

## Users' Influence on the Success of Online Communities

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### Abstract

*This paper examines how different facets of favorable user behavior drive the success of an online community by using a unique data set with surveys from 1,389 participants from the German branch of an international operating massively multiplayer online game (MMOG) community and enhancing it with the game's log files. We argue that success of the community depends on how these users contribute to the underlying success dimensions content, revenue, loyalty and growth. At this, we identify the importance and impact of overlapping online and offline social networks. Moreover, we find that satisfaction with the platform and commitment to the community have a major influence on our success variables. Interestingly, the influence of commitment on favorable user behavior is not moderated by membership tenure.*

### 1. Introduction

In the last years a broad body of knowledge has evolved from studying the success and failure of online communities. Thereby, operator-sided possibilities of exerting influence have been particularly investigated. Studying existing research on success factors, we thus regularly find “stability of the website” or “handling member data sensitively” among the top ten [29]. In this paper we take a different stand.

Relying on 1,389 responses from a survey of online gamers and log file data from the game server, we try to reveal important facets of user behavior that drive success of communities. To the best of our knowledge research on success factors has not related success dimensions to certain user behavior and user characteristics.

In this paper, our research objective is twofold. First, we identify and discuss dimensions of success for online communities. Second, we explore with the help of the survey results, if the identified success drivers prove to be significant in a massively multiplayer online game (MMOG) community.

The remaining paper is made up of 3 sections. In section 2, related work concerning research on communities and critical success factors is reviewed. Drawing on these results, a set of hypotheses is developed. Section 3 comprises the empirical design and execution of the study. The discussion of results as well as limitations and further research opportunities are drawn in section 4.

### 2. Theoretical Foundations

#### 2.1. Related Work

One of the first definitions describes communities<sup>1</sup> in concordance with social collectives in physical space as an aggregation of people in virtual space who develop relational ties amongst them [41]. Along with the rapid growth of communities, first classification approaches have been developed. According to the substance and the contents, respectively, Hagel and Armstrong [24] distinguished communities of transaction from communities of interest, fantasy and relationship. One of the first to include virtual worlds was Stanoevska-Slabeva who, drawing on Hagel and Armstrong, differentiated between discussion, goal orientation and virtual worlds [44]. MMOGs are part of these virtual worlds and are characterized as networked computer games in which hundreds to tens of thousands of players can interact with one another in real-time in a shared environment, even though these players may be geographically dispersed [43].

The communities and MMOGs of the latest generation seem to transcend the existing categories as they provide a platform where users can present themselves, communicate publicly or privately with one another, consume, store and share content, carry out transactions and play. The social life within such

<sup>1</sup> Various other terms such as social networks, virtual communities or online communities are also commonly used in research.

MMOG environments has been studied intensely [50, 51]. However, the influence of user behavior on the success of MMOGs is still uncertain.

Research on critical success factors in general has a long tradition in management science. The idea is to discover fundamental principles determining business success similar to the laws of nature in the natural sciences. Such research efforts mostly follow a quantitative research design. Performance is defined as a dependent variable with the aim to discover and validate relevant drivers of operational success [31]. However, results do not always prove themselves valuable for the industry under observation, for example, if they are obvious or generic [e.g. 31, 35]. Within the scientific community critical success factor research is therefore discussed controversially.

Research on success factors of virtual communities can be differentiated into qualitative and quantitative research methods. Further, one can differentiate between direct and indirect data acquisition. The former directly asks for success factors, the latter applies statistical procedures to analyze determinants and indicators of success. According to the goal of success factor research, one can be divided between explorative and confirmatory methods. Figure 1 shows a systematization of success factor research according to research methods.

Qualitative	Quantitative
<p><b>Direct explorative methods</b></p> <ul style="list-style-type: none"> <li>•Lobin/Rudeck/Kreuls [30]</li> </ul>	<p><b>Indirect explorative methods</b></p> <ul style="list-style-type: none"> <li>•Bughin/Hagel [10]</li> <li>•Bickart/Schindler [4]</li> <li>•Bughin/Zeisser [11]</li> <li>•Brown/Tilton/Woodside[9]</li> </ul>
<p><b>Indirect explorative methods</b></p> <ul style="list-style-type: none"> <li>•Rothaermela/Sugiyamab [40]</li> <li>•Zapf/Schaal [53]</li> <li>•Williams/Cothrel [52]</li> </ul>	<p><b>Indirect confirmatory methods</b></p> <ul style="list-style-type: none"> <li>•Okleshen/Grossbart [36]</li> <li>•Leimeister/Sidiras/Krcmar [29]</li> <li>•Panten [38]</li> </ul>

