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Trading-off the microfoundations of openness: Determinants of Participation Decisions in Open Innovation Initiatives

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Abstract

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Abstract:

The last decade has shown a tremendous raise of new organizational forms concentrating around openness. Their common core principals are openness and partnering intentionally with loose contributors. Prior work has shown that these "open initiatives" consist of heterogeneous members, including hobbyists and firm participants and offer various level of openness. However, our understanding is still limited in regards to the interplay between their core principles of openness and loose participation. We target this puzzle with a multi-level study and analyze how the heterogeneous organizational structures of open initiatives affect the participation decision of heterogeneous volunteers. In applying social exchange theory and a discrete choice experiment with 1480 observations we reveal the trade-off of openness components, namely access and ownership, as well as a contingency of participation choice behavior to personality. In bridging the individual and organizational level of analysis, this study explains why volunteers participate even in not preferred organizational settings and how organizational design shapes growth of open initiatives. We account for the multidimensional nature of open initiatives and enrich our understanding of the micro foundations of openness, participant mobility and the interplay between the organization and volunteers.

Keywords: Microfoundations of Openness, Multi-level study, Discrete Choice Experiment, Organizational Design, Corporate Governance and Business Strategy

Trading-off the micro foundations of openness: Determinants of Individual Participation Decisions in Open Innovation Initiatives

1 Introduction

The last decade has shown a tremendous raise of new organizational forms starting from distributed workplaces (e.g. Tele Working with Pico Jobs), to semiformal organizations (e.g. Open Source communities) to Broadcast Search intermediaries (e.g. Idea Competitions) and Collaborative Innovation (e.g. Customer-co Creation) which are competitive even in harsh environments (Levine and Prietula 2014, Sen 2007). Their common core principals are openness and partnering intentionally with loose contributors. Prior work has shown that these "open initiatives" consist of diverse members, including hobbyists and firm participation (Bonaccorsi and Rossi 2003, Rolandsson et al. 2011) and offer various level of openness configurations (Fosfuri et al. 2008, West and O'Mahony 2008). However, our understanding is still limited in regards to the interplay between their core principles of openness and loose participation, especially contingent on present heterogeneity. It is unclear how the varying openness components, and especially the interplay between them, impact the participation decision of volunteers. For example, why do volunteers participate in specific open initiatives, even if they have to accept non preferred organizational attributes? Empirical research shows that volunteers do not favor firm sponsorship, but they nevertheless participate. Would participants be willing to accept firm sponsorship in combination with appropriate control and ownership regimes? How do volunteers trade-off openness structures of organizations and what are the causes of their participation decisions? Viewed from a more problem-based focused, the design of open initiatives to foster self-selection of participants causes managers

'headaches' (Chesbrough and Appleyard 2007, p. 73) as attracting volunteers and talents is a key strategic issue (Healy and Schussman 2003, Chesbrough and Appleyard 2007) determining sustaining growth and competitive advantage.

We target this puzzle with a multi-level study and analyze how the organizational structure of open initiatives affects the participation decision of volunteers. In other words, how do heterogeneous types of organizational configurations perform in attracting scare and valuable resources. Combining social exchange and resource-based theory, we reveal (1) the trade-off of open governance configurations by volunteers as well as (2) the contingency of participation decisions and participation rationales. Our model shows that volunteers sort themselves along combinations of governance attributes, which enable organizations to structure their governance more effectively to engage with external volunteers and grow.

Building on earlier research on open initiatives (Biancani et al. 2014, Lee and Cole 2003) we put our analysis in the established context of open source communities and their participants. Open source community participants are neither contractually nor locally bound and are free to select their task and the people to work with (Dahlander and Wallin 2006; Lakhani and von Hippel 2003). They choose projects strategically (Kuk 2006) and familiarize themselves with the specific project context before consciously deciding to select a community to join (Shah 2006). Thereby, they have sufficient experience with different governance structures, specifically various levels of openness and organizational involvement. Yet, our research approach differs importantly in three aspects from prior studies. (1) Our study draws on a multidimensional concept of openness and organizational involvement. Early research describes openness with revealing ‘all’ or no proprietary information (Harhoff et al. 2003, p. 1753) or draws on single attributes to represent openness, e.g. intellectual property rights constraints. In contrast, we follow latest research and transfer the dichotomous concept into a multidimensional concept of openness (Henkel 2006; West and O'Mahony 2008). Openness is

split in the dimensions of access-control and appropriation regulations with each consisting of several attributes, describing far more accurate the micro foundations of openness. In addition, organizational involvement exists in the forms of a private firm, sponsorship by a non-profit organization, or support by an individual. Thus, by comparing and contrasting multiple options for governance configurations our study combines earlier research and represents a far more real world situation. (2) We assume heterogeneity, at an organizational level and at an individual level. Organizations consist of different structures and differ meaningful in their governance, namely their openness and sponsorship level. Instead of offering no further choices, participants can choose between heterogeneous initiatives and have multiple options to pursue. We thus create an environment of rivalry and variance that resembles more closely the situation of different open initiatives employing various governance structures and competing for talented resources. Also, we consider participant's diversity and their personal characteristics. Thus we bridge the macro (organizational level) and micro (individual) level and draw to the microfoundations of competitive advantages and determinants of growth. (3) We isolates confounding factors. Frequently research needs to be limited due to hardly visible effects, e.g. participation due to social ties or reputation of the initiative, which impact and blur research results. In conducting a quasi-experimental approach we control for observations and isolate research attributes for clear cause-effect relationships.

