

**Big personality traits in small-world networks:
how CEOs can improve customer satisfaction using social media.**

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Abstract

Despite the importance of corporate social media for connecting with customers, employees, and all stakeholders, the role of top managers' social media accounts, in this relationship, remains relatively unexplored. Drawing on strategic leadership and organizational networks literatures we test a personality-network fit explanation of how CEOs can improve customer satisfaction using social media. We find that extravert CEOs have a positive direct effect on satisfaction. Yet, when the moderation of network closeness is introduced, agreeable CEOs score higher in terms of customer satisfaction. The results of a moderate-mediation analysis show that extravert CEOs can influence satisfaction through the mediation of employees approval, when their network closeness is low. This study contributes to research in marketing by suggesting how different top managers' personalities can leverage the affordances of social media to either directly, or indirectly influence customer satisfaction.

Keywords: CEO, personality traits, social network, customer satisfaction, employee approval, extraversion, agreeableness, closeness.

Introduction

Today, business leaders appear to be more concerned about their appearance in social media and willfully engage in interactions with employees and customers to demonstrate their leadership and to create brand awareness. Strategic leaders who have extraverted personalities are naturally at advantage in connecting with others. Elon Musk, for example, who uses Twitter to post news about the two companies he runs as CEO (Tesla and SpaceX), answer customer requests, and share fragments of his private life, not surprisingly is one of the most popular CEOs active online. However, evidence shows that agreeable leaders are equally effective in engaging with employees and customers (Brandfog, 2013). Satya Nadella (CEO at Microsoft), for example, and Tim Cook (Apple's CEOs) both have been credited (Brandfog, 2013) as influential thought-leaders, that use social media to share business-related content and to champion the debate over key societal issue .

Recent research in marketing and strategic leadership has inferred top managers' personality traits from language used in social media, such as Twitter (Winkler, Rieger, Engelen, 2020; Wang and Chen, 2020), and measured their impact on strategic and organizational outcomes (You, Srinivasan, Pauwels, Joshi, 2020). For example, the findings of Winkler et al. 2020 suggest that Chief Marketing Officers' extraversion explains a significant proportion of their companies' web traffic, especially during the start-up phase of a new venture. Wang et al. 2020 provide evidence that extravert CEOs can positively influence their companies' operational and financial performance, by giving impulse to organizational policies such as cost efficiency, asset turnover and employee productivity. Interestingly, a number of recent studies have looked into the effects of agreeableness on firm strategy and performance, but found no conclusive evidence (Benischke, Martin, Glaser, 2019). Harrison, Thurgood and Boivie (2019), for example, found that agreeableness has a negative effect on strategic change, while Hermann and Nadkarni (2014) had argued otherwise, showing how agreeableness might positively influence strategic change through teamwork and cooperation.

Despite the importance of corporate social media for connecting with customers, employees, and all stakeholders in general, the role of top managers' social media accounts, in this relationship, remains relatively unexplored. Recent research in strategic leadership has argued

that corporate executives can affect stakeholders' identification, trust and cognition by adopting specific social media behaviors, such as dialogue, mobilization, and conveyance (Heavey, Simsek, Kyprianou, Risius, 2020). In addition, recent work in organizational public relations subscribe to the view that, aside from their executive duties, CEOs are now expected to perform a "personal marketing" role, through their active presence in social media (Mudambi, Sinha, Taylor, 2019; Bai and Yan, 2019). Yet, previous research has largely overlooked the fact that online social networks have structural properties that escape individual agency and control. Social media allow business leaders to create an extensive network of followers, provoke reactions, and trigger instantaneous feedbacks, but this is only partially the result of their individual agency. Network design features underpin the likelihood of success of online popular business leaders, either by supplying weak-ties (Granovetter, 1992), that maintain networks rich in structural holes, or strong ties that create densely interconnected small-world networks.