**Figure 1. Research on success factors in virtual communities**

Despite the fact that success is measured differently in the various studies and the absolute number and types of identified success factors vary, some conclusions may be drawn: sources of revenue, content, growth, loyalty of customers, technological infrastructure, service and marketing are claimed to be important success factors by most authors. Finding success factors for virtual communities in general seems ambitious after all, as communities vary vastly among each other.

Recently, Panten has developed and empirically confirmed a framework which models overall company success as a construct that depends on concrete subordinate dimensions [38]. His work is based on research by Hauschildt and Fritz on company goals. Hauschildt derives four company goals from findings of about 30 empirical surveys, namely profit, growth, unique capability profiles and consonance with stakeholder groups [25]. Similarly, Fritz uses factor analysis to develop the following goal categories: market goals, product related goals and profit goals [21]. Panten converts these into success dimensions for virtual communities. His framework consists of the four subordinate goals, that drive a community's success: customer attraction, customer retention, e-commerce success and profit [38].

Building on Panten's framework, we focus on the contribution of the users to a MMOG community's success. Therefore, we differentiate between four kinds of behavior, which are essential to the survival of a community: First, the creation of content (content); second, the willingness to pay for extra services (revenue); third, the intention to stay in the community (loyalty) and fourth, the acquisition of new members through word-of-mouth promotion (growth). We focus on content generation instead of e-commerce success, as this is the main type of transaction taking place in the MMOG community under observation. These four dimensions of success are what we call 'favorable user behavior'.

## 2.2. Hypothesis

Favorable user behavior in online communities is often based on norms of reciprocity. Users consume content and therefore feel obliged to produce content. They pay for extra services to support their network, which has supported them in the past or is expected to support them in the future. They are loyal to the community, because they do not want to let their online friends down. They promote the community to new members because they feel bound to the community.

Social exchange theory sees norms of reciprocity or balanced exchanges of social and material resources as the fundamental form of human interaction [19] and both, formal and informal participation, can be explained by it [13, 16, 18, 20]. Reciprocity is also crucial to maintain social networks [3, 48]. Therefore, a lack of reciprocity can produce significant challenges for online communities [27]. In particular, users might have the incentive to just consume and give nothing back to the community, if there is no face-to-face contact between them. This effect can be attributed to the lack of nonverbal cues in computer-mediated

communication leading to a decreased level of social presence [46]. Social presence theory explains how different information and communication technologies (ICT) convey the presence of participants [42]. Research shows that a reduction in social presence may result e.g. in the pursuit of self rather than group interests [47]. Hence, a cross-over between online and offline communities, in which people know each other offline and interact online, might at least weaken some of the problems of social presence online and decrease the free-rider problem. Moreover, this cross-over could increase social capital in the community by increasing the common set of expectations, the set of shared values, and the sense of trust among users because in face-to-face interactions, people are more likely to have more tie density and more reciprocity than in computer-mediated interactions [12, 39]. Therefore we hypothesize:

*H1: A cross-over between online and offline social networks is positively related to favorable user behavior.*

Literature implies that the success of online communities lies in the degree of user commitment to them [14]. The attraction to an online community can have emotional and evaluative significance [45]. This significance creates a social identity which is fostered by high affective commitment of the users [17] and leads to loyalty and organizational citizenship behaviors (OCB) [32]. In this study, commitment is characterized by the users' feeling of commitment towards the MMOG community. In that, it is not so much directed at the technical platform and respectively the community provider but at the people within the community. A high sense of user commitment should therefore increase user participation (content), willingness to pay (revenue), intention to stay (loyalty) and recommendation behavior (growth). Consequently, we hypothesize:

*H2: Commitment to the community is positively related to favorable user behavior.*

Users of online communities gain more and more experience (with the platform and with other users) as their membership length increases. New users are not yet accustomed to the special norms and regulations of the community. Therefore, they interact less with other members of the community and have fewer and weaker ties within the community than members who have been in the community for some time [28]. We thus hypothesize:

