value (e.g. the externalities produced by Free Software for the software industry) is contingent on the ability to find a rational and transparent measure of value. The latest developments have emphasized the diversity of notions of value that operate within the information economy. In this paper, we approach the construction of a framework in order to investigate value in CBPP, providing a set of dimensions of value and applying them empirically.

Strategies to quantify the value produced by CBPP by using monetary metrics -for example, quantifying the cost of the work time necessary for the production of its outcomes or by estimating the “consumer surplus” by price experiments- fail to recognize the specificity of these forms of production. Our approach -to a large extent- bypasses the monetary metrics (for a similar strategy, see Wenger et al. [25]). Arguably, without money as a general equivalent, what happens is that the notion of value breaks down into a world of uncertainty, contention and plurality of meanings. However, our choice goes along the growing understanding that “any evaluation exercise should always incorporate a plurality of perspectives on what constitutes value” [17].

2.1 Our Contribution to the Debate About Value

The application of conventional value metrics is increasingly problematic not only in CBPP, but more generally in information and knowledge economics. New definitions of value are necessary in order to evaluate the contribution of the wide diversity of productive activities. We approach the theoretical and empirical foundations for building a framework to investigate value in CBPP by providing a set of dimensions of value, and applying them empirically. There are clearly five different dimensions of value and they have diverse data sources. On the one hand -concerning the dimensions related to community building, objective accomplishment and monetary value-, the data sources were the same CBPP communities we questioned through a survey. From now on, these indicators will be named as “Internal Indicators of value”.¹

¹ When building our conceptual framework, we also identified a sixth dimension, which we called Ecological value. However, according to our understanding, this dimension could be quite distinctive and crucial in grasping value within CBPP. We could not find any feasible indicator to operationalize it.

Indicators of Internal Value

Community Building. The ratio, underlying the use of the dimension of the community surrounding the project as a proxy to assess the value generated by it, is that people participation as such is both a sign and a generator of value. On the one hand, the creation of a community is a productive result per se. Additionally, indicators of participation can be considered proxies of productive energies applied to production (and as proxies of the value of the work mobilized). At the same time, participation is an implicit indication of perceived value [13, 25]. Moreover, in many cases participation generates loops of value generation, through network effects [12] and increasing returns [2, 16].

Objective Accomplishment. The dimension of objective accomplishment focuses on a self-defined (indigenous) definition of success, rather than an “objective”, universal, external metric. It defines the value achieved, not in terms of monetary value, but in terms of the achievement of substantive missions that motivate the convergence of the stakeholders’ efforts. This strategy programmatically desists from identifying a universal, comparable measure among different projects. Rather, it assumes the uniqueness of the features and value programs of each one (along Ostrom’s insistence about the singularity of each). Yet, though it recognizes a plurality of definitions/standards/measures of value, at the same time this definition of value allows -to a certain extent- making comparisons, through a level of accomplishment scale of a mission from an applied subjective perspective. Additionally, this approach helps to catch the ad hoc, problem solving, mission-driven logic of many of these collective forms of collaborative action/production. Thus, it potentially accommodates a plurality of organizational configurations and relativizes the importance of the size and duration of the projects.

Monetary Value. In principle, commons and digital commons are not commodified. Thus, the capability of monetary metrics of capturing their core value is very limited. However, in many cases we observe hybrids rather than only “pure commons”, including commercial companies developing commons (often playing on the multi-layered outcomes, typical of this form of production). In fact, money can intervene at different moments, through different channels and with different functions within CBPP. For example, it can be a means to cover the costs of the development of the first copy of a resource, afterwards released as a commons; it can contribute in different ways to the sustainability of a project; it can even be the (indirect) core objective of the main developers (e.g. with Google’s Android). Moreover, in our society monetary economy dominates at large. Thus, it would be a mistake to completely overlook this dimension. However, at the same time, monetary metrics can distort the effective measure of value in CBPP. Just think about Wikipedia, its overall value could be considered higher than its monetary value.