The purpose of this paper is to test a personality-network fit explanation of how strategic leaders can improve customer satisfaction using their social media accounts. We present two arguments supporting a direct and an indirect relational mechanism through which CEOs can leverage the affordances of their social media to influence the satisfaction of their customers. This approach provides effective for several reasons. First, customers and employees are urging strategic leaders to go social and to act as thought-leaders and role models. A recent survey by Brandfog (2018) suggests that 93% of customers are likely to make a purchase from a company whose CEO is active online, standing for key societal issues. Likewise, 70% of employees believe that, by leveraging their social media, CEOs can become more effective leaders (Brandfog, 2013). However, there are no historical trends, no best practices, nor guidelines that might direct or restrain CEOs uses of social media (Capriotti and Reusja, 2018). Our methodology leverages social media data at its fullest potential to describe how the interplay between CEOs' personality and network position directly affect a firm's market performance. Our findings show that extravert CEOs have a positive direct effect on satisfaction. Yet, when the moderation of network closeness is introduced, agreeable CEOs score higher in terms of customer satisfaction.

Second, strategic leaders' social media coexist and interact with corporate organizational processes. It is now generally accepted that strategic leaders impact their firms' strategy and performance through a sequential mediation mechanism that includes top management teams processes, such as flexibility, cohesiveness, centralization, and organizational processes, such as culture, structures, and ambidexterity (Liu, Fisher, Chen, 2018). By investigating whether strategic leaders social media influence employees approval, we are able to test whether CEOs can indirectly affect their firms' customer satisfaction, through the mediation of their employees.

Finally, strategic social media coexist and compete for online attention with corporate social media. By understanding how specific personality traits and network configurations influence stakeholders perception, we may endeavor to foster a better fit between CEO-authored communication and organizational public relations. In this sense, social media represent a unique research setting to jointly investigate the interplay between strategic leaders' individual characteristics and the relational levers afforded by their social networks on a wide range of organizational and strategic outcomes, whose implications are extended to, but not limited to, customer satisfaction.

The reminder of this paper is organized as follows: we first briefly revisit strategic leadership and organizational networks literature. We then describe our sample and data, discuss the methodological approach, and present our findings. We conclude with a brief discussion of the main finding and the contributions of our research.

Theory and hypotheses

Strategic leadership theory argues that organizations become the reflections of their managers over time. In short, corporate executives' individual attributes affect their strategic decisions and organizational behaviors which, in turn, determine organizational performance (Hambrick and Mason, 1984). The likelihood of top managers' individual idiosyncrasies being reflected in their organizations increases as they face raising levels of contextual uncertainty, time-constraints and managerial discretion (Hambrick, 2007). Social media met all these three conditions and, as such, offer a supplemental channel through which strategic leaders can influence organizational performance (Heavey et al., 2020).

One of the most recently examined attributes of strategic leaders is personality traits, which scholars in strategic leadership measure from language in conference calls with analysts (Harrison et al., 2019), video interviews (Choudhury, Wang, Carlson, Khanna, 2019) and social media, such as Twitter (Winkler et al., 2020, Wang et al., 2020). The Five Factor Model (FFM) (Digman, 1999; Goldberg, 1992; Goldberg, 1993), also known as the Big Five Framework, accurately maps the personality of individuals of any age, gender, and social status. Psychology researchers argue that, since the big five personality traits have a significant hereditary component and remain stable, or slowly change over time, they hold significant potential for studying decision-making and real-life outcomes (Anderson, Burks, DeYoung, Rustichini, 2011). Extraversion, for example, is associated with the need for stimulation, ambition, and sociability (Hogan, 1986). Extraverts are abundant among popular leaders and online influencers (Quercia et al., 2012), who are driven by optimism and spirit of adventure (Judge and Cable, 1997). As such, extraversion is positively related to initiation of strategic change and risk-taking (Herrmann et al., 2014) and, in general, has a well-documented positive effect on firm performance (Benischke et al., 2019). We, accordingly, propose that:

H1: CEOs' extraversion is positively related to customer satisfaction.

In addition to top managers' individual characteristics, one of the dominant arguments researchers have made to explain how strategic leaders can influence organizational performance is social capital. Among business leaders' top priorities, the external leadership function (Samimi, Cortes, Anderson, Hermann, 2018) encompasses key stakeholders management, competitive intelligence and interlocking directorates. Research in strategic leadership has extensively demonstrated that social capital provide CEOs with advice (McDonald, Khanna, Westphal, 2008), solidarity (Zhu and Westphal, 2014), and information (Westphal and Zhu, 2018) that are relevant to situational requirements in conditions of resource-dependency (Pfeffer and Salancik, 2003). In addition, organizational behavior scholars subscribe to the view that centrality in professional networks can positively influence the perception of a team leaders' charisma (Balkundi and Harrison, 2011) and enhance team viability and task performance (Balkundi and Harrison, 2006).

Despite personality traits and social networks being intuitively complementary, contemporary research in management and marketing has seldom investigated the effect of their interplay on external leadership outcomes. From research in sociology we know that individuals play specific roles and exert influence over others as a result of their social networks structure (Burt, 1982). However, a recent coevolutionary perspective claims that the interaction possibilities made available through specific network configurations call forth individual differences in personality, cognition and affect that interact and shape the network itself (Tasselli, Kilduff, Menges, 2015; Landis, 2015; Casciaro and Barsade, 2015; Kilduff and Lee 2020). This suggest the existence of an interactive process that combines individual characteristics and network affordances. For example, by analyzing data on people that play multiple characters (roles) in a virtual world (online game), Burt (2012) found evidence

consistent with personality and social networks being related. Those who build closed networks will build similar networks in other roles; likewise, those who build networks rich in structural holes tend to replicate that very structure across different roles (Burt 2012).

Closed networks assign to central individuals a high number of shortest paths to every other node in the network, that give access to relevant information, key resources, and advices in a more efficient way than just creating a high number of connections. (Borgatti and Everett, 2006). This is what makes small-world networks so effective in sparking innovation outcomes through collaboration (Uzzi and Spiro, 2005). However, closed networks require time, dedication and trust. As Lonnqvist, Itkonen, Verkasalao, Poutvaara (2014) suggest, extravert individuals are not likely to indulge in the creation of densely connected networks, while agreeable individuals are the ideal candidates to the task. Interestingly, extraverts attributes, such as verbal loquaciousness (Tasselli, Kilduff, 2018), have been found to negatively correlated with trust and network closeness. Agreeableness, in contrast, positively relates to organizational cohesion and decentralization of power (Peterson, Smith, Martorana, Owens, 2003). Agreeable leaders are effective in initiating and implementing strategic change through teamwork and cooperation (Hermann et al., 2014). We therefore expect agreeable leaders to positively affect customer satisfaction, when they can leverage small-world networks online.

H2a: CEOs' extraversion is negatively related to customer satisfaction, when they occupy the central position in closed networks.

H2b: CEOs' agreeableness is positively related to customer satisfaction, when they occupy the central position in closed networks.

CEOs' individual attributes affect organizational performance through a sequential mediation mechanism that include top management team processes (flexibility, cohesiveness, centralization), as well as organizational processes (culture, structures, ambidexterity). These processes translate CEOs and TMT strategic choices into organizational performance (Liu et al., 2018). Not surprisingly, employees' approval can mediate the effect of CEOs' personality traits on external stakeholders, as recent research in marketing suggests. Employees that embody the personality and the values of their companies give "a face" to their brands and engender a more favorable attitude in customers (Li, Berens, 2013; Risius, Beck, 2015). This suggests that CEOs' extraversion may have an indirect effect on customer satisfaction, through the mediation of employees' approval.

H3: Employees' CEO approval mediates the relationship between CEOs' extraversion and customer satisfaction.

Sample and data

The population for this study included executives at large and medium-sized public companies in the United States that served as CEO for at least one year, in the period 2007-2019. Archival data for the calculation of accounting ratios, employees' CEO approval and customer satisfaction were obtained from Execucomp, Compustat, GlassDoor and the American Customer Satisfaction Index (ACSI). We inferred CEOs' personality traits and network centrality using text and network data downloaded through the Advanced Programming Interface (API) of Twitter. After matching the different data sources, we retrieved a sample of 94 firm-years, 32 CEOs, 30 firms, and 10 years.

We operationalized customer satisfaction using the American Customer Satisfaction Index (ACSI) released annually by the ACSI organization. It is a score reported on a 0 to 100 scale, assessed through a multi-equation econometric model developed at the University of Michigan's Ross School of Business. Researchers in marketing and finance have extensively

applied ACSI to understanding firm performance (Fornell, Morgeson, Hult, 2016) and customer relationship quality (Wang, Kim, 2017).

We operationalized employees' CEO approval using data from GlassDoor.com. For each firm in our sample we collected reviews available on the website and selected the CEO approval rating, which is reported on a 0 to 100 scale. We are aware of the potential biases that affect measures taken from rating-based recommender systems (Marlin, Zemel, Roweis, Slaney, 2011) and address them through an instrumental variables approach that regresses CEO approval on the employee-based company rating, measured on a scale from 0 to 5, on the logarithm of a CEO's total compensation and, finally, on the ratio between number of reviews available on GlassDoor and number of employees, for the specific company. We follow Germann, Ebbes, Grewal (2015) and compute F-statistics and J-test to verify that the instrumental variables we have chosen are relevant ($F = 67.78$, $p < 0.001$) and exogenous ($J = 0.1507$, $p = 0.6989$).

To automatically infer personality traits from language, we apply the Linguistic Inquiry Word Count dictionary (LIWC) (Pennebaker and Graybeal, 1999) and train a machine learning algorithm on the myPersonality.org database (MYPT), which was created by David Stillwell and Michal Kosinski at Cambridge University in 2009. These tools have proved extremely useful in automatic personality recognition tasks (Mairesse, Walker, Mehl, Moore, 2007; Yarkoni 2010), especially by processing social media data (Park, Schwartz, Eichstaedt, Kern, Kosinski, Stillwell, Ungar, Seligman, 2015). To perform this task, we choose the Random Forest (RF) algorithm, that maximizes the accuracy rate both in the training and in the validation phases. Further details on the machine learning procedure are available from the authors.

To measure network closeness, we downloaded the entire network connections of each CEO on Twitter, measured as the sum of retweets, replies and mentions. We augmented the retrieved data by including all the retweets, replies and mentions created by the nodes present in each CEO's sympathy network (Arnaboldi, Passarella, Conti, Dunbar, 2015). Consistent with prior research on organizational networks, we measure a CEO's centrality within its Twitter network using closeness centrality (Borgatti and Everett, 2006), by summing all the shortest paths from a focal node to every other node in the network.

On the firm level, we control for Firm Age, Firm Size, and Sales growth. On the CEO level we control for CEO Age, CEO Duality, an indicator variable that takes value 1 if a company's CEO is also Chairman of the Board, and zero otherwise, CEO Tenure, and CEO Stock Ownership, that prior research uses to predict managerial discretion (Gupta, Nadkarni, Mariam, 2018). On industry level we control for Competitive intensity, measured as the Herfindahl-Hirschman index (Herfindahl, 1950), and Business model (B2C, or B2B, control group).

Estimation procedure

As personality traits are time invariant, we cannot use fixed-effects. However, the panel data nature of our sample is likely to violate the OLS assumptions of independence between the error terms of our estimation. To overcome this issue, we use a linear mixed model with individual random effects, which is most appropriate in similar estimation tasks (Harrison et al., 2019, Benischke et al., 2019). Consistent with prior research, we test our specification, by adding all the personality traits scores as they reflect simultaneously the multi-faceted construct of an individual's personality.

We are aware of the biased nature of our sample. This bias originates from the sampling procedure, that forcedly included only CEOs who use Twitter and who, in more general terms, have a social media presence. This condition violates our model's OLS assumptions of independence between the CEO effect and the error term. We then performed a Heckman correction to control for potential endogeneity arising from this self-selected sample (Heckman, 1976). In a first-stage probit regression, we used antecedents that relate to a CEOs' decision to

adopt Twitter and hence potentially influence the likelihood of that specific CEO to be sampled. After regressing the CEOs' Twitter adoption variable on these antecedents, we computed an Inverse Mills Ratio (IMR) and added this correction term as an additional control variable to the main model.