The results of our study are grounded on a primary data sample with 1480 observations, revealed with an discrete choice experiment, and analyzed with a Mixed Logit model. The insights detail our understanding of open governance structures and their impact on attracting scare volunteers. Governance attributes are traded off and exhibit important characteristics to engage with loose participants. Access and appropriation rights determine participation decisions far more than organizational involvement. Modifying the organizational

sponsorship form can (1) increase participation probability, but falls behind the effect of changing openness attributes, and (2) an appropriate mix of governance attributes can compensate less preferred attributes. In addition, intrinsic and extrinsic motivations are revealed as causes for heterogeneous participation choices. Thus, managers can optimize their governance structure to attract specific intended participants. Our findings also resolve the dispute of seemingly obscure observations in research by proposing a more relative view in analyzing the linkage of organizational attributes and individual aspects. Individual participation rationales drive matching as well as a trade-offs of a set of governance attributes. Concentrating on single governance attributes lacks the comparison of a set of governance attributes and organizational alternatives. Thus, participants even participate in less preferred settings as long as alternatives are missing, but would choose further option as soon as they come available. Our findings extend prior research of membership dynamics in open initiatives (Dahlander and Magnusson 2005, Oh and Jeon 2007) and explain self-selection contingent of open governance configurations.

Concluding, in bridging the individual and organizational level of analysis, this study explains why volunteers participate even in not preferred organizational settings and how organizational design shapes growth of open initiatives. We account for the multi-level nature of open initiatives and enrich our understanding of the micro foundations of openness, participant mobility and the interplay between the organization and volunteers. The findings contribute to the discussion of the micro level perspective of innovating firms, collaboration with distributed volunteers, and performance of new organizational forms.

2 Theoretical Background

2.1 Impact of Resource Configurations on Performance (a macro level view)

The importance of the organizational structure as internal resource base for competitive advantage and performance is described from several viewpoints. Strategy school has a long tradition in highlighting the firm's inherent resource configuration as driver for competitive advantage. Penrose (1952, 1959) describes in her theory of the growth of the firm that the use and deployment of resources are essential for value creation. Managers combine available resources in response to changing environments to dynamic collections of productive resources. Similarly, the 'Evolutionary Theory of Economic Change' (Nelson and Winter 1982) points the view to routines within firms that determine growth and performance. Both ideas are further developed into the resource-based view (Barney 1991, 1995) and later to the dynamic capabilities concept (Teece et al. 1997). Whereas the resource-based approach views resources as valuable, rare, imperfectly imitable and imperfectly substitutable (VRIN), thus applies a rather static approach, the dynamic capability approach favors a more active perspective for sustained performance. The later emphasizes organizational efforts to modify the internal resource mix in response to changing environments. Thus, not the resources per se determine competitive advantage, but the strategic decisions and routines that shape resource configurations (Eisenhardt & Martin 2000). Sustained competitive advantage is due to specific firm internal resource configurations instead of a beneficial market position. A firm consists of a set of heterogeneous resources which needs to be combined efficiently toward the changing environment.

The importance of appropriate configurations of the organizational context is also stressed from an organizational psychology point of view. In analyzing team performance and work design, Hackman (1990) turns the view to context. Teams are social systems with boundaries

that work in an organizational context. They are embedded within this organizational context and the ambient structures and norms of the organization affect teams behavior and their performance. In the same vein shows Amabile (1998), as well as Oldham and Cummings (1996) that the organizational context influences the creativity at work, especially mechanisms and norms at work determine behavior (Yukl 2001). Furthermore, work motivation research (Colquitt et al. 2001, Rhoades and Eisenberger, 2002) analyzes the impact of organizational work context on employees work effort. Perceived organizational support, including organizational rewards and favorable job conditions, increases employees satisfaction and organization's performance. The organization has the ability to strongly influences employees willingness for participation and performance by providing appropriate organizational support. In other words, organizational structure drives the decisions and behavior of employees, and behavior is a result of organizational configuration (Coleman 1990).

Heterogeneous organizational openness configurations

A key principal for open initiatives and their organizational configuration is openness (Levine and Prietula 2013). Everybody can participate and consume at their own disposal. However, the understanding of openness is mixed. First research describes openness with revealing ‘all’ or no proprietary information (Harhoff et al. 2003, p. 1753) and "all information" needs to be exposed (Baldwin and von Hippel 2011, p. 1401). The prevalent dichotomy describes openness as being fully open or fully closed and openness considered as a binary construct. In addition openness carries the meaning of ‘free revealing’ and giving 'access' to the information without direct pecuniary compensations. Openness is understood as to make the product publicly available and relinquish most of the IPR, but do not receive a direct payment (Hars and Ou 2002). Openness carries the connotation of transparency and voluntarily release ownership rights. Following the discussion, two essential ideas emerge. First, openness is

described more specifically and broken down into the two dimensions access-control and appropriation-regulations. Second, the subdivided concept of openness repudiates the one-dimensional view of revealing 'all' or no information. Openness is described more in detail and the spectacularly stratified nature of openness considered. The early dichotomous concept is transferred into a multidimensional concept of openness[i] (Henkel 2006; West and O'Mahony 2008). Based on the multidimensional concept of openness, firms are capable of applying hybrid strategies for melding proprietary and open platform strategies (West 2003). They can steer and align their strategy according to several dimensions of openness to maximize their performance by co-operating across firms' boundaries. The meaning of access is broadened, from openness to product information to openness of the firms' boundaries. Knowledge inflows and outflows include resources being made available for others to exploit in combination with organizational permeability (Dahlander and Gann 2010). The level of access control guides development in production, appropriation regulations govern the allocation of rights to use output. However, in varying configurations of access and usage, the organization has several options to guide interactions between the firm and loose participants. They set important decisions in regards to their leadership system, property rights, and decision rights, and shape the coordination and bureaucratic organization. They build structures for economic transactions and collaborations, they configure their capabilities and bridges the organization with its collaborators.