Apart from what we classified as internal value, for the dimensions related to the social use value and reputation, we relied on proxies and indicators directly accessible by web analytics services (provided by Alexa, Google, Kred, Twitter and Facebook), which we collected automatically through scripts. From now on, these last indicators will be named as external indicators of value.

External Indicators of Value

Social Use Value. Conceptually, the usage or consumption of the resource produced by the community is clearly a measure of the value generated. What is more, we could say that a value to be “realized” requires usage or consumption. Production per se is not a sure indicator of the quantity of value generated. On one side, there is a lot of production that fails to provide utility and is not used. On the other side, there can be small productive communities that produce small resources, which -nevertheless- provide great use value (especially in conditions of non-rivalry, in consumption or usage). To a certain extent, this approach attempts to “objectify” the resulting value and gives a social and objective validation to subjective production (and to producers’ potentially biased assessment of its value), and socially validated criteria of success and failure. However, it does not deal with the quantity of the resulting resource per se. Since value can be validated and quantified only through actual use/consumption, these indicators also address a sort of community participation, but mainly through actions of consumption/use. At the same time, this approach -by recognizing value within consumption independently from price- helps to visualize the social value generated by the practices of open access to resources and the costs implied in the practices of imposing exclusion from the consumption of a non-rival resource.

Reputation. Reputation, on the other hand, is a crucial measure of value and success in contemporary economy (as with brands). From the beginning, the research on CBPP highlighted the importance of reputation as both a motivator for participation and a regulative value within community governance [5, 11, 23]. Reputation embodies the subjective and qualitative evaluation of the relevant stakeholders. It can be considered an indigenous, self-defined criteria of success or value that is not measured by money. However, according to Arvidsson and Peitersen [4], reputation can play a broader function. It can potentially aspire to encompass the fundamental functions of currencies in contemporary production -such as measure, storage and embodiment of value- and, along with the progression of digital connectivity, could potentially provide a synthetic, objective, more democratic (and dynamic) base and measure for a new value regime, different from the exchange value, and more suitable for the challenging characters of CBPP.

In order to operationalize the two dimensions of value -social use and reputation-, we have relied on proxies and used “external indicators of value”, that is, web analytics services, collected through scripts. In fact, for social usage, there might be communities that provide data on the social use of the resource produced by the community. However, this is not the case for all communities. Additionally, the data on usage provided by the communities is very diverse and difficult to compare. For these reasons, we preferred to rely on these external indicators.

As with any indicator, we have to recognize the limits in the operationalization of the concept of “value”, but beyond this inherent constraint in the creation of any indicator, one of our main caveats is having to use corporate indicators to measure what we called “external indicators of value”. The main problem with these indicators is the lack of transparency of the algorithms to calculate them. Nevertheless, they are the most

accepted indicators to measure social use and reputation on the Web, and they enabled comparing heterogeneous types of CBPP cases that otherwise would have been really difficult to compare. To summarize, we implemented the following dimensions and indicators of value.

3 Methods

The methodology is based on the statistical analysis of a sample of 302 cases. A “code-book”² for data collection -a set of indicators related to the analysis variables- was employed.). To create the sample, the use of a probability or random sample has several advantages. The most important benefit is the possibility to make inferences about the population with a certain degree of confidence. Randomization increases the likelihood that a large sample reflects the characteristics of the underlying population by avoiding assignment or selection based on the value of the variables of interest. However, randomization does not guarantee a representative sample per se. Additionally, random selection involves the risk of “missing relevant cases” [15]. Finally, there are limitations (such as the uncertainty regarding representativeness) to applying randomness to a population that is highly diverse and has an unknown size and boundaries [22]. In other words, using probability samples requires knowledge of the population—for instance, a list or census of the population, or at least a partial list -at some level- of the population. This is not the case in CBPP, which is diverse and whose “universe” is unknown.