Results

Table 1 presents the results of four mixed-effects regression models of ACSI on CEOs' personality traits and interaction terms. Inspection of the correlation coefficients suggests that multicollinearity is not a severe problem (untabulated results). Furthermore, separate tests show that Variance Inflation Indexes (VIF) are 2.66, on average, and all below the accepted threshold of 10. Model 1 (Log.Lik: - 227.630, AIC: 481.260, BIC: 514.323) is comprised of only the control variables. Model 2 (Log.Lik. -219.683, AIC: 477.366, BIC: 525.689) adds the main effects variables.

Our first hypothesis (Hypothesis 1) claims that extraversion would positively influence ACSI. Model 2 find the coefficient of extraversion to be positive and significant ($B = 2.203$, $p < 0.01$). We thus found strong support for Hypothesis 1.

Per Hypothesis 2a, we expected extraversion to be negatively related to ACSI when CEOs occupy the central position in closed networks. Model 3 provides support for this hypothesis, where we found the interaction term between extraversion and closeness centrality to be significant and negative ($B = -0.013$, $p < 0.05$). The same model provides evidence consistent with hypothesis 2b, presenting a positive and significant coefficient for the interaction term between agreeableness and closeness centrality ($B = 0.011$, $p < 0.1$). Both hypotheses 2a and 2b found support in our data.

Finally, hypothesis 3 predicted that extraversion would positively influence ACSI through the mediation of higher employees' CEO approval. Following the convention in marketing and management, we estimated two separate regression models (Baron and Kenny, 1986) to check, first, whether personality traits significantly influence CEO approval (untabulated results) and, second, to assess the impact of CEO approval on ACSI, as a mediating variable (Model 4). In model 4 we find that CEO approval has a direct effect on ACSI ($B = 5.292$, $p < 0.05$), extraversion becomes not significant (0.658 , $p > 0.1$), and the interaction term between extraversion and ACSI remains negative and significant ($B = 0.013$, $p < 0.05$).

To test the significance of the moderated mediation, we use the bootstrapping method of Preacher & Hayes (2004) that addresses the power limitations of the Sobel Test (Baron and Kenny, 1986). The results of the bootstrapping method (Table 2) show that the Average Causal Mediation Effect (ACME) for CEO extraversion is positive and significant (0.659 , $p < 0.05$), when the level of closeness is 1 standard deviation lower than the average. Extroversion has an Average Direct Effect of 2.8905 ($p < 0.01$) which, paired with the mediated effect of CEO approval, adds up to a positive and significant Total Effect (3.549 , $p < 0.01$). The proportion of the mediated effect is 18.54% ($p < 0.05$). These findings provided support for hypothesis 3.

Table 1 : Linear mixed model of Customer Satisfaction

	ACSI			
	(1)	(2)	(3)	(4)
Firm Size	-5.814 (6.301)	-4.512 (6.254)	-2.797 (6.512)	-6.675 (6.116)
Firm Age	-0.372 (2.530)	-2.532 (2.750)	-2.993 (2.886)	-0.603 (2.656)
Sales Growth	0.055 (0.358)	-0.080 (0.354)	0.072 (0.361)	0.219 (0.392)
CEO Age	12.833	9.866	11.940	9.970

	(8.273)	(8.745)	(9.085)	(8.430)
CEO Duality	-0.276	-0.058	0.055	-1.031
	(1.241)	(1.293)	(1.293)	(1.371)
CEO Tenure	-1.339	-1.637	-2.113	-1.423
	(1.646)	(1.856)	(1.919)	(1.807)
Total Shares Holding	-2.464	-2.286	-0.159	0.212
	(5.496)	(5.325)	(5.373)	(5.565)
Competitive Intensity	-2.352	-4.416*	-2.818	-3.529
	(2.257)	(2.337)	(2.506)	(2.341)
Business Model	-0.148	-0.355	0.028	1.461
	(3.019)	(3.079)	(3.229)	(2.936)
Openness		0.077	-0.232	-0.184
		(0.370)	(0.561)	(0.599)
Conscientiousness		-0.066	-0.255	0.054
		(0.362)	(0.442)	(0.470)
Extraversion		2.203***	1.927**	0.658
		(0.702)	(0.771)	(0.808)
Agreeableness		-0.657	-0.091	0.645
		(0.554)	(0.692)	(0.741)
Neuroticism		0.084	-0.035	0.358
		(0.478)	(0.538)	(0.567)
Inverse Mills Ratio		2.527	2.682	3.012**
		(1.642)	(1.677)	(1.498)
CEO Approval				5.292**
				(2.376)
Closeness			-0.002	-0.002
			(0.003)	(0.004)
OPN x Closeness			-0.002	-0.006
			(0.004)	(0.005)
CON x Closeness			-0.002	0.001
			(0.005)	(0.005)
EXT x Closeness			-0.013**	-0.013**
			(0.006)	(0.006)
AGR x Closeness			0.011*	0.009
			(0.006)	(0.007)
NEU x Closeness			0.001	-0.001
			(0.004)	(0.005)
Constant	76.199***	77.907***	70.208***	67.424***
	(10.837)	(10.627)	(11.174)	(10.835)
Observations	94	94	94	94
Log Likelihood	-227.630	-219.683	-243.367	-242.288
Akaike Inf. Crit.	481.260	477.366	536.734	534.576
Bayesian Inf. Crit.	514.323	525.689	600.317	598.159

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 2: Moderated mediation analysis, bootstrapping results (Preacher & Hayes, 2004)

Effect	Estimate	95% CI Lower	95% CI Upper	p-value	
ACME	0.659	0.0992	1.57	0.02	*
ADE	2.8905	1.2739	4.88	0.00	***
Total Effect	3.5495	1.9239	5.75	0.00	***
Prop. Mediated	0.1854	0.0254	0.45	0.02	*

Discussion

We proposed and tested hypotheses that investigate how CEOs personality traits and centrality in online social networks influence customer satisfaction. Consistent with expectations, we found that personality traits in the form of extraversion, directly impact customer satisfaction. These findings are in line with prior research that found extraversion to be positively related to web traffic (Winkler et al., 2020), operational and financial performance (Wang and Chen, 2020), and strategic change (Harrison et al., 2019). In addition, our results offer a more contextual interpretation of the ultimate effect of personality traits. As recent research in organizational social networks suggests (Tasselli, Kilduff, Menges, 2015; Landis, 2015; Casciaro and Barsade, 2015; Kilduff and Lee, 2020), personality and social networks are complementary and shape each other in a sort of coevolutionary approach. Our theoretical argument suggested that closed and densely interconnected networks play a vital role in forming a shared feeling of proximity, identification and engagement among top managers and key stakeholders, such as employees and customers (Heavey et al., 2020). When network affordances are taken into consideration, and in particular the ability to create small-worlds, our results show that agreeableness, and not extraversion, is the personality trait that positively influences customer satisfaction. Our findings confirm that, when CEOs occupy the central position in closed networks (“small-worlds”), the personality traits of agreeableness and extraversion have, respectively, a positive and a negative influence on customer satisfaction. These findings are in line with prior research that found agreeableness to interact with organizational cohesion, decentralization of power (Perterson et al., 2003) and cooperation (Hermann et al., 2014). We finally propose an organizational mechanism through which CEOs personality traits and online networking abilities can spread among stakeholders and ultimately impact customer satisfaction. We empirically test this mechanism by suggesting that extrovert CEOs can achieve higher customer satisfaction, through the mediation of employees approval, when their level of network closeness is low. This effect has already been documented in the marketing literature that studies how employees participation in social media can give “a face” to their brands (Li, Berens, 2013; Risius, Beck, 2015). Our study goes further into disentangling this relationship and separating a direct effect of personality and a network-moderated effect.

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