2.2 Performance depends on Individuals (micro level view)

While above research argues at an collective level, and in favor that performance is contingent on organizational structures, further literature highlights that performance and behavior is contingent on individuals.

Motivational theory describes the behavior of a person as a function of his/her personal characteristics, for example innate motivations. This “individual difference approach” (Chatmann 1989, p. 333) is also stressed in organizational behavior research and states that differences in motivations cause different behaviors. For example, self-determination theory (SDT) (Deci and Ryan 1985) proposes that intrinsic and extrinsic rationales drive people’s decisions and behavior. Intrinsic motivations describe “the inherent tendency to seek out novelty and challenges, to extend and exercise one’s capacities” (Ryan and Deci 2000, p. 68). Extrinsic motivations describe the “performance of an activity in order to attain some separable outcome” (Ryan and Deci 2000, p. 71).

Moreover, research on individuals highlights their prominent role for performance, particular the role of "superstars". Research in the domain of knowledge management finds examples that individual superstars are the key driver for knowledge creation and scientific breakthroughs (Zucker and Darby 1995; Zucker et al.1998). For example, experts and lead scientist within an organization are causes for knowledge-based advantages (Almeida and Kogut 1999, Teece 2003) leaving of them has lead to an stagnation (Granstrand 1990) or even decrease (Ernst and Vitt 2000) in value creation for the entire organization. Innovation management reveals superstars in terms of 'lead user' (von Hippel 1976, Herstatt and von Hippel 1992) who face needs long before the market. They are ahead of the trend and develop innovative products before commercial solutions become available. Collaboration of firms with lead users has increased firm's innovation output, or even created new product categories. In other words, above research suggests that individuals, and especially nested heterogeneity of individuals, are far more important as supposed to be (Felin and Hesterly 2007).

Diversity of collaborators in open initiatives

Diversity of collaborators in open initiatives analyzes the heterogeneity of participants. A generic differentiation exhibits the separation in two collaborator groups: The open initiative as the sponsoring host, and individual participants loosely contributing to the open initiative. Firms' utilization of external sources is a growing trend and rooted in the traditions of complementary assets (Teece 1986; Tripsas 1997) and the role of firms in social networks (Powell et al. 1996; Baum et al. 2000). Open innovation – driven by globalization, market institutions, technological change, and labor market mobility (Dahlander and Wallin 2006; Chesbrough et al. 2006) – utilizing local knowledge (Luthje et al. 2003), and the acceptance of innovative (lead) users (von Hippel 1976; Herstatt and von Hippel 1992) additionally point to the sourcing of distributed knowledge from outside the boundaries of firms. Firms actively participate in open communities with individual employees (Dahlander and Wallin 2006; Dahlander and Magnusson 2005). Examples of sponsored communities include musical instruments (Jeppesen and Frederiksen 2006), several sports-related consumer products (Franke and Shah 2003), and a wide range of professional software products spanning from web browsers, office productivity suites, and media streaming, to customer management systems (West and O'Mahony 2008). Thereby, hosting organizations are not limited to private firms, but open to all organizational forms like NGOs and autonomous individual und nearly unknown persons. An example is the non-profit Wikipedia foundation, hosting Wikipedia and responsible for coordination activities. However, without contributors, the open initiative collapses, and individual loose participants are essential for sustaining of open initiatives.

Individual participants are dispersed volunteers with principally loose relationship to the open initiative. They develop new products, carry out even mundane tasks, provide services, manage processes, and create innovations. Work which traditionally has been conducted by employees hired by organizations. In contrast to traditional firms' employees, they do not

have a formal contract with the hosting firm. They are neither contractual bound, nor receive a direct compensation. They are free to leave and can easily vote with their feet. Due to this independence, and also autonomous participation and the lack of formal contracts, individuals are free to select their task and the people to work with (Dahlander and Wallin 2006; Lakhani and von Hippel 2003). Beyond this fundamental view of the nature of loose participants, research has discovered a wide range of participants characteristics. Early studies described participants in open source initiatives as "hackers," including a positive connotation and badge of honor (Raymond 1999), participants in a "gift" culture (Bergquist and Ljungberg 2001), or as "geeks" (Pavlicek 2000). Following research has further enriched our understanding of participants in open initiatives. Individual contributors are students, academics, hobbyists, and professional contributors. According to Lakhani and Wolf (2005), students represent 20% and academic researchers 7% of the population, whereas (Hars and Ou 2002) find 14% students and 25% hobbyists in open source communities. Both studies find also professional contributors participating. They were directly paid for their contributions by others and account for roughly 37%-53% of contribution efforts. Examples include Netscape, offering its browser Mozilla under an open source license, but continued to support the project. Linux Kernel 3.2 is written by 1,316 developers, including 226 known companies. The top ten firms participating in the Linux Kernel project account for over 60% of the total contributions; paid developers even account for 75% of all kernel developments (Linux Foundation 2012). In further analyzing the participation rationales a wide set of motives was discovered. Hars and Ou (2002) conducted one of the first quantitative studies explaining participation in open source projects. Their survey reveals fun and altruism, as well as the role of external rewards, such as expected future returns and personal needs. Lakhani and von Hippel (2005) extended the scope to user-to-user assistance. Their survey of field support within the Apache community found reciprocity, helpfulness, reputation, career

prospects, being paid and enjoyment as reasons. Following literatures strengthened their findings and concluded that both intrinsic and extrinsic motivations drive participation.

2.3 Research Model: Integration of both perspectives

In order to bridge the individual (micro level) and the collective (macro level) view we draw an social exchange theory and view behavior as a relationship process from individuals with other entities. This perspective builds on the work on psychology of Homans (1958), who introduced the concept of relationship processes based on material goods and immaterial objectives, e.g. prestige, power, or justice. A person who received a service is expected to reciprocate in the future as a token of gratitude. The received reward becomes an inducement for further exchange. The relationship becomes fortified and results in a social bond. However, an individual will terminate a relationship if the reciprocated reward does not satisfy his expectations. The reason is due to perceived small advantage of maintaining the relationship and is based on the available opportunities and the invested social input.