Given the lack of adequate conditions and the unsuitability of developing a probability sample of diverse CBPP experiences, as well as the absence of a comparability goal, we used non-proportional quota sampling to build the sample of 302 cases. Our goal does not focus on representation. Rather, the sampling aims to support an analysis that allows us to compare diverse formulas of CBPP (i.e., a comparability goal). Because this sampling aims to guarantee diversity, we expected to be able to talk about even small groups in the universe of CBPP. We ensured the inclusion of a mixed type of CBPP experiences to reflect the heterogeneity of CBPP. From an initial list of cases identified (around 1000), we used different “matching” criteria to ensure the diversity of the sample. Additionally, in order to improve the robustness of our sample, we ensured the systematization of the sampling.

The case selection strategy for the sample was to filter out all the cases that failed to match the definition of CBPP (our unit of analysis). This pertains to the fulfillment of the delimitation criteria of CBPPs we defined, and which dealt with the presence of four features: collaborative production, peer relations, commons and reproducibility.

We included in our sample a diverse range of experiences, some of which are well known and important, in terms of the different dimensions of value that we considered (Table 1), but we also included many experiences that were almost unknown.

² <https://goo.gl/WcGhCi> Codebook (23/03/2016).

Table 1. Dimensions and indicators of value

Internal dimensions of value	Community building	Mission accomplished	Monetary value
	How many people—overall - do you estimate participate in the community?	On a scale of 1–10, how far has the project accomplished its mission?	What is the annual turnover (budget) of the project?
	How many registered accounts are there?		
	How many people do you estimate actively contribute to the community?		
External dimensions of value	Social use value of the resulting resource	Reputation	
	Alexa global rank		
	Google pagerank		
	Alexa inlinks		
	Google search results (putting the domain name of the CBPP case between brackets), all times		
	Google search results (putting the domain name of the CBPP case between brackets), last year		
	Facebook likes		
	Twitter followers		
	Kred: influence and outreach		

The data collection was based on four modalities: data from an open directory of CBPP cases (<http://directory.p2pvalue.eu/>), where we invited members of the CBPP cases -who in a cooperative way helped us to populate the directory-, a survey sent to the cases and web analytics services (data collected through scripts). Finally, during the data collection, “field notes” on general impressions were kept in a field book.

To guarantee the reliability of our sample, another team member (who collected no data on experiences) was assigned exclusively to randomly test almost 30 % of all the cases and verify the data of some outliers. In this way, we controlled the quality of our data. As for the data obtained through scripts, almost 15 % was manually contrasted.

For the statistical analysis of the data, we applied different non-parametric tests. We were aware that non-parametric methods are not as powerful as parametric ones. However, because non-parametric methods make fewer assumptions, they are more flexible, robust, and applicable to non-quantitative (categorical/nominal) variables. Some of the tests that we applied to our dataset were bivariate non-parametric correlations calculated using Spearman’s correlation [20].

4 Dimensions of Value and Descriptive Statistics

4.1 Internal Indicators of Value

Community Building. Data suggests that the scale of the communities is extremely variable (Fig. 1). There is not a very frequent range of number of people engaging or/and contributing, 201 to 1000 (or more) is the most frequent range of people that generally participate in the community and the number of registered accounts (although it is “only” around 20 % of cases for both indicators). In contrast, 51 to 200 (or less) is the most frequent range (23 %) of people that actively contribute to the community. It seems rational and in line with a power law dynamics, that the range of very active participants is lower than that of regular participants.