*H3a: The time spent in the community (tenure) relates positively to favorable user behavior.*

The accumulated experience tends to change the relative importance of the attributes of the community [33]. After spending some time in the community, users learn to adapt and interact more frequently with

other users. Thus, we expect that the relationship between commitment and favorable user behavior will strengthen as time progresses. Accounting for time, we hypothesize:

*H3b: Tenure moderates the relationship between commitment and favorable user behavior in a way that members who have longer tenure with community show a higher level favorable user behavior, if they are more committed than members who are new to the community.*

Satisfaction is an ex post evaluation of member experience with the community. Researchers describe it as a positive feeling, indifference or a negative feeling [2]. Most satisfaction definitions in literature focus on the evaluation of single transactions or exchanges [e.g., 37]. However, we follow the approach by Anderson, Fornell and Lehmann [1] and define satisfaction in this study as an overall evaluation based on the experience with a service over time. This cumulative perspective to customer satisfaction is measured with a multi-dimensional construct [e.g., 6] covering various aspects of satisfaction with the community. Hereby, it is mainly directed at the community provider and the technical platform per se.

Satisfaction in general is said to be positively related to service usage [7]. Users of online communities adapt their participation level in the community by maximizing their subjective utility obtained from the virtual community [8]. Therefore, a high level of satisfaction should lead to a high level of participation (content). A high level of satisfaction should also increase the intention to stay (loyalty), the willingness to promote the community to other people (growth) and the willingness to pay for extra services (revenue). In all, our hypothesis is as follows:

*H4: Satisfaction is positively related to favorable user behavior.*

### 3. Methodology

To receive meaningful results for our exploratory research questions, we settled for a quantitative research strategy. In our context we supplemented the data from the online survey with observational data from the logfiles of the game provider.

#### 3.1. Sample and Procedure

The MMOG community *Travian* evolves around a browser-based online game with more than 3.3 million users playing in the beginning of 2008. The game itself is a real-time strategy game (RTS). Players start out as chieftains of their own villages and seek to gain natural resources, build armies and expand their realms. The game is timed to last approximately one year. Each

server is a closed game environment and holds approx. 25,000 users on maximum.

In March 2007, we conducted a survey on one of the German servers. Moreover, we were able to obtain the logfiles of the players since they entered the game. Of the 17,495 users playing Travian on our selected German world, 1,895 filled out our survey. Deleting those records which included missing values or outliers left us with 1,389 records. Of these, we were able to match each record with the data of the logfiles.

The average age of users playing Travian is 21.8 ranging from 12 to 50. Of these users, a share of 24% is female. The lion's share of users is currently engaged in education (67%). A share of 28% is working, either employed or self-employed. 5% of the users are not working e.g. being unemployed. The dispensable income per month is 211 Euros on average (see Appendix 1).

### 3.2. Measures

**Dependent Variable.** Ratings of the four dimensions of favorable user behavior were obtained from the user survey. *Content* was assessed by a single item, asking the users how often they write articles in the community forum. For this, we used a five-point Likert-type scale ranging from -2 to 2 with anchors of "never" and "always". *Revenue* was measured with a single item on a five-point Likert-type scale ranging from -2 to 2 by asking the users how often they are paying fees for extra services in the game. Again, the anchors of the scale were "never" and "always". *Loyalty* was measured with a single item by asking for the users' intention to stay in the game. It was assessed by a five-point Likert-type scale ranging from -2 to 2 with anchors of "absolutely not" and "absolutely". *Growth* was operationalized by a single item asking the users if they would to recommend Travian to other people. It was measured with a five-point Likert-type scale ranging from -2 to 2 with anchors of "absolutely not" and "absolutely".

**Independent Variables.** *Cross-over with offline social networks* was measured by the number of fellow Travian players a user also knows in his or her offline life. *Commitment* was assessed by a single item, asking the users whether they felt committed to the community. For this, we used a five-point Likert-type scale ranging from -2 to 2 with anchors of "absolutely not" and "absolutely". *Tenure* indicates how long the user has been a member of the game. We obtained this variable through matching the logfiles of the server to the survey data. *Satisfaction* is an aggregated measure of four items asking users about their level of satisfaction with Travian. The single items were whether they felt enough support from the community,

whether the community fulfilled their expectations, whether there was a good atmosphere in the community, and whether they were satisfied with the community in general. Again, we applied a five-point Likert-type scale ranging from -2 to 2 with anchors of "absolutely not" and "absolutely" for each scale point. This measure showed good reliability with a Cronbach's  $\alpha$  of 0.86.

**Control Variables.** We controlled for *Age*, *Gender*, *Currently not working* (employment status), *currently in education* (pupils, student, etc.) and *education achieved* (highest educational achievement). Further, *active internet usage* was measured by the extent to which users participate in online chats, online communities and forums/newsgroups. This was measured on a five-point Likert-type scale ranging from -2 to 2 with anchors of "never" and "always". *Hours online* was assessed by the number of hours the users were logged in into the community each day. *Dispensable income* was measured by asking each user for the amount of money they had available for their hobbies each month. The *willingness to pay* reflects the general willingness of the users to pay for online games and was measured by asking whether they spend money on online games. This was assessed on a five-point Likert-type scale ranging from -2 to 2 with anchors of "never" and "always".

### 3.3. Analyses

Table A1 in the appendix provides bivariate correlation coefficients. We also checked our data for multicollinearity and computed variance inflation factors (VIF). We do not expect multicollinearity to be a problem since none of the VIF values exceeded 10 [26]. Moreover, the large size of our sample allows the estimation method we applied to provide robust coefficient estimates.

To estimate our model, we applied simultaneous estimation of a system of structural regression equations via three-stage least squares (simultaneous-equation models). Using this estimation method allowed us to answer a set of interrelated research questions in a single, systematic, and comprehensive analysis and to account for the potential interdependencies among our four success dimensions. Ignoring simultaneity would lead to biased coefficients [23]. Simultaneous-equation models are conceptually related to so-called Structural Equation Modelling (SEM), since both allow the simultaneous analysis of relationships among multiple independent and dependent constructs. Applying a technology acceptance model to an e-commerce adoption setting, Gefen et al. [22] showed that linear regression techniques and SEM result in consistent and

remarkably similar results. However, SEM is usually employed when latent variables are to be addressed [5]. With this paper, this is not the case. Obviously, several of our constructs could also been conceptualized as latent variables. However, we confined ourselves to using proxying variables. Moreover, when using

statistical software such as LISREL in order to employ SEMs, researchers usually aim at analyzing the overall model fit [22]. Since the objective of this analysis is to solely analyze the effects between independent and dependent variables, we deem regression-based simultaneous-equation models as the adequate method.

**Table 2. Estimation results of simultaneous-equations model**

Equation	Content equation	Revenue equation	Loyalty equation	Growth equation
<b>Control variables</b>				
Age	0.013 (0.028)	0.055 * (0.025)	-0.058 ** (0.019)	0.003 (0.018)
Age <sup>2</sup>	0.000 (0.000)	-0.001 (0.000)	0.001 ** (0.000)	0.000 (0.000)
Gender is female	-0.034 (0.080)	0.008 (0.073)	0.056 (0.053)	0.007 (0.050)
Currently not working	-0.501 ** (0.168)	-0.091 (0.153)	0.117 (0.111)	-0.131 (0.106)
Currently in education	-0.074 (0.115)	-0.155 (0.105)	0.046 (0.076)	-0.041 (0.073)
Education achieved	0.043 (0.024)	-0.006 (0.022)	-0.076 ** (0.016)	-0.027 (0.015)
Active internet usage	0.115 ** (0.036)	-0.041 (0.033)	0.011 (0.024)	0.008 (0.023)
Hours online	0.050 ** (0.011)	0.069 ** (0.010)	0.024 ** (0.008)	0.017 * (0.007)
Dispensable income	0.010 (0.015)	-0.004 (0.013)	-0.007 (0.010)	-0.003 (0.009)
Willingness to pay	-0.006 (0.054)	0.211 ** (0.049)	0.032 (0.035)	0.039 (0.034)
<b>Hypotheses</b>				
Cross-over with offline social networks	0.039 ** (0.010)	0.034 ** (0.009)	0.010 (0.007)	0.025 ** (0.006)
Commitment	0.291 ** (0.056)	0.076 (0.051)	0.130 ** (0.037)	0.101 ** (0.036)
Tenure	0.019 * (0.008)	0.013 (0.007)	-0.003 (0.005)	0.003 (0.005)
Commitment x tenure	0.001 (0.002)	0.003 (0.002)	-0.001 (0.002)	-0.001 (0.001)
Satisfaction	0.036 (0.050)	-0.103 * (0.045)	0.348 ** (0.033)	0.489 ** (0.031)
<b>Constant</b>				
	-1.406 ** (0.404)	-2.324 ** (0.368)	1.839 ** (0.268)	1.047 ** (0.255)
<b>Diagnostics</b>				
R <sup>2</sup>	0.198	0.205	0.259	0.300
χ <sup>2</sup>	344.61	357.75	485.12	596.50
	p ≤ 0.01	p ≤ 0.01	p ≤ 0.01	p ≤ 0.01

Source: Own calculation. Note: N = 1,389 observations. Estimation method: Simultaneous estimation of system of structural equations using three-stage least squares. Standard errors in parentheses. Significance levels: \* 0.01 < p ≤ 0.05; \*\* p ≤ 0.01. Reference groups: currently working. All models include a full set of region dummies.

Finally, the equations of our model contain polynomials representing nonlinear relationships which cannot be estimated with LISREL and the like [22, 34].

We did several robustness tests that validate our results. Firstly, instead of using simultaneous estimation techniques, we estimated the four equations depicted in Table 2 independently using OLS. These results have been fairly consistent with those reported in Table 2. Secondly, recall that our dependent variable has been surveyed applying a Likert-type scale. Accordingly, these variables are censored. Consequently, we also estimated four independent Tobit regressions which account for this characteristic of the dependent variable. By employing OLS or Tobit regression techniques, an equi-distant measure is assumed to operationalize the dependent variable. Third, to provide additional robustness of our model, we also estimated four independent ordered probit models. Since the results did not change in a major way, they have been omitted here.

### 3.4. Results

Table 2 reports the estimation results of our simultaneous-equation model including four equations with content, revenue, loyalty and growth as dependent variables. According to hypothesis H1, we expected the cross-over between online and offline social networks to be positively related with favorable user behavior. Indeed, cross-over with offline social networks is positively significant with most of our dependent variables. The larger the cross-over, the higher users' production of content (0.039 with  $p \leq 0.01$ ). The same is true for the revenue-related dependent variable. Users who know more playing fellows in real life tend to be more willing to pay for extra services (0.034 with  $p \leq 0.01$ ). Cross-over is also positively significant with the propensity to recommend the game to others, our operationalization of growth (0.025 with  $p \leq 0.01$ ). The effect on loyalty is not significant. With the exception of loyalty, we can confirm our hypothesis H1. H2 hypothesized that commitment to the community is positively related to favorable user behavior. With content, the coefficient is positive and significant (0.291 with  $p \leq 0.01$ ). Larger commitment is positively associated with content production. This is not true for revenue. Here, commitment is not significantly related. Viewing loyalty as dependent variable, a positive and significant effect can be observed (0.130 with  $p \leq 0.01$ ). The same is true with growth (0.101 with  $p \leq 0.01$ ). Positive commitment is associated with a higher loyalty and a higher propensity to recommend the game to others. Again, with one exception, we can confirm H2. In H3a, we hypothesized that the time spent in the community

(tenure) relates positively to favorable user behavior. Here, the number of weeks the user has played the game is positive and significant with content (0.019 with  $p \leq 0.05$ ). The coefficient in the models with revenue, loyalty and growth as dependent variable are insignificant. Consequently, we are only able to confirm H3a for one of our success dimensions. Hypothesis H3b included the interaction of tenure and commitment. None of the models shows a significant effect for this moderating effect. Consequently, we cannot prove tenure to be a moderator of the relationship between commitment and the single success dimensions. Moreover, this relationship appears to be unmoderated. Accordingly, H3b cannot be confirmed at all. In H4, we hypothesized that satisfaction is only partially positively related to favorable user behavior. Satisfaction is not significantly related to content production. Viewing the model with loyalty and growth as dependent variables, a positive and significant relation can be observed (0.348 with  $p \leq 0.01$  and 0.489 with  $p \leq 0.01$ ). Accordingly, satisfaction is positively related with the intention to remain in the community (loyalty) and the propensity to recommend the game to others (growth). However, regarding revenue as a dependent variable, the coefficient of satisfaction is negatively significant (-0.103 with  $p \leq 0.05$ ). We cannot back this relationship with a clear causal effect. On the one hand, more satisfied users might tend to be less willing to pay for extra services or on the other hand it might be possible that payments to the community provider makes users unsatisfied. In all, H4 can only partially be confirmed.

## 4. Conclusion

### 4.1. Discussion

This study set out to explore the influence of cross-over between online and offline social networks, membership tenure, satisfaction and commitment on favorable user behavior. As favorable user behavior, we identified four major categories that drive community success: content (creation of content by users), revenue (willingness to pay for extra services), loyalty (intention to remain in the community), and growth (propensity to recommend the community to other users). We hypothesized that users with mixed online and offline networks would exhibit more favorable behavior than users with no cross-over. We further argued that a higher level of satisfaction with the community would lead to higher levels of favorable behavior. We also hypothesized that higher levels of commitment would lead to higher levels of favorable behavior. We further argued that the relationship

between commitment and favorable behavior would be moderated by membership tenure. Therefore, our study sheds light on the influence of user behavior on the success of online communities.

We found that the cross-over between online and offline social networks had a significant influence on three of the four user behaviors. Only loyalty was not influenced. This could be because in case of a cross-over users can still be in touch with some of their online social network when they leave the community and therefore do not lose all their ties. As predicted, users who have been longer with the community display a higher level of satisfaction than new members. However, membership tenure had no influence on revenue, loyalty or growth. The reason might be that these three dimensions reflect users' attitude towards the community which is, of course, varying between different types of users and their behaviour but not depending on the time users have spent in the community. Furthermore, we found that satisfaction with the community had a negative influence on the willingness to pay and a positive effect on loyalty and recommendation behavior. No influence could be found on the creation of content. This strengthens the argument that the creation of content is separated from the satisfaction with the community and more attached to the other users of the community. Moreover, this study shows that a high level of commitment had a significant impact on three of the four dimensions of favorable user behavior. These results demonstrate the importance of a committed user base for the success of an online community. However, the hypotheses that the relationship between commitment and favorable behavior would be moderated by membership tenure could not be supported on any dimension. This is an opposite finding to previous research in other kind of communities [15] and therefore probably takes into account the special nature of a MMOG community. Accordingly, commitment indeed influences community success but over time remains largely constant in a MMOG context.

Considering all the relationships in our framework, we observe that all dimensions are influenced by user attributes. However, it should be noted that one of the most important success dimension from a provider's point of view – revenue – was positively related to cross-over only and even negatively related to satisfaction.

These results bear several important implications for community providers. As we noted in the beginning of the paper, the drivers of a successful community are very hard to determine but there seems to be an overall agreement that the userbase and the underlying user characteristics play a major role. Therefore, favorable

user behavior is crucial to the survival of the community. Most importantly we sought to highlight that it is not solely the volume of the userbase that makes a community successful, but, instead, the various attributes of the users *within* the userbase that drive different factors of success. Success in this context is a multi-faceted construct community providers have to have in mind when setting up and managing their community. Especially the commitment of the users should be fostered at any stage of their membership tenure to ensure that enough content is created within the community. Satisfaction with the community is another critical factor. However, the relationship to favorable user behavior is ambivalent and therefore community providers must carefully balance the level of (dis-)satisfaction with their platform. Moreover, community providers should encourage the cross-over of online and offline social networks by establishing incentives to pull ones offline friends into the online community. On the other hand, community providers might seek to enhance pure online friends to real life contacts in order to increase the overlap between offline and online contacts.

#### 4.2. Limitations and future research

Inevitably, this study has some limitations that have to be taken into account in order to adequately interpret the results and judge their generalizability. First, we employed self-reported measures for several key variables. In some cases (e.g. willingness to pay), other sources of data were not available, but there was little reason to expect distortion in self-reporting. In some cases (e.g. commitment and satisfaction) the constructs are intrinsically subjective and perceptual; this condition necessitated the use of self-report [49].

Second, we gathered data only in a single MMOG community and therefore, some effects could be unique to the specific design of the community.

Third, this study has been the first to examine different success factors of online communities, but cross-sectional in nature. To analyze the relation between the userbase and community success in greater detail, longitudinal studies using panel data could be of great value. Moreover, Partial Least Squares (PLS) using multi-item measures could also be an adequate technique.

Future research may build upon the results of this study in a number of ways. Extending this study to several MMOG communities and also in different countries could further deepen the understanding of determinants of favorable user behavior. Furthermore, the role of membership tenure could be investigated in more detail to deepen our understanding of the user life cycle in a community and the different impact of users'

characteristics and their behavior in various stages. The ambiguous relationship between favorable user behavior and the level of satisfaction seems particularly noteworthy. It was the only attribute to have both positive and negative relations with our success dimensions. Since most business models of MMOG communities are based on premium memberships, future research should explore the negative relationship between satisfaction and willingness to pay identified in this study more thoroughly.

In summary, the results of this study provide answers to the antecedents of favorable user behavior in online communities and provide insights into the diverse dimensions of success.

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Table A1: Correlation Matrix

Variables	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
<b>Dependent variables</b>																			
1. Content <sup>1</sup>	-0.45	1.37																	
2. Revenue <sup>1</sup>	-1.26	1.25	0.25*																
3. Loyalty <sup>1</sup>	1.03	0.94	0.21*	0.00															
4. Growth <sup>1</sup>	1.31	0.92	0.23*	0.10*	0.56*														
<b>Socio-demographic characteristics</b>																			
5. Age (years)	21.78	7.39	-0.01	0.22*	-0.14*	-0.08*													
6. Gender is female <sup>2</sup>	0.24		-0.06*	-0.02	0.00	-0.03	0.10*												
7. Currently not working <sup>2</sup>	0.05		-0.08*	0.04	0.04	-0.01	0.16*	0.16*											
8. Currently in education <sup>2</sup>	0.67		0.01	-0.19*	0.08*	0.03	-0.68*	-0.07*	-0.32*										
9. Currently working <sup>2</sup>	0.28		0.03	0.18*	-0.11*	-0.03	0.64*	0.00	-0.14*	-0.89*									
10. Education achieved <sup>3</sup>	3.57	1.52	0.04	0.02	-0.21*	-0.12*	0.16*	0.02	-0.16*	0.13*	-0.06*								
11. Dispensable income (€)	210.9	272.7	0.14*	-0.01	0.09*	0.08*	-0.20*	0.00	-0.04	0.18*	-0.16*	-0.01							
<b>Internet usage</b>																			
12. Active internet usage <sup>1</sup>	-0.02	0.96	0.21*	0.25*	0.11*	0.12*	0.10*	-0.04	0.05*	-0.08*	0.05*	-0.01	0.12*						
13. Hours online (hours)	2.65	3.03	0.04	0.12*	-0.11*	-0.03	0.40*	-0.07*	-0.07*	-0.47*	0.53*	0.07*	-0.11*	0.07*					
14. Willingness to pay <sup>1</sup>	-1.83	0.63	0.03	0.10*	0.07*	0.08*	-0.02	-0.04	-0.01	0.01	0.00	-0.05	0.14*	0.04	0.05*				
<b>Game specific variables</b>																			
15. Tenure (weeks)	2.82	3.52	0.26*	0.31*	-0.09*	0.01	0.12*	-0.04	0.02	-0.09*	0.09*	0.07*	0.02	0.13*	0.08*	-0.04			
16. Cross-over (on-/offline) <sup>4</sup>	0.15	1.11	0.19*	0.11*	0.13*	0.18*	-0.20*	-0.14*	-0.07*	0.14*	-0.11*	-0.04	0.08*	0.15*	-0.05	0.01	0.07*		
17. Satisfaction <sup>1</sup>	18.75	13.16	0.18*	0.00	0.44*	0.52*	-0.14*	-0.03	0.02	0.07*	-0.09*	-0.14*	0.10*	0.08*	-0.06*	0.09*	-0.01	0.13*	
18. Commitment <sup>1</sup>	0.62	0.83	0.31*	0.13*	0.37*	0.39*	-0.07*	-0.06*	0.02	0.03	-0.04	-0.13*	0.14*	0.17*	-0.05*	0.09*	0.07*	0.19*	0.58*

Source: Own calculation. Note: N = 1,389 observations. Significance levels: \* p ≤ 0.05. S.D. = Standard deviation. <sup>1</sup> 5 point Likert scale ranging from -2 to 2. <sup>2</sup> dummy variable. <sup>3</sup> ordinal variable ranging from vocational education to Ph.D. <sup>4</sup> number of contacts.