Blau applies this perspective to everyday social life, pointing to broader theories of society and referring to Max Weber. A "wide range of behavior is pertinent for a study of exchange, including goal-oriented conduct in love relations, and including particularly 'wertrational' as well as 'zweckrational' conduct" [ii] (Blau 1964, p. 5). He summarizes that social exchanges reflect any behavior oriented toward socially mediated goals – even duty, honor, pursuit of beauty, a religious call, or an important cause. Blau thus bridges the theory from its roots in sociology to a "quasi-economic mode of analysis" (Emerson 1976, p. 336). He considers social exchanges as economic transactions rather than kinds of relationships (Cropanzano and Mitchell 2005). Nevertheless, Blau (1964) distinguishes between economic and social exchanges. Accordingly, social exchanges, in contrast to economic exchanges, are characterized by "unspecific obligations" (p. 93), where "return cannot be bargained" (p. 93),

that “engender feelings of personal obligations” (p. 94), and “do not have an exact price in terms of a single quantitative medium of exchange” (p. 94). Thus, social exchanges represent subjective evaluations of exchanges based on implicit behavior like trust instead of explicit legal obligations like contracts. However, due to the flexibility of exchanges, prospective social rewards are uncertain. As a result, social exchange theory is one of the most influential conceptual paradigms in the study of organizational behavior (Cropanzano and Mitchell 2005, p. 1). The exchange and coalition behavior of an individual and an organization is described by inducements and contributions. Particularly, inducement-contribution theory describes an individual’s participation in an organization as an exchange process between contributions of the individual and inducements from the organization (Barnard 1968; March and Simon 1958; Cyert and March 1963). The exchange process describes the conditions for successful organizational survival. As long as the organizational stimuli (inducements) are greater or in equilibrium with the individual’s objectives, the individual will continue to participate (make contributions). In other words, as long as the organization provides sufficient benefits, it will attract participants to contribute to the organizational objective and ensure the success of the coalition. Individual behavior in terms of the participation decisions results from the perceived individual stimuli of the organization and the satisfaction of one’s objectives.

Following this line of arguments we propose: The heterogeneity of organizations and individuals determines participation decisions. In particular, participation of individuals in open initiatives is caused by a set of organizational structures which are traded-off and individuals self-select into open initiatives according to their personality. Thus, the interaction of loose volunteers and organizations results in participation behavior.

3 Research Strategy

3.1 Experimental Design

As open regimes differ widely in their contextual settings, care in comparative analysis and research objective selection is required (Boudreau 2010). Strong influence factors for participation are present, but they are not very measurable for research. Socializing effects (Hahn et al. 2008) and "we-feeling" from a social point of view (Hinds and Bailey 2003) skew joining decisions, blur real preferences, or override trade-offs. From a market analysis point of view, passionately perceived products and the availability of rival communities can impact the joining decision. In order to target these challenges and overcome local research bias, we apply a mixed method design with sample diversity.

In order to enable the identification of trade-offs and evaluation independently of distortive factors, we conduct a discrete choice field experiment. A discrete choice experiment (DCE) represents a quantitative method for estimating the relative importance of several decomposed sub-characteristics of an analyzed object which influence the choice behavior of an individual (Louviere et al. 2010; Hensher et al. 2005). The DCE is able to predict market demand, simulate decisions and elicit individual preferences – even for prospective alternatives and unobserved trade-off decisions as in this study (Carson 1995). Moreover, observed preferences and survey-based results often have low internal validity and uncontrolled measurements, impeding causal inferences (Bryman 2012). In contrast, an experiment is best suitable to identify clear cause-effect relationships and explain why these effects emerge (Colquitt 2008). The experimental set-up controls the variable exposure and allows systematic manipulation. Finally, a discrete choice field experiment answers the call for more experimental research and "places actual employees in an environment where randomly

assigned conditions have been created" and increases psychological realism (Colquitt 2008, p. 616).

3.2 Measures and Operationalization

Our study analyses the interplay between organizational heterogeneity and participation diversity. For this multi-level approach adequate measures for the macro level, the organization are required, as well as for the micro level, the individuals. Describing an open initiative as 'open' without indicating concrete mechanisms may cause confusion. Therefore, we draw on the multidimensional concept of openness for describing organizational heterogeneity. Choice alternatives are described with the attributes access rights, appropriation allowances, and organizational sponsorship with its corresponding sub-levels. We consider the DCE criteria of validity, cognitive overload, degrees of freedom, behavioral choice oversimplification, and research relevance (Louviere et al. 2010; Hanley et al. 2001, Green and Srinivasan 1990). Sponsorship is subdivided into for-profit organizational sponsorship, non-profit organizational sponsorship, and no sponsorship according to Stewart et al. (2006). Access right is broken down into accessibility, transparency and restrictiveness (West and O'Mahony 2008). Appropriation allowance is split into usage of a non-profit license or a for-profit license. We do not use blurred dimensions of license restrictiveness, but explicitly isolate restrictiveness in commercialization allowance. Thus, instead of complex license terms which result in slow decision making as well as uncertain proprietary claims, or may not be entirely clear to the user, we apply an easier to understand decisive criterion to avoid confusion. This approach reduces the plethora of license options, avoids measurement bias, and allows the clear understanding of decision makers' preferences and enables unambiguous interpretation. In order to transform the DCE levels into more familiar, concrete variables and phenomenon-based indicators for decision makers, the stimuli are further described (see table 1).

Reflecting the experimental design, we apply a multinomial Bayesian D-error design consisting of three choice alternatives and a fourth 'none' option. The DCE profile sets are unlabeled and checked for extreme combinations. Besides the statistical, theoretical, and behavioral advices, we use a reviewed statistical design proposed by Kessels et al. (2009) and support the call to reveal the design principles.

Insert Table 1 about here

In order to measure individual diversity we draw on participation rationales and include psychometric constructs. In order to endorse external validity we adapt motivational constructs from research studying extrinsic and intrinsic participation rationales (Hars and Ou 2002, Lakhani and von Hippel 2003) as antecedents for choice heterogeneity. We follow the movement for short scales and brevity in constructs to reduce parsimony effects and to please respondents (Bearden et al. 2011). We additionally control for further causes of preference heterogeneity and check influences within the area demographics (user's age, sex, work experience, level of education, and topic expertise) and community activity (hours reading, writing, moderating).

3.3 Data Collection

For the experimental approach are decision makers required who are familiar with open initiatives. In alignment with earlier research analyzing open initiatives, we draw on volunteers from open source communities. In particular, the sample consists of volunteers of open source software and open source content communities. Moreover, members of different domains, specifically entertainment (e.g. games) and business (e.g. enterprise resource planning applications) oriented initiatives, are included to increase the degree of

generalization, reduce sampling bias of pure commercial settings or iconic projects, and to transfer findings to further open initiatives. Thus, data triangulation based on a number of individuals of several heterogeneous communities as well as utilization of actual community data is conducted to enhance research validity (Mathison 1988). Figure 1 shows the sampled communities. Data was collected by directly contacting random community members and posting forum messages. The collected sample is screened for consistency, completeness, and plausibility, and compared in terms of age and sex against earlier studies and similar distributions found. The cleared sample consists of 185 replies nearly equally spread as seen in figure 1.

Insert Figure 1 about here.

3.4 Data Analysis

In order to analyze the choice preferences a prediction model needs to be specified. We employ a log-likelihood approximation approach with a correlated mixed logit panel model. Thus, we apply a continuous probabilistic distribution in combination with a model releasing the assumption of independence of irrelevant alternatives, covering random taste across individuals and considering inter-user heterogeneity, as well as accounting for repeated panel observations. The specifications are supported by qualitative factors, for example behavioral aspects, and quantitative factors, like statistical support. We take special care for the design and estimation model to reflect real decisions and derive very similar outcomes from this stated preferences as compared to revealed tastes (Louviere and Swait 2010; Swait and Andrews 2003). Table 2 recapitulates the full model specifications:

Insert Table 2 about here

Psychometric data evaluation in terms of internal consistency and construct structure checks are conducted for participation rationales and provide acceptable results. The corrected latent constructs internally correlate well above the recommendation of 0.6 (Bearden et al. 2011) for a smaller number of item constructs, as well as above the general recommendation of 0.7 (Churchill Jr 1979), and support reliability and scale unidimensionality. Additionally, mean inter-item correlation scores of above 0.4 for narrow constructs (Clark and Watson 1995), above the general recommendation of 0.5 (Bearden et al. 1989) provide a second criterion for scale homogeneity. Intrinsic and extrinsic motivation constructs suggest validity convergence for the conceptual components and two-folt dimensionality due to directed loadings of items. In order to assess the overall validity and understanding of the survey, the survey respondents are asked to provide a brief feedback on the questionnaire via an open question at the end of the survey. Reviewing this question reveals positive statements like ‘survey was clear, concise and easy to follow’, ‘looks good to me :)’ and ‘good work!’.

4 Empirical Results

4.1 Discrete Choice Preferences and Trade-offs

In order to analyze the DCE data set, the previously developed estimation model is applied. The model is highly significant with a “very good” model fit[iii] (Louviere et al. 2010). All random and fixed parameters are highly significant at a 99% confidence level, except NGO which is significant at a 90% level as shown in table 3

Insert Table 3 about here

Going further and placing the levels in relationship to each other with a share of preference prediction enables calculation of the marginal change and selection probabilities of parameter combinations.[iv] This approach compares two initiatives and discloses the likelihood of one community being selected over the competing initiative (see equation 1).

$$P(a) = \frac{\exp(U_a)}{\exp(U_a)+\exp(U_b)} \qquad \text{(Equation 1)}$$

Initiative U_b is set as the (lower) reference and constitutes of the attributes with the lowest prediction values (commercial affiliation, restricted access and for-profit license). In contrast, initiative (U_a) represents a competing community. The probability P(a) represents the share of the preference prediction, the likelihood of choosing initiative (U_a). Because initiative (Ub) comprises the lowest preferences, calculated probabilities represent maximum values reduced if the community (Ub) does not only consist of inferior parameters. The following share predictions thus represent the increase in members if a closed proprietary community opens up. Comparing the choice predictions for the maximum value, a respondent is 99.44% likely to join the superior initiative and 0.56% likely to join the inferior community - all else beeing equal. Further predicted choice shares are shown in figure 2. The abscissa shows the access dimension, read-write access (RW), read-only access (RO), and restricted access (RA). The ordinate represents the affiliation and license dimensions. The ordinate is subdivided into three constructs. The first construct indicates commercial affiliation (Com.Aff.), the second NGO sponsorship (NGO Aff.), and the third no affiliation (No Aff.). Each of these three constructs consists of two columns: a non-profit license and a for-profit license. Finally, the applicate marks the probability value P(a) with the height of the column.

Concluding, the diagram reveals why is one initiative preferred over another. The aspects of access-control, usage-regulations, and sponsorship-involvement including their respective levels are perceived differently by the prospective joiner and impact their joining decision

significantly. Preference of participants for an initiative is contingent on organizational structures, particularly, the specification of access, usage, and sponsorship.

Insert Figure 2 about here.

4.2 Sensitivity Analysis of Marginal Changes

Calculating the ratios of predicted choice-share probabilities increases the understanding of changing one particular initiative to another. It reveals the impact of marginal community modifications, enables the construction of what-if scenarios of selection probabilities. The scenarios[v] of marginal change are shown in table 4 for affiliation, table 6 for access, and table 5 for modified usage regulations.

Based on these results, the impact of certain levels is exposed. Opening an initiative from restricted access to read-write access increases selection probability by 4.76 times, but changing an NGO affiliation to no sponsorship predicts rises in community selection by only 1.26 times. The sensitivity values are even higher if several parameters are changed. The most extreme value results from the change from a restricted access, for-profit license with commercial sponsor (0.56%) to an highest preferred initiative (50%), with an increase of participation likelihood by 89.29 times. Considering a scenario between an example corporate community (P(RO/For-Profit/Com.Aff.)=7.26%) competing with an NGO initiative with for-profit license (P(RW/For-Profit/NGO.Aff.)=92.73%) reveals a relative increase in participation probability of 12.77 times.

Insert Table 4-6 about here

4.3 Sources of Heterogeneity and Individual Diversity

The choice results represent the taste for the average population across the entire open source sample and show the preference of access over usage constraints and the minimal impact of sponsorship. However, in this study, we challenge the assumption of homogenous participants and preferences. In order to determine possible causes of preference heterogeneity and explain why certain users prefer a certain initiative, the interactions of choice experiment parameters with suspected sources of heterogeneity are estimated (Hensher et al. 2005a). Table 7 shows the results for the control (Sex = sex; Age = age; HRead = hours spend reading; HWrite = hours spend writing content to the initiative; Tenure = pedigree in open projects; Expertise = level of expertise) and for the main variables (Extrinsic = extrinsic motivated; Intrinsic = intrinsic motivated).

Insert Table 7 about here

Concluding, participation rationales are antecedents for participation behavior and cause the preference of certain organizational factors, while characteristics like expertise or activity are not linked to organizational configuration.

5 Discussion

5.1 Implications for Competitive Dynamics and Organizational Growth

One, if not the, key challenge in business management research exhibits the puzzle what accounts for competitive advantage and how to achieve it. Highest importance is thereby given to organizational structures as well as individuals within the organization. They represent microfoundations of routines, determine knowledge exploration and exploitation, coordination within the organization, and in large collective actions (Fellin et al. 2012).

However, little is known how they interact with each other and impact on organizational competitiveness and growth (Murray and oMahony 2007). How do heterogeneity within the resource base of different firms affect employee work participation? What is the effect of varying levels of appropriation and how do norms affect individual mobility (Felin and Hesterly 2007)? These questions become even more important with the raise of new organizational forms centering around openness. Open initiatives cooperate loosely with volunteers, and partnering does not rely on formal constraints. Attracting volunteers, and participant migration represents an indispensable issue as successful organization of open initiatives and interaction with participants represents an effectiveness factor for high performance and directly impact core areas like the viability of the business model, organizational growth, and sustained performances (Dahlander and Magnusson 2005, West and O'Mahony 2008). This study contributes to the conversation and responds to the call to analyze the interplay between the organization at a macro level and individuals on a micro level (Felin and Hesterly 2007, Felin et al. 2015) and the mechanisms underpinning dynamic capabilities (Teece 2007).

Trading off the Microfoundations of Openness

This study decomposes organizational routines into the multidimensional concept of openness. It shows how the microfoundations of the organizational routine openness, namely the heterogeneous levels access control and appropriation right, interact to gain traction within an open economy. Changes within the microfoundations heavily impact the growth of the initiative. Indeed, prospective participants value the openness structure far more than the sponsorship of an organizational form. The research model proposes how openness configurations determine participation and extends earlier research by revealing ordered importance and trade-offs of attributes. The results suggest, that a set of governances attributes, instead of single attributes, impact the efficient organizational design. Thus certain

changes can compensate other attributes and explain why participants even contribute to not preferred settings. The attributes are considered as a whole and traded-off. This is particularly important, as open initiatives consist of several attributes, volunteers need to accept as a whole or not. The level of granted access to the production represents the most crucial factor, followed by usage constraints and organizational affiliation. Closer examination with trade-off examination and sensitivity analysis reveals highly different impacts with respect to the magnitude of importance. Sponsorship impact remains far less important than openness. The study also reveals a non-linear relationship of preferences: certain level changes in contextual attributes cause non-proportional effects and jumps in community preference. For example, the change from NGO to no sponsor affiliation has only a marginal impact compared to a change from commercial to NGO level.

The study also informs commercial firms how to foster interaction with volunteers. While earlier research (Varadarajan and Menon, 1988) has shown that firm involvement creates mistrust, this study shows multiple ways to decrease animosity. Opportunities for firms exist in offering higher levels of access, alter IP regime, and change organizational form to an non-governmental organization. In other words, open initiatives hosted by private firms can balance their perception by mechanisms creating greater stimuli for members. Based on these insights, the study enriches the discussion about participants mobility and why volunteers participate in a specific community. As long as no 'better' participation alternatives exists participants accept projects with less preferred attributes (like commercial sponsorship), but as soon as alternatives exists they chose rival initiatives to realize higher comfort (an example is forking of open source projects, like the case of Open Office).

Interplay between organizational and individual aspects

Diversity of individuals in organizations is widely recognized and varies strongly, either in terms of demographic aspects like age, previous knowledge, like experience, or behavioral aspects like motivations (Felin and Hesterly, 2007, Fellin et al. 2012). In addition, organizations consist not only of capabilities, but also work with heterogeneous individuals (March and Simon, 1993). Yet, management research frequently lacks considering this multilevel phenomena of combining the organization (macro level) with the individual (micro level) (Hitt et al. 2007; Gavetti et al. 2007; Fellin 2012). This study responds to the call to specify individual differences and their relationship to organizational effects, specifically volunteer participation and growth. By bridging the individual levels and the organizational level of analysis, organizational context and personality are taken into account and insights into divergent choices revealed. In particular, demographic diversity and heterogeneous activity levels of participants exist, but do not explain organizational choices. In contrast, participation rationales exhibit significant sources of preference heterogeneity and impact the decision of volunteers to join a specific project. Intrinsically and extrinsically motivated volunteers show significant different choice behavior. Extrinsic in contrast to intrinsic motivated participants, have a strong desire for commercialization allowance and are less sensitive to private firm involvement. This is particular important, as prior research (Shah 2006) reveals different subsequent actions of these members in open initiatives, e.g. explore uncharted territory versus innovating along established customer dimensions. This insight carry important implications for organizational behavior. It indicates who specifically participates and is attracted by certain attributes. In turn, this insight enables initiatives to design their project to foster matching of intended volunteers. It also indicates, that the surrounding organization not only impact motivation, but also that a predisposed preference exists contingent on individual motivations for specific organizations. Thus, by

'misspecifying' the organizational configuration certain participants are scared off. Moreover, our study suggests that there exists no optimal organizational openness design, only a design optimal for specific participants. There is no one-preferred solution, instead, heterogeneous distributed volunteers sort themselves contingent on their inherent motivations to different organizations. This finding also inform the debate about self-selection in organizations and crowding-out effects. The differences in choice behavior are contingent on the motivation indicate a silent sorting effect, meaning projects in extreme are either chosen by intrinsic or extrinsic motivated users, at least, it could create tensions between commercial-oriented users and fun-driven participants. This research adds to the conversation a significant link of individual personality to institutional configuration.

Finally, our study does not only advance theory with a mircofoundation perspective of openness and individual participation contingencies, but also answers a challenging managerial question (Davis and Marquis 2005). This study lessens “non-trivial managerial headaches” (Chesbrough and Appleyard 2007, p. 73) and answer the open question for developing a prospering collaboration: ‘How can open organizations be strategically designed to foster self-selection of users?’ The selection of appropriate openness factors enables community managers to improve the effectiveness of the organization by building the project in such a way as to attract the intended volunteers. Harnessing the creative distributed capital depends on the regulations of collaboration, whereby talented dispersed volunteers may self-select into tasks according to their preferences and the freedom to work.

5.2 Limitations and Future Research Directions

Despite careful consideration of theoretical and empirical challenges, as well as the application of counteractions like multifold triangulation or randomization, this study has some limitations. Discrete choice experiments represent stated preferences within an isolated

environment. Certain decision attributes are not offered and interrelationships in the experimental settings are a simplification - for the sake of avoiding e.g. social influences. The underpinning sampling concentrates on a broad assortment of different online open source communities. Whereas most other studies consider members from one project type or even single cases, this study intentionally broaden the scope and introduce variance by sampling software, content, entertainment and business projects. As this might lead to a potential selection bias and a limitation to digital production projects, this approach controls for the highly diverse community ecology and avoids selecting of potentially biased iconic projects. Nevertheless, first examples provide confidence that findings could be transferred to tangible products (Balka et al. 2009), and to multinational organizations (Stuermer et al. 2009). Nevertheless the question about obstacles and minimum requirements for volunteering remains largely unanswered. Probably, preferences could be structured in terms of hygiene factors (Herzberg 1968) or satisfaction levels (Kano et al. 1984). Finally, the question of fairness emerges. Fairness, understood as interpersonal relative payoff (Loewenstein et al. 1989), seems to impact volunteering in an open initiatives (Nov and Kuk 2008), and organizational behavior (Colquitt et al. 2006). Yet, participation research widely ignores this aspect, it seems to be a fruitful field for further research.

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7 Tables and Figures

Table 1: Stimuli

	Control	Appropriability	Organizational Involvement
Dimension (Attribute)	Access • Possibility to participate in product development	Usage • Commercialization and usage constraints	Sponsorship • Publicly displayed affiliation
Construct (Levels)	• Read-Write: everybody can read everything and fully do edits • Read-Only: everybody can read everything but only registered users can do edits • Restricted: only selected users are allowed for reading and editing	• Non-Profit: you may not use this work for commercial purposes • For-Profit: you may use this work for commercial purposes. This is often compared to `copyleft´ and used in many open source products	• Commerce: a for-profit organization runs the community • NGO: a university or nongovernmental organization (NGO) runs the community • No Sponsor: neither an NGO nor a for-profit organization runs the community

Table 2: Applied Discrete Choice Model Specifications

Criteria	Specification
Type	• Mixed Logit Model
Parameters	• Choice Levels (Random parameters, effect coded) • None-Option (Fixed parameter)
Random Parameter Distribution and Drawing	• Normal distribution applied for all random parameters • 1000 Halton draws applied
Observation Correlation	• Panel data of eight repeated questions per respondent • Four stimuli per profile set, eight choice observation per individual
Parameter Cross Correlation	• Confounding effects of random parameters considered

Table 3: Discrete Choice Results

Attribute	Level	Part-Worth Utility	Level Significance (p-value)	Standard Deviation	St. Dev. Sign. (Heterogeneity Indicator)	Attribute Utility Range	Attribute Importance
Sponsorship	Commercial NGO No Sponsor	-0.73189 +0.15770 +0.57419	0.0000 0.0864 Base Level	1.09084 0.68766 Base Level	0.0000 0.0000 Base Level	1.306	0.2522
Access	Read-write Restricted Read-only	+1.26631 -0.87587 -0.39044	0.0000 0.0000 Base Level	1.98135 1.47744 Base Level	0.0000 0.0000 Base Level	2.142	0.4136
Usage	Non-Profit For-Profit	+0.86542 -0.86542	0.0000 Base Level	1.25200 Base Level	0.8528 Base Level	1.731	0.3342
Outside Alternative	Choose None	-0.38560	0.0000				

Table 4: Change of Selection Probability Caused by Altering Community Affiliation

Affiliation	To			
From	Level	No Aff.	NGO Aff.	Com. Aff.
	No Aff.	x	0.795	0.426
	NGO Aff.	1.258	x	0.536
	Com.Aff.	2.346	1.864	x

Table 5: Change of Selection Probability Caused by Altering Community Usage

Usage	To		
From	Level	Non-Profit	For-Profit
	Non-Profit	x	0.301
	For-Profit	3.323	x

Table 6: Change of Selection Probability Caused by Altering Community Access

Access	To			
From	Level	RW	RO	RA
	RW	x	0.320	0.210
	RO	3.121	x	0.656
	RA	4.759	1.525	x

Table 7: Results of Sources of Preference Heterogeneity

	Com. Sponsor	NGO Sponsor	RW Access	Restricted Access	No Profit License
Extinsic	+ (**)	-	+ (*)	-	- (**)
Intrinsic	-	+	+	-	-
Sex	+	+	+	-	+
Age	+	-	-	+	-
HRead	-	-	-	-	+
HWrite	-	+	-	-	-
Tenure	+	-	+	+	+
Expertise	+	-	+	-	-

Figure 1: Sampled Communities

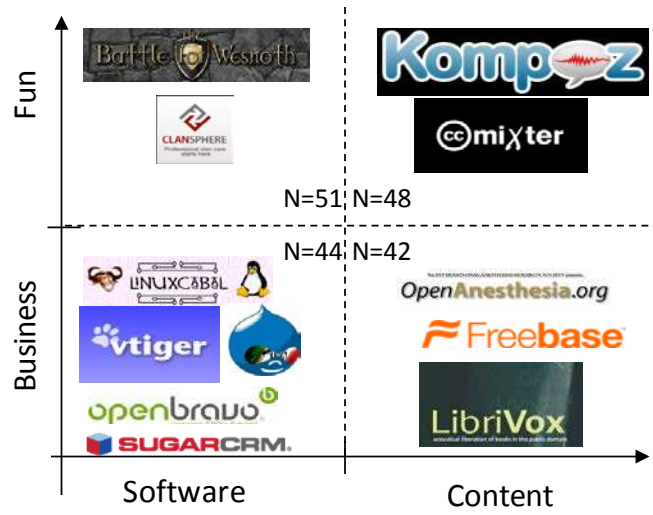
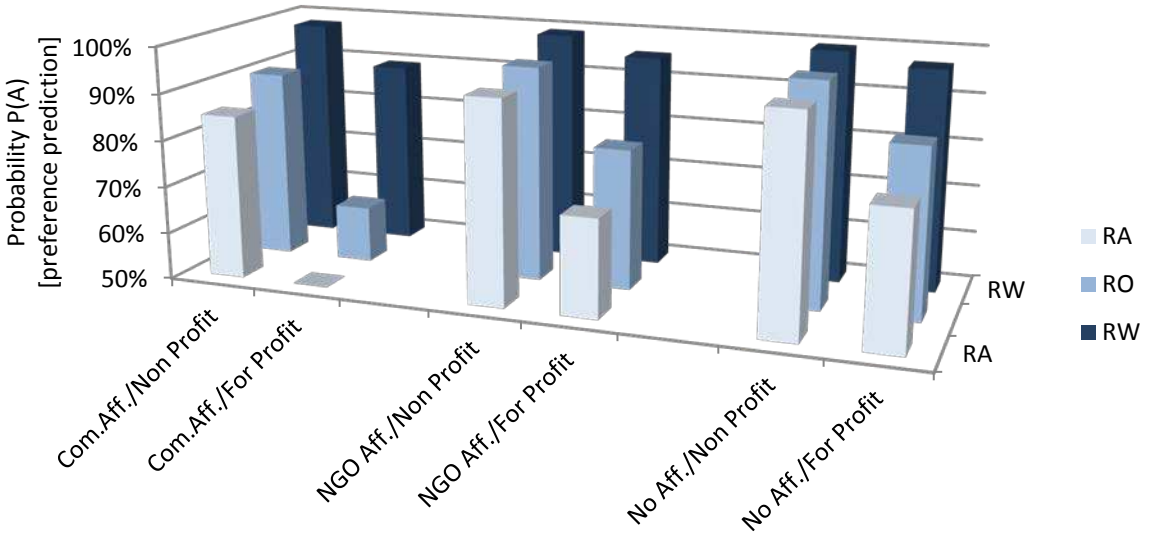


Figure 2: Share of Preference Prediction (Reference: Lowest Reference)



[i] Instead of referring to openness as a 'gradual concept' on one continuum, we regard openness as a multidimensional construct through the separation of access-control and usage regulations with each aspect containing individual degrees of application.

[ii] 'Zweckrational,' meaning instrumental rationality, describes the calculated actions and purposeful consideration of goals, efforts and consequences in order to achieve an optimal solution for one's objective. 'Wertrational,' meaning belief-oriented, describes the undertaking of actions based on

values (e.g. religious, ethical, aesthetic) but independent of the actions' consequences (Weber 1956).

[iii] Chi squared value of 1191.261 with 21 degrees of freedom results in a p-value smaller than 0.0001; and the prediction quality is measured with a McFadden pseudo R^2- value of 0.2903.

[iv] Parameters are uncalibrated and presented without scale factor.

[v] Assuming highest predictions for the remaining two dimensions. Minor deviations from calculated values result from rounding; the tables provide exact values based on the calculated predictions.