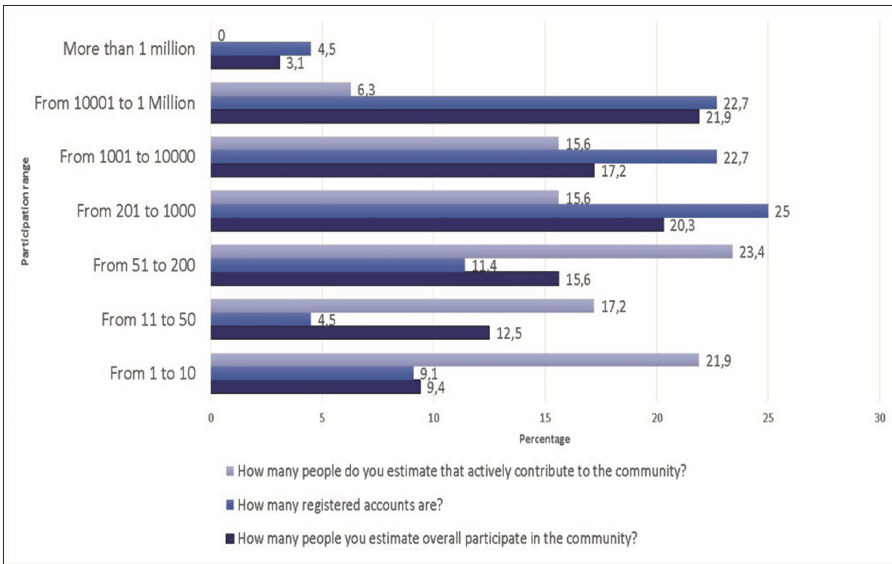


Fig. 1. Community building

Cases do not seem to be composed by very large communities. According to the two first indicators (people that participate and number of registered accounts), 50 % (the median) of cases are below 1000 participants and 60 % of cases (cumulative percent) are below 200 people that participate actively.

Objective Accomplishment. In order to ask the projects to assess their level of mission accomplishment, we asked them to evaluate on a scale of 1–10 how far the project had accomplished its mission. More than 50 % of cases rated their accomplishment from 7 to 10, which could be interpreted as more than medially satisfied in the accomplishment of the mission. The most frequent “score” ranges between 7 and 8 (around 20 % for each score). This suggests that in these cases, participants are quite satisfied (Fig. 2).

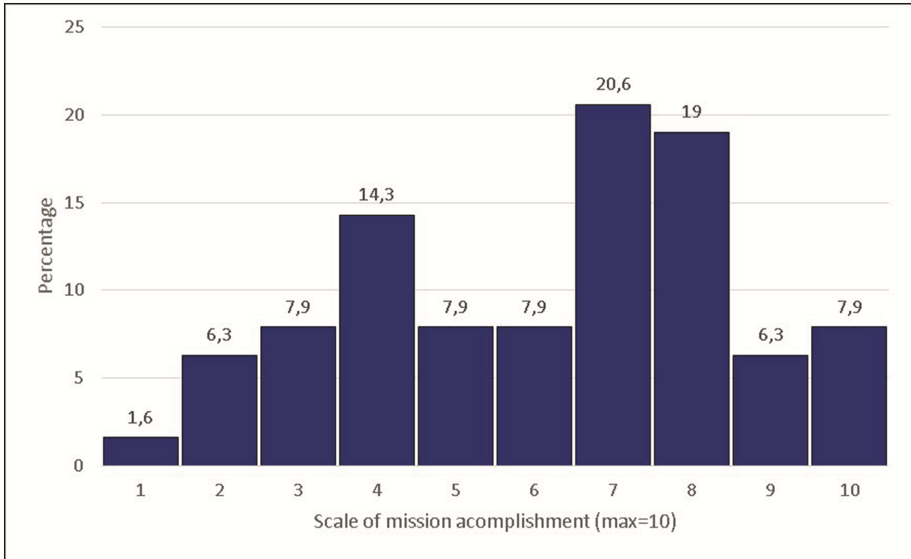


Fig. 2. Mission accomplishment

Monetary Value. In order to have a proxy of the monetary value mobilized around the cases, the survey asked what the annual turnover (budget) of the projects were. What we observed on the dimension of community building is similar to the monetary value of the CBPP communities. The majority of them have an annual budget under 1.000€. The answers obtained showed that 40 % of cases had the lowest turnover level (less than €1.000). This reinforces the idea that CBPP is an activity which has a low level of mercantilization. But around 25 % have more than €100.000 and 6 % more than

