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Changes in formal structure towards self-managing organization and their effects on the intra-organizational communication network

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Abstract

Changes in organizational structure affect the intra-organizational communication network. However, despite an increasing relevance of less hierarchical and less bureaucratic forms of organizing, the question of how self-managing forms of organization influence employees' communication behavior has received only scant attention yet. In our study, we analyze the case of a medium-sized firm that experiences organizational change from rigid bureaucratic structures to a more self-managing organization model and question how employees' centrality in the communication network is affected by this reorganization. Following an explorative research approach informed by prior research on self-managing forms of organizations and communication networks, our findings show that after the change process communication generally is less dependent on formal hierarchy. However, while employees who held a higher rank before the change process loose in centrality, their centrality at the end of the change process is still higher than that of other employees. Moreover, employees who experience a promotion become more central in the communication network while demotions do not have an effect. By discussing these findings in the context of organizational change and the persistence of organizational structures, we contribute to a more comprehensive understanding of the implementation process of self-managing organizations.

Keywords Self-managing organization · Organizational change · Communication network · Hierarchy

JEL Classification L22 · L90

Introduction

Hierarchy is one of the most widespread and long-lasting phenomena of organizations (Diefenbach 2020) and directly influences the communication network that is essential for the functioning of organizations (Schoeneborn et al. 2019). However, the relevance of hierarchy is challenged by the increasing popularity of new forms of organizing (Lee

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and Edmondson 2017; Martela 2019). The idea of such self-managing organizations differs from more traditional and bureaucratic understandings of organization (Oberg and Walgenbach 2008) by proposing flattened hierarchies (Sturdy et al. 2016) as well as crosscutting and decentralized interactions (Josserand et al. 2006). Despite extensive research on self-managing organizations (Lee and Edmondson 2017; Puranam et al. 2014; Reitzig 2022; Maurer et al. 2022, 2023) as well as on research on communication networks (Srivastava 2015a; Kleinbaum et al. 2008; Reagans and McEvily 2003), we know little about the consequences of organizations engaging in reorganization-away from hierarchical models of organization toward more selfmanaging organization-for the communication network in organizations (Foster et al. 2019; Johnson et al. 2012). This is surprising as prior studies on self-managing organizations show that such forms positively affect employee autonomy, self-direction, and participation (Lee and Edmondson 2017; Josserand et al. 2006; Johanson 2000). While the question of how formal ranks in hierarchy influence individuals' position in communication networks in a situation of reorganization has received only scant empirical attention yet (Meske et al. 2020; Johnson et al. 2012; Hunter et al. 2020), it can be expected that changing an organization's formal structure toward more self-managing is likely to affect communication behavior. Therefore, we ask: *How does organizational change toward a more self-managing organization and the corresponding promotions and demotions of individuals affect the intra-organizational communication network?*

In order to address this research question, we exploratively study a reorganization process in a medium-sized company that is trying to change from a clearly hierarchical to a more self-managing organization. In addition to loosening managerial control and renouncement of several formal procedures, most functional departments are replaced by cross-functional self-managing teams. Besides these changes in the formal organization structure, as a result of the change process, we also observe that some employees lost their formal rank as managers, while other employees were promoted into central ranks they had not held before. Based on this observation, we study the effects of the formal reorganization on the communication network of employees. In particular, we study how (i) formal rank in hierarchy before the change, and (ii) promotion or demotion in rank during the change affect actors' centrality in a communication network after the change. The core of our data consists of log files documenting the email-communication behavior throughout the entire firm (100,751 emails from 399 employees over 3 years) as well as contextual and sociodemographic data before, in between, and after the change. Additionally, we also conducted 95 interviews in different phases of the change process, which we used to contextualize our study.

Our results indicate that communication networks are affected by their members' hierarchical position. Although employees with initially higher ranks and management responsibility lose with regard to the number of communication partners, after the change towards self-managing teams they remain more central in the communication network than other employees. Furthermore, our findings show that being a frequently chosen communication partner precedes a promotion, while conversely, a demotion shows no prerequisites or consequences in terms of the communication network.

Our study contributes to the literature in three ways: First, our study enables a better understanding of organizational change in the context of implementing self-managing organization—that is, to what extent does formal organizational change also manifest itself in actual (i.e., not formally regulated) communication networks (McEvily et al. 2014). Our findings show that formal organization and ranks in hierarchy affect the communication network in an organization. This is highly relevant, as taking communication structures into account allows insights into whether formal changes do have a real effect or only lead to superficial changes (Josserand et al. 2006). Second, our findings provide insight into the effect of promotions and demotions on employee networks in organizations (Brass and Burkhardt 1992). By focusing on such changes, our study contributes to research on relationally embedded relationships and the extent to which changes in one's position affect individuals' communication networks (Lynch and Mors 2019). Third and from the empirical point of view, we focus on a case study of a medium-sized enterprise and longitudinal changes in communication behavior. Although the literature on organizational change (Gulati and Puranam 2009; Lynch and Mors 2019; McEvily et al. 2014) and the network literature (Soda and Zaheer 2012) both emphasize the importance of longitudinal studies as well as the focus on small and medium-sized enterprises (SME), particularly regarding change processes towards more self-managing organization, these aspects have received only scant attention yet.

Our study is structured as follows: we first present the current state of the literature on hierarchy, self-managing concepts of organization, and communication. Then, in the spirit of an exploratory study, we present our data and methodology including a detailed description of our research setting. After presenting our findings we discuss the contributions of our study in relation to previous research (a) in the context of self-managing organizations and communication and (b) in the context of change toward such organizational forms.

Literature review

Hierarchy and communication

Formal structure refers to rules, processes, roles, and responsibilities, while informal structure describes the social network in terms of repeated patterns of any interactions or instrumental and affective relationships (Hunter et al. 2020; Gulati and Puranam 2009; McEvily et al. 2014). Both perspectives partially share a vocabulary, theoretical foundations and an interest in explaining social interactions in organizations (Hunter et al. 2020). However, despite recent contributions (Whetsell et al. 2021; Meske et al. 2020), a better understanding on the relationship between formal and informal structures in organizations is still regarded a highly relevant topic (Hunter et al. 2020; McEvily et al. 2014). This is where our study starts, following on the one hand the common notion of formal structure as hierarchy and on the other hand the neglected but recently revived perspective of informal structure as communication (Meske et al. 2020).

Although formal structure encompasses more than hierarchy, the latter is the research focus of the formalist approach (Hunter et al. 2020). Hierarchies and the role of authority in organizations are one of the most widespread and long-lasting phenomena (Diefenbach 2020). Hierarchy describes the superordinate, subordinate and equal relationships between ranks and gives top-down command and control to higher ranks (Powell 1990). For this purpose, hierarchy structures the desired communication flows within an organization (Kleinbaum et al. 2008; Clement and Puranam 2018; Meske et al. 2020), thereby enabling coordination through fiat within the firm (Friebel and Raith 2004). Hence, hierarchy makes some interactions more likely and others less likely (Clement and Puranam 2018; McEvily et al. 2014), yet it does not fully determine the informal social structure, for example, communication within the organization (Meske et al. 2020; Friebel and Raith 2004; Von Krogh 2012).

Previous research on informal social structure pursued different paths (Hunter et al. 2020): studies focused, for example, on its importance for advice-seeking behavior (Gibbons 2004) or for knowledge and information exchange in organizations (Whetsell et al. 2021), for trust (Ferrin et al. 2006), friendship (Gibbons and Olk 2003), or communication in more general (Meske et al. 2020). In this regard, all of these studies generally treated formal structural elements as antecedents of informal social structure (Hunter et al. 2020). In contrast, other studies show that informal social structure also enables changes in formal positions. In this respect, the informal social structure affects all career stages from job search to career development in organizations or leaving the organization to become an entrepreneur (Hasan 2019). Hence, informal social structure also has an effect on employees' formal position, for example, if an employee's social network can be used for professional success and promotion (Burt 2004; Wolff and Moser 2009).

While this aspect of informal social structure is well researched, the communication network as part of an organization's informal social structure has received considerably less attention (Meske et al. 2020). Meske et al. (2020: 4) highlight that "no in-depth study has examined the communication patterns of different hierarchy levels inside a company." We take this as the starting point of our study analyzing email communication before and after a three-year organizational change process in a medium-sized enterprise. This change process aims to drive a historically formal and strongly hierarchical organization into a more self-managing organization with direct communication and less formal obstacles to the flow of information. Although communication in general and the medium email may be different from other social structures, in focusing this unit of analysis we follow Johnson et al. (2012) who studied the relationship of online and offline social networks. They found a high similarity between email networks and offline social networks, especially with regard to basic centrality measures like degree centrality or betweenness. Following these findings, we assume that email communication networks are a good proxy for mapping the informal social structure in organizations, especially for explorative research.

Self-managing organization and communication

Recent years have seen an increasing interest in self-managing organization (Lee and Edmondson 2017; Martela 2019; Puranam and Håkonsson 2015; Burton et al. 2017; Bernstein et al. 2016; Puranam et al. 2014; Foss and Dobrajska 2015). This stream of research is characterized by both means and ends to make organizational boundaries more permeable and to increase transparency, participation of organizational members and accountability. Thus, the general idea of selfmanaging organization is expected to change our traditional understanding of organizations, organizing and the organized (Dobusch et al. 2019) and subsequently also its underlying formal and informal structures (Joseph and Gaba 2020).

Based on the above literature, self-managing organizations rest on less rule-following, less or even no hierarchical layers, more flexibility, more coordination based on dialogue and trust, more self-organized teams, and more decentralized decision-making (Bourgoin et al. 2020; Hodgson 2004; Diefenbach and Sillince 2011; Sturdy et al. 2016). Consequently, self-managing organizations are not only lesshierarchical (Lee and Edmondson 2017), but fundamentally change the way organizations operate and, therefore, implications for communication are expected (McPhee and Poole 2004; Hodgson 2004).

Although large-scale empirical studies are lacking (Bolin and Härenstam 2008), self-managing organization postulates major consequences for information processing, decisionmaking (Joseph and Gaba 2020), and consequently for intraorganizational communication. Flat hierarchies (Robertson 2015) should make intra-organizational communication and collaboration boundaryless (Heckscher 1994). According to the self-managing maxim, communication should generally be characterized by more frequent interaction, with more partners and less constricted by hierarchical constraints (McPhee and Poole 2004; Hodgson 2004). Given that different problems require different expertise, self-managing organization should lead to less hierarchy-oriented communication links between employees (Hales 2002).

Seminal studies show empirically that more self-managing organizations in principle differ from bureaucracies (Lyle 1961; Tichy and Fombrun 1979; Stevenson 1990). However, more recent studies suggest otherwise, highlighting institutional reasons for tie persistence (Oberg and Walgenbach 2008). Summarizing what we know so far (Lynch and Mors 2019; Battilana and Casciaro 2012; Kleinbaum and Stuart 2014; Srivastava 2015a; Vogel 2005), we contend that a change in formal structure can induce a change in an organization's communication network. Then, given the increasing importance of self-managing organization (Lee and Edmondson 2017; Martela 2019) it is surprising that to date we do not know how communication networks evolve when organizations change from bureaucratic structures to self-managing structures.

Data and methods

Research setting

Empirically, we study the case of a medium-sized enterprise in the German logistics industry (Maurer et al. 2021, 2023). The SME is a fourth-generation family business located in Germany that was founded at the end of the nineteenth century. In 1990, the firm had four employees as the reunification of the two German states opened up new business opportunities and the third-generation owner (the senior owner) decided to enter the logistics sector, signing contracts as regional distributor for industry leaders in logistics machinery like e.g. material handling and trucks. Soon the original inner-city premises became too small and the family decided to build new facilities outside the city and established regional branch offices to reach new customers. The firm's subsequent growth in multiple business lines resulted from the senior owner's entrepreneurial spirit. By running a tight regime and reinvesting most of the money earned, the senior owner grew the firm to more than 100 employees.

In order to have a smooth transition from one generation to the next, the fourth generation owner (junior owner) first studied business administration and after his studies was made CEO of the core business line in 2011; 2 years later, the business was completely handed over to him. Under the junior owner's leadership the business continued to grow, tripling its number of employees within the first 7 years. The new employees tend to be younger and have never worked for the entrepreneurial senior owner and his crew of seasoned industry experts. Many of the new staff came from other industries, and some previously had careers in larger corporations. Others made a change from running their own business to taking up a managerial role in the fast-growing distribution and services firm. While the operating units were replicated (e.g. with more service technicians, branches, and workshops) or enlarged (e.g. to four full-time equivalents in HR) during the growth process, the owner also decided to build centers of competence at the headquarters and to increase management capacity. This led to additional levels of hierarchy between the junior owner at the top and the operating staff at the bottom.

Being in full responsibility for the firm's success and without previous experience in the job, the junior owner decided to hire consultants for a check-up of the business. One of the results was that employees were dissatisfied with the working conditions and the authoritarian leadership style. This was the starting point of a campaign to improve working conditions, including measures like additional holidays, special leave for various reasons, flexible work hours, work from home, and training both on the job and off the job.

Despite the increased management capacity and outstanding financial figures, the junior owner believed that the firm was not prepared for future challenges. He continuously attended practitioner conferences, sent his middle managers to trainings, and paid management consultants to search for new concepts. This finally led to his top-down decision in 2016 to reorganize the company by implementing a self-managing organization.

Our observation started right before the junior owner's announcement to change the organizational model (2016, see Fig. 1). At this time the formal organization consisted of four hierarchy levels with the owner at the top of the hierarchy and three division managers at the second level. The organization chart showed 19 third level middle managers leading between three (marketing) and 40 (workshop) subordinates. These middle managers had to comply with strict formal procedures and processes and in their understanding keeping control was very important to the managerial role.

"The technician must know that he is on a leash. He should not feel constraint in what he does for the customer as long as he is within the reach of the leash. But he must know the leash is there – if he would try to back out."

As a first step of the change process in 2017 throughout the organization middle managers' formal authority was reduced and most operational decisions were relegated to a team or to individual workers. The first pilot project of a self-managed team had been implemented and most of the company's formal procedures had been suspended.

"We [the firm] now want to have more self-responsibility and decisions taken where the problem originates. But some do not have the full picture on what they have to decide. Expertise and background knowledge did not shift the same way as decision making. Sometimes decisions are made and you think: You better had asked somebody who knows..."

While on the one hand managers were curtailed regarding what to decide, on the other hand they had less rule following and double-checking in their remaining managerial discretion.

"What are the rules they have to follow? In the past I [CEO] had to approve decisions beyond certain limits. Now we have softened that [...]. In short: Now,



Fig. 1 Overview of the change process and data over time

whenever a matter is settled anyway, you do not have to ask for approval anymore. [...] There are a number of examples for this."

In the subsequent year (2018) the layer of division managers (second management level) was removed and the previously existing functional departments handling the sales and distribution process were planned to be replaced by cross-functional teams as integrated units, each team serving a different (customer) region. All previous managers whose functional role was made redundant had their job contracts guaranteed but were asked to seek new job roles. However, because the owner had not set a deadline for the reorganization to be implemented and due to building works not being finished as planned, the new self-managed teams only took over from the functional departments at the end of 2018. With the start of the self-managing teams the former middle managers were told to abandon their old job roles.

"There was a very clear statement that in our function as middle managers, I would say, that we are no longer allowed to fulfill our functional role or tasks."

At the end of the change process (2019), the self-managed cross-functional teams had fully taken over daily operations in the sales and distribution process, and most of the former managerial authority, order, and control had been replaced by team decision processes.

"The ones that had to leave their managerial role, those whose subordinates now work in the self-managed teams [...] They do not have formal authority over their former subordinates anymore."

Notwithstanding the intent to implement more self-managing into the organization, the four regional branch offices and eight of the smaller functional units (e.g. marketing, procurement, finance, human resources) kept their functional structure with a formal manager. Transforming these units into self-managing teams seemed not feasible given the size of the firm and the teams, because the managers were by far more qualified and had a broader skill set then their staff. Changing the structure of a regional branch office to a self-managing team without a formal manager seemed one step too far at the time; only in 2022 one branch office changed to self-management as a pilot project. We contend that the changes observed in our case study firm are at the upper limit of what can be expected when reorganizing an SME this size toward self-managing.

Data collection

We use email log files to derive information about the company's social communication network (Johnson et al. 2012; Kleinbaum and Stuart 2014). For this purpose, the IT department logged the company's email traffic and provided us with a 30- to 60-day log for each of the following times of observation: before (2016), during (2017), and after the change (2019). The email logs contained data on the sender, recipient, date, and subject. In addition, we received information about whether the message was successfully sent but received no data about the content of an email. Additionally, the HR department provided us with employee data about age, sex, work area, product area, hierarchical level, number of training courses, exit dates, and tenure. While the core of our data is quantitatively motivated, we also collected 95 semi-structured interviews with top management, middle managers, and selected employees over the course of the change process. The interviews and additional contextual data provided by the company allowed us to position the

Table 1 Network data overview

	Emails	Ties	Unique actors	Emails per day and actor	Density	Cen- tralization degree
Before change	27,487	4215	260	3.520	6.26%	49.92%
In change	26,035	4235	276	3.140	5.58%	31.08%
After change	47,229	6089	363	4.340	4.63%	28.32%
Σ	100,751	14,539	399	-	-	-

main organizational measures on a timeline and to study and analyze both the subsequent effects on the communication network and the co-evolutionary process (Soda and Zaheer 2012).

Data preparation

Our unfiltered raw data contained 479 email addresses and about 390,000 messages. In order to prepare the data for network analysis, we filtered the corpus by email addresses and subject line. First, we removed duplicates and limited our sample to successfully transmitted messages. Furthermore, we limited the analysis to email addresses that could be clearly assigned to a person in the company (Eckmann et al. 2004), excluding group emailboxes and distribution lists. For the remaining persons, we checked together with the HR department whether any names had changed during the investigation period (e.g. through marriage) and standardized the anonymous identifiers of the email addresses. Furthermore, we identified and removed all emails based on the prefix of the subject, which were sent automatically (e.g. read confirmation or out-of-office note etc.) or which contained a schedule-related communication (e.g. request, confirmation, rejection of appointments and tasks, see Srivastava (2015a) for a similar procedure). Finally, we merged the data set with the personnel data and then anonymized the resulting overall data set to protect the employees' privacy (Johnson et al. 2012).

After the first data cleaning, we aggregated and filtered the data into three time frames of 30 days each (Moody et al. 2005). Our remaining data set after the cleaning contained 399 unique email addresses and 100,751 emails for analysis (see Table 1). Current research shows that although the inclusion of all email data can reveal many communication contacts, the actual personal networks are much smaller (Wuchty and Uzzi 2011). For this reason, various methods exist for deriving social networks from processed data (e.g., Moody et al. 2005; Wuchty and Uzzi 2011). However, the literature lacks a univocal recommendation for operationalizing social ties from email data (Johnson et al. 2012). We tried different thresholds and got similar results. Based on this we considered a tie to exist when at least two emails were sent per actor. Then, we counted the messages between each sender and receiver and derived an edge list, as the basis for the network construction and analysis.

Moreover, we analyzed the subject lines of a random subsample of approximately 5000 emails. We found that a large part of the communication was job-related (98.6%) and only a few messages were private in nature. Additionally, we classified 76.6% of the emails having an internal rather than external content. In addition, we asked our interviewees about issues they typically deal with via email and have received responses like the following:

"[Former middle manager] sometimes says to me: Just decide on your own. Then I say: No, I'd like to hear your opinion now. [...] I always make sure [via email]. I'm just like that."

Combining the information available to us we subsume that in our case study firm email is used primarily for jobrelated advice-seeking and coordination matters.

Based on our observation of the change process in the case study firm, we studied how the change from a clearly hierarchical organizational model to a more self-managing organizational model influences the communication behavior of the employees—that is, how the intra-organizational communication network changes following the changes in formal structure. Based on our observations, an employee's previous formal position as well as promotion and demotion from her initial position seem to impact her centrality in the communications, we deduce the following variables that allow us to further investigate our research question.

Dependent variable: Individual's position in the organization's communication network

Freeman's (1979) degree centrality in directed graphs is the number of incoming (in-degree) and outgoing (out-degree) ties. The in-degree and out-degree are dependent on each other because usually sending an email depends on receiving an email (Quintane and Kleinbaum 2011). Further correlation analyses (not shown here) confirmed that in-degree and out-degree in our data set were strongly correlated. For this reason, we used only the in-degree as the dependent variable (Wasserman and Faust 1994). Furthermore, we

operationalized the change in centrality by subtracting the normalized in-degree in the first communication network (before the change) from that of the last communication network and coded a directed dummy variable for which direction there was a difference (-1, 0 and 1). The normalized measures indicate the percentage of all company employees with whom each employee had an email conversation during the observation period.

Independent variables

In line with our observations regarding our case study, we study hierarchy level and the change in hierarchy level (by promotion or demotion) as independent variables. An individual's hierarchical rank was derived from the organization chart at each observation point. Our variables for promotion (including team speaker roles) and demotion were coded as binary dummy variables. Cases of individuals who left the organization after a demotion and new hires into a management position were not included in the analysis.

Control variables

Homophily—similarity in terms of attributes—is a highly studied and confirmed influence in social networks (McPherson et al. 2001; Tasselli et al. 2020). Having similar demographic or organizational attributes makes social relationships more likely (Ibarra 1999). Therefore, like previous studies (Hunter et al. 2020; Johnson et al. 2012), we also included individual demographic variables such as age and gender but also organizational variables, for example, in which section the employees worked (the commercial or industrial section) and for which main product line (A or B) they were responsible, in the dataset.

Results

Descriptive statistics

Table 2 shows the variables' descriptive statistics and correlation matrix. The highest correlations occurred between working in the industrial section for product 2 and sex (-0.67), followed by that between working in the industrial section for product 2 and working in the sales section for product 2 (-0.55). Moreover, the centrality of actors after the change correlates positively with working in the sales section for product 2 (0.54) and negatively with working in the industrial section between the decline in formal position and formal rank in hierarchy before the change (0.46) is striking, but it simply reflects the basic idea of implementing a self-managing

Table	2 Descriptive statistics																		
		Μ	SD	Min	Max	(1)	(2)	(3)	(4)	(5)	(9)	(7)	(8)	(6)	(10)	(11)	(12)	(13)	(14)
(1)	Centrality of actors after change	18.15	15.26	1.00	69.00	1.00													
(2)	Dummy: Change in centrality	-0.08	0.89	-1.00	1.00	-0.15	1.00												
(3)	Change in centrality	-0.01	0.03	-0.17	0.13	0.04	0.65	1.00											
(4)	Formal hierarchy level before change	2.20	0.62	2.00	6.00	0.39	-0.27	-0.31	1.00										
(5)	Improvement of the formal position	0.02	0.14	0.00	1.00	0.22	-0.04	0.02	0.15	1.00									
(9)	Decline of the formal position	0.03	0.17	0.00	1.00	0.11	-0.13	-0.16	0.46	-0.03	1.00								
6	Tenure	9.27	6.35	1.30	29.20	-0.01	-0.10	-0.04	0.18	-0.07	0.12	1.00							
(8)	Age	44.91	11.72	21.12	68.74	0.05	-0.15	-0.07	0.16	-0.03	0.05	0.53	1.00						
(6)	Sex	0.20	0.40	0.00	1.00	0.38	-0.34	-0.25	-0.11	-0.02	0.03	-0.07	- 0.09	1.00					
(10)	Trainings	1.49	3.20	0.00	25.00	0.25	-0.20	-0.28	0.25	0.03	0.02	0.05	0.05	-0.02	1.00				
(11)	Sales section P1	0.09	0.28	0.00	1.00	0.10	-0.11	-0.06	0.02	0.04	0.02	-0.09	0.08	0.21	0.03	1.00			
(12)	Sales section P2	0.34	0.47	0.00	1.00	0.54	-0.31	-0.31	0.19	0.05	0.10	-0.02	0.01	0.39	0.29	-0.22	1.00		
(13)	Industrial section P1	0.08	0.27	0.00	1.00	-0.14	0.14	0.11	-0.03	-0.04	0.03	-0.04	0.02	-0.25	-0.01	-0.09	-0.21	1.00	
(14)	Industrial section P2	0.38	0.49	0.00	1.00	-0.51	0.28	0.26	- 0.21	-0.11	-0.09	0.18	0.00	-0.67	-0.28	-0.24	- 0.55	- 0.23	1.00
D=D	roduct: $n = 2.82$																		

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Table 3	Factors that	influence t	the centrality	and change	of centrality of	of actors in	communication networks
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Dependent vari-	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
able	Centrality in t ₃	Change in centrality (t_3-t_1)	Centrality in t ₃	Change in centrality (t_3-t_1)	Centrality in t ₃	Change in centrality (t_3-t_1)	Centrality in t ₃	Change in centrality (t_3-t_1)
Formal hierarchy level before change			0.31*** (0.07)	- 1.22** (0.44)				
Improvement of the formal position					0.66*** (0.18)	-0.65 (0.85)		
Decline of the formal position							0.42 (0.28)	-2.37 (1.75)
Age	0.00	-0.04*	-0.00	-0.03*	0.00	-0.04*	0.00	-0.04*
	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)
Sex	0.14	-0.58	0.25*	-0.79*	0.17	-0.61	0.14	-0.64
	(0.10)	(0.38)	(0.11)	(0.39)	(0.11)	(0.38)	(0.11)	(0.38)
Tenure	0.01	-0.10**	0.01	-0.09**	0.01	-0.10**	0.01	-0.09**
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)
Trainings	0.03*	-0.20**	0.01	-0.16*	0.03*	-0.20**	0.03*	-0.20**
	(0.01)	(0.07)	(0.01)	(0.06)	(0.01)	(0.07)	(0.01)	(0.07)
Sales section P1	0.24	-0.47	0.30	-0.49	0.29	-0.48	0.22	-0.42
	(0.18)	(0.55)	(0.17)	(0.57)	(0.17)	(0.55)	(0.18)	(0.55)
Sales section P2	0.47**	-0.36	0.51**	-0.22	0.52**	-0.37	0.45**	-0.27
	(0.16)	(0.43)	(0.16)	(0.47)	(0.16)	(0.44)	(0.17)	(0.44)
Industrial section	-0.74***	1.17*	-0.58***	1.00*	-0.65***	1.13*	-0.74***	1.18*
P1	(0.17)	(0.47)	(0.17)	(0.50)	(0.17)	(0.47)	(0.17)	(0.48)
Industrial section P2	-0.47*	2.15*	-0.40	2.16**	-0.38	2.10*	-0.50*	2.31**
	(0.24)	(0.84)	(0.20)	(0.77)	(0.23)	(0.84)	(0.24)	(0.79)
Constant	2.70***	2.75***	2.10***	5.10***	2.61***	2.81***	2.71***	2.81***
	(0.22)	(0.69)	(0.28)	(1.13)	(0.22)	(0.69)	(0.22)	(0.70)
Ν	282	282	282	282	282	282	282	282
Pseudo R2	0.41	0.37	0.46	0.41	0.43	0.37	0.42	0.38

Standard errors are heteroskedasticity robust. ***p<0.001; **p<0.01; *p<0.05

organization: employees higher up in hierarchy tend to lose their rank through change. Although these values are high, they did not affect our analysis. Even in models without these variables, results remain robust.

Multivariate analyses

Regression models

As we expect changes in formal structure to affect the organization's communication network we build regression models with actor's centrality in the communication network as the dependent variable. As the original data were based on a discrete count (the number of email contacts per employee), we modeled a GLM (Papke and Wooldridge 1996) with a negative binominal distribution and a log link function with robust standard errors. To check for multicollinearity, we examined the variance inflation factor (VIF), for which the highest value was 1.72. Because the maximum VIF is well below the critical value of 10 (Baum 2006), multicollinearity did not seem to be a concern in our data. For change in centrality the normalized in-degree was greater than or equal to 0 and less than or equal to 1. Given this fractional data structure, we applied a logistic regression with robust standard errors.

Table 3 shows our results regarding the factors that influenced actor's absolute centrality after the change (models 1, 3, 5 and 7). While those models inform about effects on the positioning of individual actors relative to each other in the communication network, they do not allow conclusions with regard to changes in centrality compared to the former communication network. To analyze this, the other models (2, 4, 6 and 8) in Table 3 consider change in centrality after the organizational change as the dependent variable. Model 1 and 2 are baseline models including only control variables. All results are stable even in models with all variables.

In Model 2, we analyze whether employees in higher formal positions at the beginning of an organizational change process are more likely to be central in the communication network at the end of the change process. The highly significant results confirm this. Consequently, employees with a higher hierarchical rank before the change were central in the communication network after the change due to having more contact partners than others do. We also find that the impact of formal hierarchy on an employee's centrality in the communication network decreases through the implementation of a self-managing organization (Model 4). Thereby our findings are in line with organizational models that emphasize self-management. Overall, the communication network after the change is less dominated by individual actors than the network before the change. The key findings can be summarized as follows:

(1) Employees in higher formal positions before reorganizing toward a self-managing organization hold a more central position in the communication network after the reorganization than employees who were in lower formal positions before the change.

(2) Employees in higher formal positions are more likely to decrease in centrality during a reorganization toward a self-managing organization compared to their previous communication network.

Models 5 and 6 include a dummy variable for those who improved their hierarchical rank during the organizational change. Our results show that employees who are promoted during the change process towards a more self-managing organization take a more central position in the communication network compared to other employees (see Model 5). In contrast, we found a negative but insignificant effect for the change in centrality due to promotion in Model 6 focusing on the employees' individual communication network.¹ This adds to our findings:

(3) Employees who are promoted during the reorganization toward a self-managing organization afterwards hold a more central position in the communication network than employees who are not promoted.

Models 7 and 8 show that demotion has no effect on the centrality of employees in the context of the change to a more self-managing organization. Our findings show a positive effect of demotion to the centrality after the change and a negative effect for the change in centrality. However, both effects are insignificant.

Besides these main findings, regarding sex as an independent variable, only two of the models found a significant influence on the degree of centrality. This means that our case study data differs from previous studies which show that women communicate more and generally have more contact persons, regardless of their professional role and communication medium (Kleinbaum et al. 2008, 2013). We also examined whether participation in training courses had an influence and found a positive effect on degree centrality.

Robustness checks

Our analysis uses data on changes in the email communication network during an organizational change in a mediumsized enterprise with 300 employees. This setting brings about certain limitations. The most central limitation is that in our sample we have only six cases of promotion and eight cases of demotion during the observation period. These small absolute numbers may distort our statistical analysis, which is why we conducted statistical robustness checks and performed additional qualitative analyses regarding the dependent variables.

As a statistical robustness check and to be able to interpret the above findings, we ran the regression models with individual cases of promotion or demotion removed from the sample. No matter which of the cases we eliminated, the findings always remained robust—that is, our findings are not based on outliers. Our coding of team speaker roles as promotion seems to have the same effect as promotion to a formal rank in hierarchy. Similarly, it seems that none of the cases of demotion previously had exclusively been communicated with because of formal procedures not required anymore after the reorganization.

To cross-check we also analyzed the interviews available to us with regard to the individual promotion and demotion cases and whether the interview partners reported changes with regard to individual's centrality and position in the communication network. Analyzing our interview data with respect to promotion statements by the interviewees suggest that promotions during the organization's change process indeed led to a more central position in the communication network. For example, even the temporary and formally equal role of a team speaker, resulted in being contacted more frequently.

"Yes, since we chose [team speaker's name 1] and [team speaker's name 2] to represent our team, they are asked more often for advice, especially in the case of difficult problems or when information is needed about the development of the organization."

The increased centrality in the communication network associated with promotion is also recognized by the promoted individuals themselves. For example, in one team, the team speaker recognized himself as the most central person in the communication network when we showed the team an anonymized chart of the communication network:

¹ The findings are also stable in a linear regression, in which the improvement in formal position is also weakly significant. Results of this robustness check are available by the authors upon request.

"This must be me. Most of the internal requests come my way. And then I try to distribute them within the team, see who could solve what best. Also, management or corporate functions, like marketing, if they have a question it usually lands on my desk first."

Regarding demotion, the interviews clearly support our quantitative findings that a demotion has no effect on the position in the communication network. The interviews suggest a kind of tie inertia; the position in the communication network of demoted actors seems to remain stable.

"Whether you call it a self-managing team or whatever, my former staff still call me boss. It's just the way it is. Nothing I can do about it. They just don't want it any other way, they call me that way."

"At the moment, we are setting ourselves up in such a way that certain things still come my way, because I simply have a lot of experience and they are used to my advice. I don't deny their competence in what they do, but we have completely different perspectives on the same matter."

In another case, the demoted middle manager emphasized the multiplex nature of relationships built in the past, which continue even though his new focus is on other tasks.

"I get along well with the guys and the girls, so we're also friends, we've exchanged private cell phone numbers. We watch out that we're not having this official conversation [as before the reorganization], but communicate between the doors like: "Hey, watch out, that didn't go so well."

All in all, we contend that while based on small absolute numbers, our quantitative findings for promotion and demotion are supported by all our additional analyses. Furthermore, the qualitative analysis leads to a better understanding and interpretation of the results.

Limitations

Like all empirical studies, our study is characterized by some limitations, which at the same time may trigger future studies in the field: First, even though three 30-day time periods can be modeled in our data, a classical longitudinal approach is not meaningful. On the one hand, these three time points show only comparatively small windows in the context of the organization's change process—although they are central observation points with regard to the case study. For an analysis of variance over time, as it would be possible with a panel data set, however, we would have needed additional observations of the phases in between. Such data would have allowed, for example, to analyze whether and in what way variations in communication behavior exist in between the current observation intervals. On the other hand, time-varying variables are largely missing in our sample. Many of our variables are either not subject to changes (gender), only to linear changes (age, tenure), or are characterized by comparatively low rates of change (to work in a particular section or division in the company). In longitudinal analyses and with a view to future studies, however, such time-varying variables would be of great interest and should be included. Such variables could be, for example, salary changes, changes in span of control within hierarchy, or the degree of participation in decision-making processes. Second, additional socio-demographic characteristics of the individuals, such as details of their individual work history both within and outside the organization, could help to explain changes in communication behavior more comprehensively. In our study, however, such data were not available and future studies could start at this point by adding further independent variables or control variables that may complement our research. Third, we decided to focus on a medium-sized enterprise addressing an empirical research gap at this point. At the same time, SMEs are limited by their size and in terms of hierarchy levels. For this reason, future studies should consider large firms and examine whether our findings also apply to them. Moreover, given that we focus on a single firm case study, future studies may evaluate our findings based on larger samples. Largerscale studies would also be highly important because in our case study the case numbers regarding individual hypotheses (promotion/demotion) are very limited and findings can thus only be interpreted with a high degree of caution. Fourth, in our study we focus on emails, which often have an informal character, but should not be taken as a proxy for informal only communication. Future studies should therefore particularly examine other and informal only forms of informal communication in addition to emails and thus further evaluate our findings.

Discussion

Based on our observations of a medium-sized company which changed from a hierarchical organization to a selfmanaging organization, in this study we asked: *How does* organizational change towards a more self-managing organization and the corresponding promotions and demotions of individuals affect the intra-organizational communication network? Our empirical analysis shows effects of individuals' hierarchical rank and changes in formal position on the centrality of organizational members within the intraorganizational communication network. By interpreting these findings several points of discussion arise with regard to previous research (a) in the context of self-managing organizations and communication and (b) in the context of change toward such organizational forms.

Persistency effect of hierarchy

Our findings are related to both research showing that a change in formal structure can induce changes in the communication network (Lynch and Mors 2019; Battilana and Casciaro 2012; Kleinbaum and Stuart 2014; Vogel 2005) and previous studies on implementing self-managing organizations. Our findings from a case study in a medium-sized enterprise support the notion that typical bureaucratic communication patterns matter (Weber 1968; Chandler 1962; Oberg and Walgenbach 2008). More specifically, one's previous hierarchical position and the respective communication patterns can explain higher centrality positions in the communication network after the change.

In general, studies very critically debate the proposed benefits and sustainability of self-managing organizations (Brown et al. 2010; Clegg 2012; Clegg et al. 2006; Courpasson 2000; Courpasson and Clegg 2006; Parker 2009). While attempts have, in rare cases, indeed led to more self-managing organizations (Lee and Edmondson 2017), corporate restructuring towards self-managing organization frequently does not bring about the expected results (Hodgson 2004; Morris and Farrell 2007; Foster et al. 2019). Instead, research frequently observes a high persistency of structures and work processes (Harrison and Smith 2003; Lee and Edmondson 2017).

We argue that one reason for the observed persistency of bureaucratic structures and hierarchy-even in situations like our case, in which management aims to move toward self-managing-is institutionalization (Meyer and Rowan 1977). Hierarchical models of organization have reached a status of taken-for-grantedness (Slade Shantz et al. 2020; Magee and Galinsky 2008) that puts pressure on organizations and their members to conform and fulfill expectations. