

## ONLINE MEDIA IN FAST-GROWING COMPANIES: ADOPTION, USAGE AND RELATION TO REVENUES

*JOSÉ-DOMINGO MORA, University of Massachusetts Dartmouth*

*NORA GANIM BARNES, University of Massachusetts Dartmouth*

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*This study describes how fast-growing companies (specifically the Inc. 500) use online media and explores the relationship between combinations of these media, which we call usage patterns, and firm performance. We find that both the use of individual media and media usage patterns have changed between 2006 and 2010 among fast growing firms. Furthermore, we show that the complexity of a specific series of patterns co-varies with firm total revenues. This specific series is anchored on social networking sites. By estimating a system of structural equations we find that firm revenues and pattern complexity positively influence each other. Implications are discussed and future research directions are proposed.*

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### INTRODUCTION

Organizations adopt sets of related innovations in ways that are determined, among other factors, by the relationships between innovations individually considered. Sometimes these relationships are hierarchical, as with cellular telephones and instant messaging, in which case they are called *synergistic* innovations (Kimberly 1981). In other cases, the relationships between innovations are non-hierarchical, as with cellular telephones, teleconferencing and laptops. These are called *parallel* innovations and can usually be combined in a number of ways. Importantly, each of these possible combinations may lead to different outcomes in terms of organizational performance, depending on the criticality of the set of innovations for business processes and/or product quality as perceived by customers.

The present study investigates how fast-growing companies (FGC) have been adopting and combining online media in order to communicate with their customers. Online media (e.g., blogs, podcasts, email) are a set of communication devices whose usage by organizations is in principle non-exclusive. That is, there is no functional connection

conditioning the adoption of any of them to the adoption of another even though some of these media may end up substituting for others after a process involving organizational learning and optimization of the communications portfolio. Thus, Internet media can be framed as *parallel* innovations. FGC constitute an interesting subset of small and medium enterprises (SME). While it is widely accepted that SME tend to be innovative (e.g., Salavou 2005; O'Dwyer, Gilmore and Carson 2009) empirical modelling research indicates that innovation is critical for the success of FGC (Coad and Rao 2008). Given the important role that the customer interface plays in firm performance, this study further investigates the potential relationship of company revenues and a series of empirically-determined patterns of online media usage by these highly competitive organizations.

The paper is organized as follows: First, we present research questions in the context of past research. Second, we introduce the sample and data, as well as the methodology of the study. Third, we present the results and an emerging research question about the relationship of online media usage patterns and market performance. Fourth, we estimate a set of exploratory linear regression models that shed light on this emerging research question. Fifth, we estimate a system of equations with two endogenous variables that further supports our

initial findings. Finally, we discuss our results and propose directions for future research.

### BACKGROUND AND RESEARCH QUESTIONS

The literature on adoption of innovations within organizations can be traced back to the early 1970s (Czepiel 1974; Zaltman, Buncan and Holbeck 1973). In most cases, the focus was to link innovative behavior with characteristics of the organization, its leadership or environmental influences. It was even argued that researchers should employ a single innovation design, categorizing innovations themselves rather than to focus on the organization (Downs and Mohr 1976).

Classification schemes using criteria such as source of the innovation (Daft 1978) and whether adoption was voluntary or mandated (Beyer and Trice 1978; Aldrich 1979). This research stream was challenged by Kimberly (1981) who posited that studying any innovation in isolation rather than in the context “as part of the ebb and flow of invention” was less than optimal. Instead, he suggested that every innovation should be viewed as connected to an existing body of knowledge or set of techniques: “An innovation may either extend the state of the art or offer an alternative to it, and may or may not resemble existing programs, procedures, or techniques” (p.96).

The two types of innovation proposed by this author, based on what he called its “primary attributes”, are *parallel* and *synergistic*. Parallel innovations (as in the case of the study presented here) pose competing alternatives. Synergistic innovations are those which follow a synergistic diffusion, i.e., the adoption of one innovation greatly facilitates the subsequent adoption of another innovation. For instance, adopting particular software platforms facilitates the use of particular email-based communication programs.

Synergistic innovations have been relatively well-researched in the extant literature. Fennell (1984) replicated and extended the work of

Beyer and Trice by evaluating two voluntary policies (as opposed to mandatory) in the private (as opposed to the public) sector. Their sample was 173 private sector firms with at least 250 employees. They considered whether the two policies studied were parallel or synergistic, i.e., insurance coverage of alcoholism treatment and in-house treatment programs for this condition. Fennell showed that these two innovations were synergistically linked. Guthrie (1999) explored the organizational characteristics that predict the adoption of two related innovations: the Internet and a company website. Although not explicitly acknowledged by the author, these two innovations are clearly synergistic as the adoption of a company website can only come after the adoption of the Internet. The range of organizational characteristics he studied is wide, the sample large (712 companies) and the models estimated show a significant relationship between organizational characteristics (e.g., company size and complexity) and the adoption of both innovations separately considered. A third study on synergistic adoption of innovations (Forman 2005) focused on the adoption of some specific information technology platforms and the subsequent adoption of Internet. The study was conducted on a sample of medium and large enterprises in the financial, insurance, real estate and services sectors. This study has the merit of using a very large sample (N=6,156) and a nested logit choice model specification. Findings show a significant relationship between investment on different types of IT platforms and the subsequent adoption of Internet.

The study presented here explores the organizational adoption of online media (e.g., blogs, social networking sites) that we also call Internet “tools” for simplicity. These tools can be adopted individually or jointly as no tool is a pre requisite for adopting another and, thus, they constitute parallel innovations. This makes this study one of the few dealing with this type of innovations. Under the process/product innovations framework (e.g., Damanpour 2002; Prajogo 2006) these tools can be viewed both as

process innovations, since they facilitate a processes owned by a specific company function, marketing communications; and, as product innovations since they contribute intangible attributes (information, service) to the actual products delivered to customers.

Furthermore, in the spirit of Tan et al. (2009) this study attempts to provide “innovative and provocative research that can keep small business research at the center of academic action.” Past research has shown that investing in innovation such as new products is viewed by small and medium enterprise (SME) managers as a fundamental competitive strategy (Hay and Kamshad 1994). Moreover, as discussed in the Introduction we consider FGC, a subset of SME for which company innovativeness has been shown to predict sales growth (Coad and Rao 2008).

Given the unique character of the data and the scarcity of research on parallel innovations the present study is framed in an exploratory fashion. We first consider possible longitudinal changes in the use of Internet tools by firms during the period of reference. This stems from the fact that, since the advent of Facebook in 2004, the use of social networking sites has skyrocketed among individual users, possibly affecting the share of other media in terms of number of users and time spent. It should be expected that a similar process had been taking place in the organizational realm. We formalize this speculation as our first research question (RQ):

RQ<sub>1</sub>: How has the use of selected online media among FGC changed in the period 2006-2010?

At the same time, as the use of these tools in non-exclusive, it is unlikely that the adoption of the emerging social media had completely obliterated the use of pre-existing social or broadcast tools. Furthermore, with time passing companies have the chance to learn and optimize the use of these communication tools which, although very inexpensive to acquire, demand dedicated resources on an ongoing basis. Thus, we ask:

RQ<sub>2</sub>: Has the way in which FGC combine online media changed over time?

Furthermore,

RQ<sub>3</sub>: Are there specific patterns in which FGC combine these online media?

We will call the specific patterns in RQ<sub>3</sub> *internet usage patterns*, UPOM. Building on the previous argument on organizational learning and optimization of the use of individual tools, we further ask:

RQ<sub>4</sub>: Are some of these patterns becoming more widely used than others among FGC?

## METHODOLOGY

### Sample and Data

A large north-eastern university has conducted a series of surveys on the usage of Internet by fast-growing US corporations reported in the Inc. 500 rankings (Barnes 2010). These rankings are compiled annually and independently by the *Inc.* magazine. Criteria for the inclusion in the rankings remained stable during the period of reference.

The sample covers four years, namely 2006, 2007, 2009 and 2010, making this a valuable and rare study on the trends in corporate adoption of these new technologies. The marketing executives at the Inc. 500 companies were interviewed by phone using a structured questionnaire. The response rates fluctuated between 24 percent and 42 percent across years, with a mean of 32%. The survey was run shortly after the publication of the list. The sampling error over the four years of data collection ranges from five percent to seven percent.

The questionnaire captures several aspects of internet usage, including changes in the SNS category as new platforms emerged, i.e., Twitter, Facebook, MySpace, LinkedIn and Foursquare. The variables of interest in the present research are categorical variables reflecting use or not use of six types of online

media: blogs, podcasts, video-blogs, social networking sites (SNS) and bulletin or message boards. For brevity, we will use the broader term Internet *tools* to refer to either of these media. The data used in this research includes most of the companies surveyed in the original study. As there were only few companies common to each year's sample, common companies are dropped from the data set. This procedure yields four unduplicated cross-sectional samples which reduces autocorrelation. An additional firm was dropped due to lack of revenue data. The total loss is 4.89 percent of 613 cases. The resulting sample size is 583 with year sub-totals being 110 for 2006, 193 for 2007, 130 for 2009 and 150 for 2010.

### Use of Online Media

A series of ANOVA was conducted to assess the effects of chronological year on the use of each tool individually considered.

### Pair-wise Associations

2x2 contingency tables were created for each of ten possible pairs of tools in each of the four available years, for a total of 40 contingency tables. The significance of the association between each pair of tools was assessed with the Pearson chi-squared test. The direction of association was assessed by calculating the difference between the sum of the cases, where both uses were present and the cases where neither was present, minus the sum of cases where either use was present and the other was not.

### Usage Patterns of Online Media

A series of exploratory *k*-means cluster analyses specifying a fixed number of clusters is run for the four sample subsets corresponding to each level of calendar year. The choice of number of clusters was six since this number of clusters was found to produce the lowest level of concentration of cases by cluster in the total sample. Next, common clusters across years are identified. Each of these clusters represents a

*usage pattern of online media*, UPOM, i.e., a pattern of association among two or more Internet tools; for instance, social networking sites associated to blogs and video-blogs. We use the designation "usage pattern of Internet tools" equivalently. At least two tools are identified as potential anchors of consistent UPOM; these UPOM can be organized in sequences of increasing number of Internet tools involved in the pattern. Based on these results, we assess changes over levels of calendar year in five sequences of UPOM corresponding to each individual tool considered as a candidate anchor, i.e., the tool around which others are organized. We call these sequences *UPOM series*; for instance, a series of UPOM with bulletin boards as a common tool and increasing number of other tools.

### UPOM and Market Performance

An emerging research question presented in the Results section points to UPOM series as potentially associated to company performance. To answer this question, we estimate two groups of regression model, the first one exploratory and the second one confirmatory.

**Exploratory regressions:** These seek to establish whether there is a potentially interesting relationship between the two variables of interest. It comprehends three multivariate linear regression models (one benchmark model and two test models) with the logarithm of firm revenues as their common dependent variable capturing firm's market performance. In benchmark model 1 the predictor of interest is total number of tools; in model 2, the predictors of interest are four dummies for the use of each individual tool, with video-blogging as the base case. Based on the results from the estimation of model 2, i.e. SNS is the only tool significantly related to revenues, model 3 further splits the effect of the tool SNS using dummies representing the number of other tools associated to SNS. That is, each of these dummies is an UPOM and the complete set of dummies represents an UPOM series.

The base case for the SNS-anchored UPOM series dummies is “no use of SNS”. Other covariates in these models include the logarithm of the number of employees, an ordinal variable for calendar year, an ordinal variable for number of years in business and the dummies for four of the five sectors created by grouping the 33 industries reported in the original data set. These are business to business non-capital intensive (e.g., human resources, consulting; N=203); capital intensive (e.g., energy, infrastructure; N=79); information technology regardless of type of customer (N=139); and, business to consumer (e.g., retail, health care; N=108). Financial services, regardless of type of customer (N=54) is the base case. In the absence of SIC codes, industries as reported by *Inc.* were grouped into these sectors by the researchers and the classification was validated by asking three blind judges (marketing professors) to assign industries to either one of the four proposed sectors. On average, the judges agreed with the proposed classification in 80 percent across items and inter-judge agreement was 73 percent. Autocorrelation is a potential issue for models 1 to 3 because the data are a time series; thus, the Durbin-Watson D and the first-order autocorrelation  $r$  are calculated for each model and reported together with regression parameters and fit measures in the results section.

**Confirmatory system of equations:** As we find that usage patterns of online media predict revenues in the exploratory models, we estimate a second group of regression models specified as systems of equations with two endogenous variables in order to confirm these findings. The two endogenous variables are the logarithm of revenues, and either a dummy variable capturing use of SNS or else an ordinal variable capturing progressively complex SNS-anchored usage patterns. These variables are described in more detail in the Results section. Estimating this group of models is necessary in order to account for the potential endogeneity between revenues and UPOM series, as: a) the ability of a firm to deal with more complex UPOM may result from larger marketing

budget and more capable management, which co-vary positively with firm revenues; and, b) more complex SNS-based UPOM may positively affect the effectiveness of marketing communications and thus, revenues. Elucidating the direction and magnitude of these effects will provide the answer to the emerging research question.

## RESULTS

### Use of Online Media

Figure 1 is a graphic display of the effects calendar year in the use of total Internet tools and on each individual tool individually considered: social networking sites, blogs, bulletin boards, video blogs and podcasts. The paragraphs below report significant effects of calendar year on each individual tool, at average levels for the remaining tools; and, the significance of pair-wise comparison within graphs.

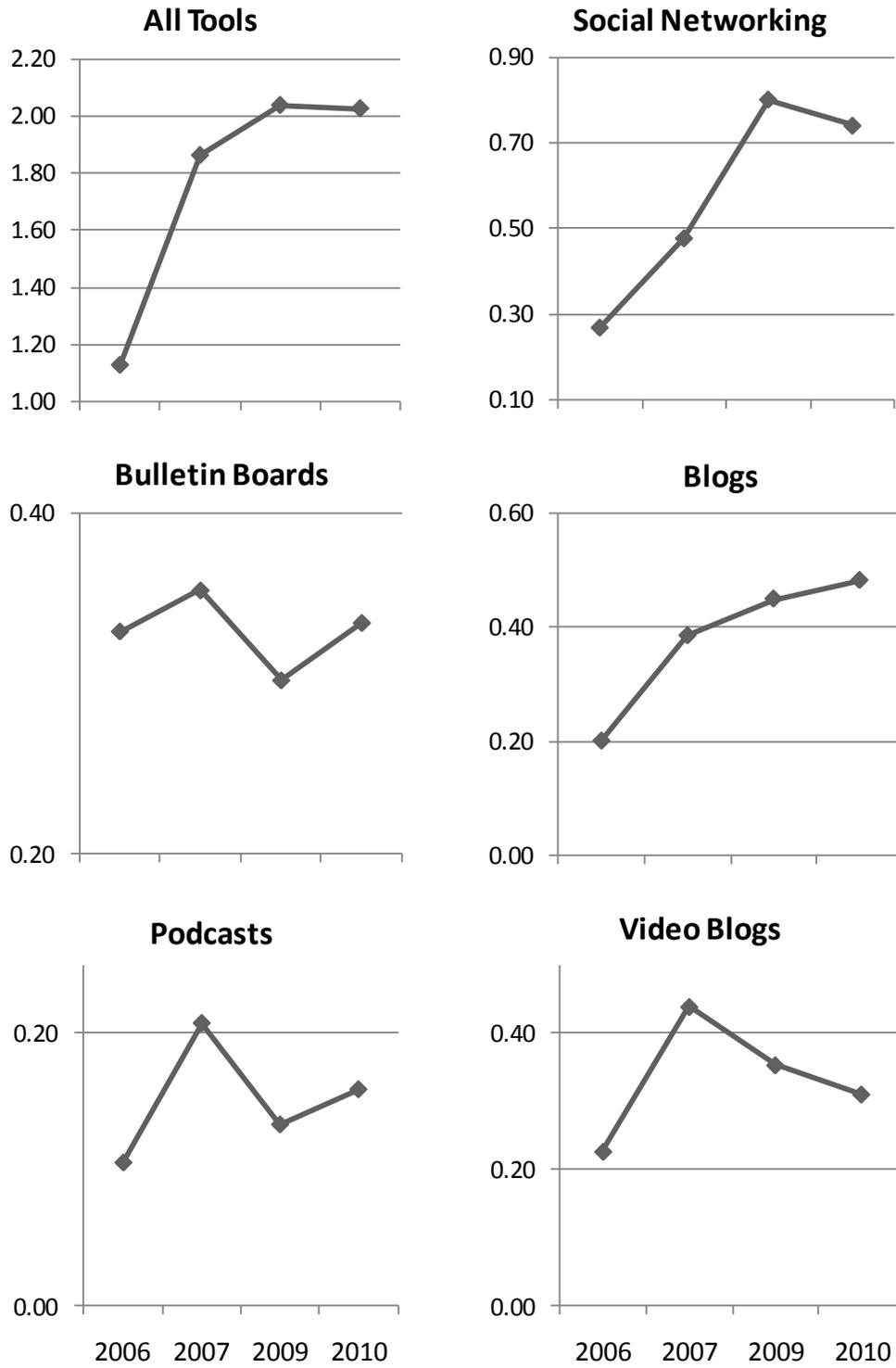
**Total tools:** Calendar year has a significant effect on total number of tools ( $p < .001$ ). Use of Internet tools increased significantly only in 2007 vs. 2006 ( $p < .001$ ) and has remained stable around two uses in 2009 and 2010 respect to 2007.

**Social networking sites (SNS):** Calendar year has a significant effect on the use of SNS ( $p < .001$ ). Use of SNS increased significantly in 2007 vs. 2006 ( $p = .020$ ) and in 2009 vs. 2007 ( $p < .001$ ). It remained stable in 2010 vs. 2009 ( $p = .160$ ).

**Bulletin boards:** Calendar year does not have a significant effect on the use of bulletin boards ( $p = .143$ ) although the latter decreased significantly in 2009 respect to 2006 ( $p = .023$ ). All other pair-wise comparisons yielded  $p > .05$ .

**Blogs:** Overall, calendar year does not have a significant effect on *BLOGS* ( $p = .205$ ) but *BLOGS* in 2010 was higher than in 2006 ( $p = .033$ ). All other pair-wise comparisons for *BLOGS* yielded  $p > .05$ .

**FIGURE 1:**  
**Estimated Means, Number of Tools by Firm**



*Podcasts:* Overall, calendar year has no significant effect on the use of podcasting but the peak in 2007 shows a significant difference respect to the valley in 2009 ( $p=.029$ ).

*Video-blogs:* Overall, calendar year has no significant effect on use of video-blogs ( $p=.150$ ) but the peak in 2007 shows significant differences respect to 2006 ( $p=.018$ ), 2009 ( $p=.005$ ) and 2010 ( $p<.001$ ).

### Pair-wise Associations

Table 1 summarizes the Pearson chi-squared  $p$ -values for the 40 tests of association on 2x2 contingency tables between each pair of uses and year. Smaller values represent higher degrees of association. In one case, segregation instead of association was detected.

In 2006, only podcasting and blogging were closely associated with each other; while the use of social sites was marginally associated to bulletin boards and 2007 video-blogging achieved a maximum. Interestingly, Table 1 shows that video-blogging became a sort of standalone tool that same year, for some firms at least, as this use is not associated to any other uses. All other uses are shown to be at least marginally associated (most of them significantly) in 2007, with the sole exception of video bulletin boards and podcasting. In 2009, social networking sites abruptly become the predominant way of using the Internet by the 500 Inc firms [Graph 1b)] almost duplicating any other uses individually considered. The overall use of podcasting, video-blogging and bulletin boards plummeted [graphs 1d), 1e) and 1f)] while blogs continued growing modestly. Still, total use of tools remained unchanged (1b). Such major shift in the way firms combine Internet tools levels off almost all pair-wise associations in 2009, as Table 1 shows, with the only exception of the pair blogs/video-blogs. Furthermore, like podcasting in its 2007 heyday, social networking sites seems to become in 2009 a standalone tool as it shows the highest average

$p$ -value over its four pair-wise associations for that year (.563 vs. an average of .254 for all other tools).

Social networking sites and blogs are still the predominant uses of Internet by 500 Inc. firms in 2010 (Graph 1) but, again, a major shift in pair-wise tools associations takes place respect to previous years. SNS in 2010 are strongly associated to blogs but, at the same time, strongly segregated from bulletin boards. Blogs show a remarkably high degree of association with all other tools. Podcasts follow a similar pattern with the sole exception of social networking sites.

The seemingly erratic changes in the patterns of pair-wise associations on Table 1 are in stark contrast with the monotonic or flat trends of adoption of the five tools shown on Figure 1, especially when statistical significance is considered. That is, underneath the relatively smooth process of adoption of online tools, a hectic, possibly trial-and-error learning process took place among FGC.

### Usage Patterns of Online Media

Having established on statistical grounds that the way firms combine Internet tools has changed over time, the next step is to identify sets of relevant patterns that can be traced during the four-year period and be used in regression models. A series of exploratory  $k$ -means cluster analyses revealed that the most common clusters of uses along the four-year period of the study accounted for 75% of all cases. These clusters capture consistent ways in which tools are combined and are called usage patterns of online media, UPOM, or usage patterns of Internet tools as explained in the Methodology section. Two important conclusions emerged from the exploratory cluster analyses: a) these patterns can be ordered by increasing complexity; and, 2) some tools seem to work as anchors for specific UPOM, especially SNS and, to a lesser extent, blogs.

**TABLE 1:**  
*p*-Values for the Pearson Chi-squared Tests of Association Between  
 Pairs of Internet Tools on Contingency Tables, by Year

<b>2006</b>	SNS	Blogs	Bull. Boards	Video-blogs	Podcasting
SNS		<i>0.553</i>	0.051 (+)	0.063 (+)	<i>0.438</i>
Blogs			<i>0.388</i>	<i>0.580</i>	<b>0.03 (+)</b>
B. Boards				<i>0.407</i>	<i>0.789</i>
Video-blogs					<i>0.241</i>
Podcasting					

<b>2007</b>	SNS	Blogs	Bull. Boards	Video-blogs	Podcasting
SNS		<b>0.015 (+)</b>	0.088 (+)	<i>0.680</i>	<b>0.007 (+)</b>
Blogs			<b>0.022 (+)</b>	<i>0.154</i>	<b>&lt;.001 (+)</b>
B. Boards				<i>0.958</i>	<i>0.136</i>
Video-blogs					<i>0.210</i>
Podcasting					

<b>2009</b>	SNS	Blogs	Bull. Boards	Video-blogs	Podcasting
SNS		<i>0.523</i>	<i>0.548</i>	<i>0.882</i>	<i>0.299</i>
Blogs			<i>0.371</i>	<b>0.004 (+)</b>	<i>0.135</i>
B. Boards				0.063 (+)	<i>0.117</i>
Video-blogs					<i>0.135</i>
Podcasting					

<b>2010</b>	SNS	Blogs	Bull. Boards	Video-blogs	Podcasting
SNS		<b>&lt;.001 (+)</b>	<b>&lt;.001 (-)</b>	<i>0.330</i>	<i>0.803</i>
Blogs			0.082 (+)	<b>0.003 (+)</b>	<b>0.017 (+)</b>
B. Boards				<i>0.290</i>	<b>0.032 (+)</b>
Video-blogs					<b>0.003 (+)</b>
Podcasting					

Legend: Bold characters for  $p\text{-value} \leq .05$ ; regular characters for  $.05 < p\text{-value} \leq .10$ ; lighter, italicized characters for  $p\text{-value} > .10$ . Direction of association indicated in parentheses as positive (+) or negative (-).  
 SNS: Social networking sites.

Based on these findings, we define five *series* of UPOM where each one of the five Internet tools is considered as the sole anchoring tool. These *UPOM series* are the following: a) SNS-based series, all uses except social networking sites/social networking sites alone/social networking sites plus one or more other tools; b) blog-based series, all uses except blogs/blogs alone/blogs plus one or more other tools; c) bulletin-based series, all uses except bulletin boards/bulletin boards alone/bulletin boards plus one or more other tools; d) v-blog-based series, all uses except video-blogs/video-blogs alone/video-blogs plus one or more other tools; and, e) podcast-based series, all uses except podcasts/podcasts alone/podcasts plus one or more other tools. Figure 2 shows the evolution of these five UPOM series by year.

The assessment of the prevalence of each of these five UPOM series in the sample is performed as follows: If any given tool is the backbone of a prevalent UPOM series, the proportion of cases where this tool is not present should be small; the proportion of cases where this tool is combined with all other tools should be high; and, the proportion of cases where this tool is used as a standalone tool should be somewhere between these two extremes. That is, the slope of the “trend lines” on the graphs in Figure 2 should grow in the positive direction as the anchoring role of the focal tool increases. Figure 2 indicates that SNS have had a predominant role in anchoring UPOM series since 2007, with the exception of blogs in 2010; and, that the anchoring role of SNS has grown steadily. Figure 2 also shows that most other UPOM series have an inverse pattern. Figure 3 allows a better assessment of the changes in the slope of the trend lines in Figure 2. Figure 3 confirms that SNS’ anchoring role has been increasing but makes it evident that blogs’ anchoring role has grown as well although at a more modest pace. The anchoring roles of all other tools have remained minor.

### Emerging Research Question

The evident, major changes in uses of Internet tools by 500 Inc. firms between 2006 and 2010 might be in part the result of influences from the broad business environment; however, the scope of these changes and the increasing role of electronic interfaces in marketing communications make it difficult not to consider their connection to marketing strategy. In fact, past research has found online tools to have a positive impact on the effectiveness and efficiency of marketing communications (Drèze and Hussherr 2003; Briggs, Krishnan and Borin 2005; Dwyer, 2007; Naik and Peters 2009) and thus it is possible that, as a second-level effect, marketing communications has a positive effect on market performance. We formalize this speculation as an emerging research question, as mentioned in the Methodology section:

RQ<sub>5</sub>: Are the predominant UPOM related to market performance?

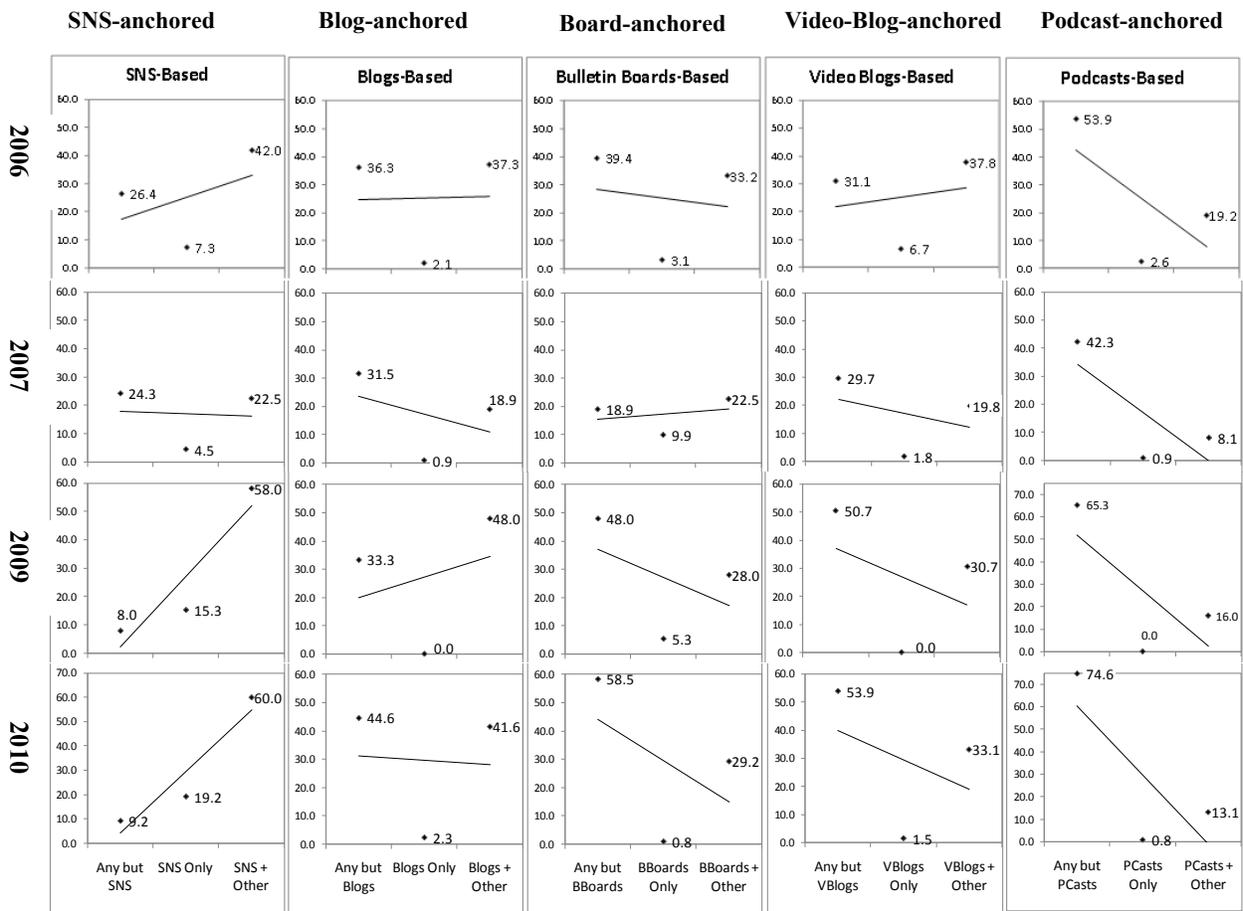
This relationship is analyzed in the next section.

### Exploratory Regressions

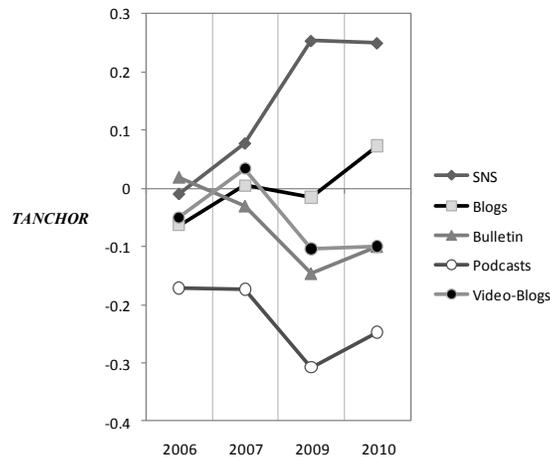
Table 2 presents the statistics and correlations for the five continuous variables included in all regression models. Table 3 shows the results of the estimation of the benchmark model 1 as well as models 2 and 3. These models explore a possible relationship between UPOM series and revenues and help establish whether there data are serially correlated. Estimates in these models might be biased though as there is a potentially endogenous relationship between the variables of interest: firms with larger revenues can afford to manage more complex communication portfolios and these more complex tools may in turn contribute to increase revenues.

In model 1, only the logarithm of number of employees shows large, significant, positive estimates. This holds true for all other models as well and derives from the relationship of number of employees and company size. In model 2, the introduction of the dummies by tool leads to an interesting pattern of effects in

**FIGURE 2:**  
Evolution of Five UPOM Series, by Year and Anchor Tool



**FIGURE 3:**  
Slopes of the Trend Lines on Figure 3, by Tool and Year



**TABLE 2:**  
**Statistics and Correlations Among Continuous Variables, Total Sample**

3a) Statistics

	Mean	SD
Revenues (log)	2.48	1.18
Ordinal IUP series	3.08	1.57
Number of employees (log)	3.90	1.20
Years in business	4.92	1.35
Total number of tools	1.81	1.50

3b) Correlations (*p*-values underneath)

	1	2	3	4	5
Revenues (log)	1.0000	-0.0762 0.0658	0.3890 <.0001	0.0427 0.3034	0.0753 0.0693
Ordinal IUP series		1.0000	-0.0106 0.7989	0.0494 0.2341	0.9329 <.0001
Number of employees (log)			1.0000	0.0575 0.1659	0.0284 0.4940
Years in business				1.0000	0.0248 0.5509
Total number of tools					1.0000

**TABLE 3:**  
**Exploratory Regressions: Standardized Estimates (total sample)**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Intercept</b>	0.00	0.00 **	0.00 **
<b>Calendar year</b>	-0.07	-0.11 **	-0.11 **
<b>Use of tools</b>			
Total number of tools	-0.06	-0.22 +	-0.20
Dummy for blogs		0.00	-0.01
Dummy for bulletin boards		0.03	0.02
Dummy for podcasts		0.07	0.07
Dummy for social networking sites		0.17 *	
<b>Dummies for UPOM</b>			
Only social networking sites			0.08
Social networking sites + 1 more tool			0.17 **
Social networking sites + 2 more tools			0.13
<b>Firm characteristics</b>			
Years in business	0.00	-0.01	-0.01
	* *		
Number of employees (log)	0.39 *	0.39 ***	0.39 ***
Dummy for sector 1	-0.02	-0.18 **	-0.18 **
Dummy for sector 2	0.00	-0.12 *	-0.12 *
Dummy for sector 3	0.09	-0.15 *	-0.15 *
Dummy for sector 4	0.04	-0.10	-0.10
<b>Model fit statistics</b>			
Pr > F	<.0001	<.0001	<.0001
Adj. $R^2$	0.170	0.177	0.172
Durbin-Watson $D^a$	2.052	2.073	2.062
<b>Sample size</b>	583	583	583

+,  $p < .10$ ; \*,  $p < .05$ ; \*\*,  $p < .01$ ; \*\*\*,  $p < .001$ ;

<sup>a</sup> Durbin-Watson tests: Model 1:  $D$  interval is [1.831, 1.900]; Model 2:  $D$  interval is [1.819, 1.901]; Model 3:  $D$  interval is [1.812, 1.908]. Values for the first-order autocorrelation parameter  $\rho$  are non-significant for all models at  $\alpha = .01$ . Thus, neither positive nor negative autocorrelation are supported.

which calendar year has a negative estimate, as it should be expected from the effects of the 2008 financial crisis; and, three sector dummies show significant negative estimates. Number of tools has directionally negative estimates with *p*-values close to .10 across models on Table 3. That is, the number of Internet tools when used as a sole predictor in model 1 does not relate to company revenues and these effects are seemingly absorbed by sector dummies. In model 2, considering tools dummies, particularly SNS, makes sector effects vanish and yields directionally negative estimates for number of tools, possibly an indication of negative effects of increasing complexity of the customer interface. The two-tailed Durbin-Watson tests do not support either positive autocorrelation or negative autocorrelation that respectively, indicates independence of predictors across time periods and provides no basis to question model specification.

As only the use of SNS shows a significant relationship with revenues, and Figures 2 and 3 reveal that SNS-anchored are the most prevalent UPOM series, we further explore the relationship of this specific UPOM series and revenues. To this aim, model 3 further splits the effect of SNS into three UPOM: SNS as the only tool, SNS plus one other tool and, SNS plus two or more other tools. Together, these three dummies capture a single, SNS-anchored UPOM series. The estimates for these three dummies show an inverse-u pattern. Estimates for other covariates remain almost unchanged in relation to model 2.

### Confirmatory System of Equations

In order to elucidate the direction of effects between UPOM series and revenues, we estimate a system of two equations where these are defined as the two endogenous variables. The SNS-anchored series in model 3 is captured by three dummies, which would make it necessary to specify a system of four equations. Instead, we re-specify this UPOM series as a single ordinal variable (Ordinal SNS series) with value equal 0 for no SNS use, 1 for SNS-only, 2 for SNS plus one other tool and so

on until a value of 5 for SNS plus four other tools. Also, a condition for the system of two equations to be fully identified is that the equations differ in at least one variable. Thus, we chose not to include a variable with very limited predictive power, years in business, in equations type 1 where the DV is Ordinal SNS series. Furthermore, the estimation of the systems using this variable in equations type 2 instead of type 1, not reported in this paper, yielded very similar estimates across the board. As models 2 and 3 have very similar  $R^2$ , we consider in this section two equivalent candidate models: model 4, accounting only for the use of SNS; and model 5, accounting for the SNS-anchored series. Furthermore, we estimate these models for two data subsets corresponding to the periods 2006-2007 and 2009-2010, as figures 3 and 4 show a major shift in the prevalence of SNS-based patterns after 2008. Thus, the estimation results for models 4 and 5 presented on Table 4 comprise a total of four systems of equations (2 model specifications  $\times$  2 time periods) with two columns of estimates for each system (one for each of the 2 endogenous dependent variables).

Estimation results for the 2006-2007 and the 2009-2010 models on Table 4 indicate that the overall fits of the two systems accounting for SNS-anchored series (right hand side) are considerably better than those of the models accounting only for the use of SNS. The covariates of interest on Table 4 are Ordinal SNS-anchored UPOM series and Revenues (log). Importantly, both of these variables show highly significant ( $p < .001$ ) and strong positive effects on each other. That is, model 5 indicates that increasingly complex SNS-anchored UPOM enhance revenues and, at the same time, revenues predict increasingly more complex SNS-anchored UPOM.

### DISCUSSION AND FUTURE RESEARCH

This study has established several important facts with respect to the way FGC use online media, as well as identified a potentially interesting relationship between the use of such media and market performance. First, the use of

**TABLE 4:**  
Systems of equations: Standardized Estimates by Period

	Period 2006-2007					
	Model 4: Use of SNS as a predictor			Model 5 : SNS-based usage pattern as a predictor		
	Equation 1 DV: Ordinal SNS UPOM series	Equation 2 DV: Revenues (log)		Equation 1 DV: Ordinal SNS UPOM series	Equation 2 DV: Revenues (log)	
<b>Intercept</b>	-0.19	0.02		-0.49 +	0.50 *	
<b>Calendar year</b>	0.01	-0.21 ***		0.02	-0.21 ***	
<b>Firm characteristics</b>						
Revenues (log)	1.17 **			0.95 +		
Years in business		0.01			0.00	
Number of employees (log)	-0.32 **	0.25 ***		-0.27 +	0.26 ***	
Dummy for sector 1	0.64 *	0.01		0.53 +	0.00	
Dummy for sector 2	0.47 +	-0.53 *		0.33	-0.53 *	
Dummy for sector 3	0.69 *	-0.35		0.55 +	-0.32	
Dummy for sector 4	0.77 *	-0.59 *		0.66 +	-0.56 *	
<b>Internet tools</b>						
Ordinal SNS UPOM series					1.11 ***	
Dummy social networking sites		1.17 ***		**		
Total number of tools	0.39 ***	-0.64 ***		0.92 *	-0.67 ***	
<b>System of Equations Statistics</b>						
Weighted MSE		3.067			1.647	
Weighted R <sup>2</sup>		0.2712			0.5963	

+,  $p < .10$ ; \*,  $p < .05$ ; \*\*,  $p < .01$ ; \*\*\*,  $p < .001$ .

online media individually considered has changed over time, with SNS and blogs becoming the predominant firm-customer interface (RQ1) without considerably affecting the use of other tools. Rather, the total use of internet tools has grown considerably as a result of the increased adoption of SNS and, to a lesser extent, blogs. This represents a major shift from *broadcast* to *interactive* online media which probably mimics the growing adoption of the latter by the general public. It may reflect as well the benefits firms get from engaging in dialogs with their customers, as estimation results on Table 4 show. Second, the way in which these tools are combined has changed in a seemingly erratic way. The lack of finer grain data keeps us from further speculating on the specifics of such process, but it can certainly be concluded that firms have gone through a learning process over the five-year period of the study (RQ2). Third, consistent with the previous findings, there is a tendency to use some UPOM more frequently (RQ3) and a specific UPOM series involving SNS as the anchoring medium has gradually become predominant over the years (RQ4). This supports our initial assumption of the Internet tools as non exclusive parallel innovations which firms assemble at will and may tailor to their specific needs.

A fourth important finding from this study is the positive relationship between firm revenues and increasingly complex, SNS-centered usage patterns of online media (emerging RQ5). This relationship goes both ways. With regard to the revenues-patterns direction of effects, results indicate that companies with more resources favour the adoption of more complex, SNS-centered patterns. With regard to the patterns-revenues direction, these patterns series also affects revenues positively. We acknowledge though that marketing budget, which we do not observe in our data, should positively co-vary with firm revenues and, thus, should mediate the relationship revenues-UPOM series in both directions. First, in the revenues→UPOM series direction, a larger marketing budget increases the ability of firms to deal with more complex communication portfolios by allowing hiring

numerically larger and/or more qualified personnel. The mediation of marketing budget is not problematic in this case: larger revenues lead to larger marketing budget that leads to the choice of more complex SNS-anchored usage patterns. Importantly, this means that FCG value SNS-centered complexity, one possible explanation being its possible positive impact on firm revenues, i.e., positive effects in the UPOM series→revenues direction. The present study does not allow for clear conclusions in that regard though, as a larger marketing budget would enable firms to assemble more effective marketing mixes and communication mixes, not just more effective online communication portfolios. In this direction of effects, the mediation of marketing budget is problematic as it brings about competing explanations for improved revenues, i.e. all other elements of the marketing mix. Thus, marketing budget needs to be accounted for to fully elucidate the contribution of the use of Internet tools to revenues among FGC. This remains an interesting avenue for future research. Regardless, we now present arguments to support a hypothetical positive relationship.

Statistical modeling research has consistently shown an overall weak or even null relationship between innovation and company growth (e.g., Bottazzi et al. 2001; Del Monte and Papagni 2003; Lööf and Heshmatt 2006) which has been attributed to the fact that most innovations lead to either small or else delayed changes in product performance and customer perception (e.g., Mansfiel et al. 1977, cited by Coad and Rao 2008; Belderbos, Caree and Lokshim 2004). Innovations in SME and FCG seem to play a more critical role though. For instance, Hay and Kamshad (1994) report that innovation was the preferred growth strategy among the key decision makers in SME in the UK; whereas Coad and Rao (2008) find significant, strong effects of innovation specifically on FGC's revenues in a multi-nation sample of more than 1,200 firms.

Furthermore, we argue that Internet tools have a direct impact on the firm-customer interface; thus, they affect market performance more

directly than other innovations. As stated in the Background section, online media are dual process-product innovations which affect both the products' intangible attributes and the responsiveness of the company to customer feedback. In sum, we believe that future research should consider the hypothesis of a positive impact of increasingly complex, SNS-based online communication portfolios on the revenues of FGC.

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