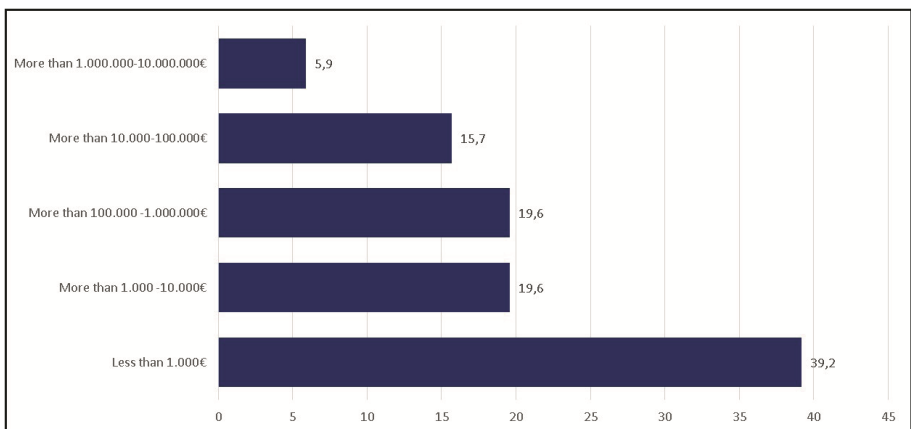


Fig. 3. Monetary value.

€1.000.000. The last case might be that of corporate oriented cases, or highly successful cases like Wikipedia (with an annual turnover of more than US\$40 million) (Fig. 3).

4.2 External Indicators of Value

The two dimensions of value underlying the indicators we have used to collect data through web analytics scripts are social use value and reputation.

All the indicators (Table 1) can be considered proxies for both social use value and reputation. However, possibly Alexa Traffic Global Rank and Google search results align better as proxies of social use value, while the others fit better as proxies of reputation. All indicators were applied to the official URL of the project and, when applicable, to the official account of the project on the social networks.

Across most of the indicators (Alexa Global Rank, Alexa Linking in, Google last year, Google all times, Twitter followers, Facebook likes) there is an extreme variability/range of values. This can be observed when we compare the median and the mean, as well as the number of standard deviation of most of these indicators (in the stock chart, the σ or SD are the small marks in each line that represent how the CBPP are distributed according to each indicator) Still, we could say there is a “range” that is typical of CBPP, where most cases are positioned. This typical range is positioned at low values.

A deviation from the skewed distribution -regarding the concentration of cases in a single range of very low value and very few with very high values- is that of Google Pagerank, the Outreach measure of Kred and the Influence measure of Kred. In these three indicators, 50 % of the observations are near the middle or within the higher range of the scale. The mean and median value of these dimensions suggest (Google Pagerank mean 5.54, median 6 on a scale of 10; Kred Outreach mean 4.37, median 5 on a scale of 10 and Kred Influence mean 694.13, median 727.00 on a scale of 1000) that CBPPs tend to be in the intermediate range of value on the Internet (Fig. 4).

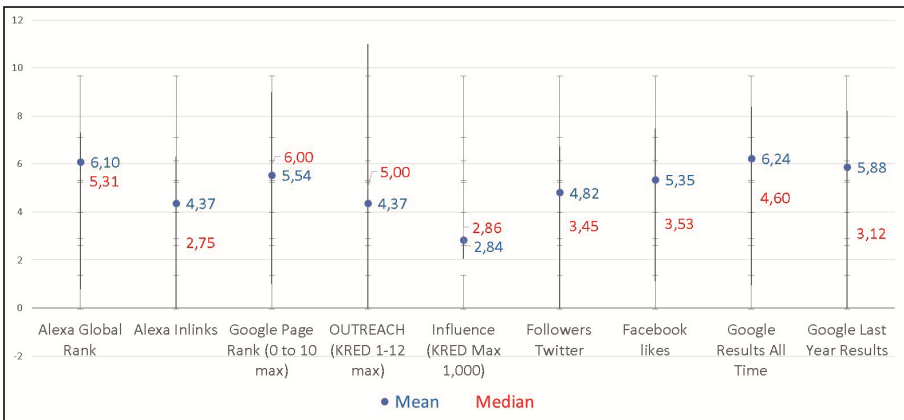


Fig. 4. Indicators of external value (log₁₀)

According to the Alexa Traffic Global Rank, 10 % of the sample could be considered as very successful (with a rank lower than 3000). Since the Alexa ranking is applied to the whole universe of Internet websites (the rank goes from 1, the highest value, to more than 6 million), this can be considered as an indicator of the importance of CBPP in the digital economy. Similar conclusions may also be drawn looking at the Google Pagerank.

In regard to Twitter and Facebook, when we analyze the median value of both indicators, it points to a result as high as 50 % of the CBPP, with at least 2,800 followers and more than 3,000 likes. We recognize that we have to contextualize this data, but the majority of CBPPs studied have not been operating for more than 7 years and are relatively young to achieve this high number of followers and likes. The majority of cases tend to be in the middle values of both indicators, so it is frequent for cases to have a considerable number of followers and likes.

5 Correlations Between the Dimensions of Value

In this section, looking at the correlations, we provide data on how the various indicators of value and sub-dimensions of each variable relate to each other. More concretely, the analysis looks at possible explanatory relations between the indicators of internal and external value.

5.1 Between Internal Indicators of Value

Monetary value is moderately correlated (.461** N36) with community building. But it is not correlated with mission accomplishment. This data may suggest that there are communities that just focus on the accomplishment of their mission, neither aiming for nor requiring high monetary turnover or a large engagement of people, but just pursuing the necessary money and people to assure their substantive objective.

5.2 Between External Indicators of Value

We found strong correlations between several indicators of external value (Alexa Traffic Global Rank; Alexa Total Sites Linking In; Google PageRank; Google search all times and last year; Kred1: influence; Kred2: Outreach; Twitter followers; and, Facebook Likes).

We identified that there is a strong correlation between Facebook Likes and Twitter followers (.728** n:175)³, as well as a very strong correlation between Kred Influence and Twitter followers (.942** n:224), and Kred influence with Facebook likes (.671** n:170). The strong correlation between Kred and Twitter is something expected because of it being the main social medium that this indicator considers when evaluating influence on social media. Nevertheless, we consider it important to highlight how a good reputation on one social medium seems to be related to good reputation on the others.

³ ** => 0.005 and * => 0.05.

We also found a strong correlation (negative, because of the inversion of the scale) between Alexa Traffic Global Rank and Google search results, in its “all times” set ($-.790^{**}$ $n:285$) and even more in its “last year” set ($-.826^{**}$ $n:285$). Also, there is a significant correlation between Alexa Total Sites Linking In and Google PageRank ($.725^{**}$, $n:279$). Finally, as it can be expected, the experiences that have a high score in Google search results across all times, also have - in general- a high score in the results limited to last year ($\text{corr } .806^{**}$ $n:302$). This also may mean that a good social value and reputation on one of the external indicators of value reflects a good performance on the others indicators.

5.3 Relationship Between Internal and External Dimensions of Value

We found a low correlation between the index of external dimensions of value (linked to use and reputation) and two of the internal dimensions of value. The index of the external dimensions of value correlate weakly with the index of community building ($.340^{**}$ $n: 64$), which would possibly suggest that bigger communities correlate -to a certain extent- with more social use and reputation. The index of the external dimensions of value correlate weakly with monetary value, which would possibly suggest that in order to have visibility and reputation, online monetary power is required ($.320^{*}$ $n: 51$).

6 Conclusions

As we mentioned at the beginning of this document, value is a complex and practically unexplored concept in the CBPP ecosystem. In this work we propose a framework that considers five dimensions of value, and -with strong empirical support- we identify the main value features of CBPP. We propose to go beyond the monetary formulation of value, considering dimensions of internal and external value. The first dimension is composed of measures such as community building, objective accomplishment and monetary value. The external value dimension is composed by social value and reputation measures, mainly composed by indicators traditionally used on web analytics. These indicators have the advantage that they can be applied on the diverse and heterogeneous cases of CBPP included in our sample.

Regarding what we call internal value, CBPP does not seem to be composed by very large communities. The majority of them are below 200 people that participate actively. In this vein, it seems that the 80–20 work ratio that has been identified in other organizations, applies to CBPPs. That means that a small core of participants -approximately 20 %- assumes the highest level of engagement in comparison with the other members. Nevertheless, it is a hypothesis that we have to explore in depth.

Also, we identified that the majority of CBPPs are satisfied with the accomplishment of their mission, something not necessarily correlated with a high level of community participation or monetary value. According to the indicator of monetary value, the majority of CBPPs have an annual budget under 1.000€. Monetary success does not really seem to be a central motivation.

When we analyzed social use value and reputation we found an extreme variability of values among CBPPs, where there are a few extremely successful cases, but most of them present low values. Nevertheless, on indicators such as Google PageRank, Outreach measure of Kred and the Influence measure of Kred, the CBPPs tend to be in the intermediate range of value on the Internet.

At the moment of testing the different indicators of value, we found a strong correlation between the different indicators of external value, which means that a good performance of CBPP cases on some of the spaces of the Web, for instance social media, also reflects a good reputation and the social value of its web page. However it is something that we have to test on the different types of CBPPs, for instance by means of a cluster analysis.

When we tested if the internal and external indicators of value were correlated, we addressed the fact that the biggest CCBP communities in terms of participation also have a higher social use and reputation, confirming as well something that different community managers know, that is, that to have a higher visibly and better online reputation, it is important to have monetary power.

Regarding some of the limits and necessary improvements of our research, the indicator of objective accomplishment has its own limits. The main problem, in this case, is the subjective assessment of the degree of accomplishment achieved. In respect of the indicators of external value, it is important to say that each indicator, as a proxy, applies differently - with its own problems- to each case configuration. For example, the applicability and reliability of some indicators (like Kred, Twitter, Facebook) depend on the specific use of the social networks given by each project (some do not even use them, while for some of them usage is very marginal). Equally, the values of the Google search results can be more or less distorted, depending on the range of ambiguity that the domain name can generate. More generally, most indicators produce a bias in favor of the projects that are more centralized in their architecture and that are more digitally based. Thus, all of them potentially underestimate the value of projects with a more decentralized architecture and that are less digitally based. Finally, even for the most basic values (like Alexa Traffic Global Rank, Alexa Total Sites Linking, Google PageRank, Number of results by Google search), for a few cases, the values were impossible to collect or plainly wrong: either because the values were too low and the projects came out as not ranked by the web analytics services, or because the websites of the projects were hosted on other platforms (and the measures did not distinguish between the hosted project and the hosting platform).

The origins of the external indicators of value and the control of these by commercial companies clearly expose them to the risk of these services' metrics incorporated biases, and could be influenced by economic interests of providers (e.g. Google metrics could privilege the performance of other Google services, in contrast to the performance of the services of other companies). Additionally, these external value-based indicators on corporate services are not based on FLOSS and the functioning of their algorithms is unknown and non-transparent. That is why they should be used with caution.

An important conclusion from the work undertaken is the need to develop alternative indicators of value (both external and internal to the communities) that are transparent in their functioning. We are also exploring options to adopt Wikipedia visits (if the CBPP

has a Wikipedia page) as a potential source of external indicators of value, which is based on FLOSS and is relatively more transparent.

Nevertheless, the limits that the operationalization of value can have on CBPP communities are fundamental to continue improving the indicators and the data available on CBPP, which some authors have denominated a third global model of production.

Acknowledgments. This work is supported by the Framework programme FP7-ICT-2013-10 of the European Commission, through project P2Pvalue (www.p2pvalue.eu) (grant no.: 610961).

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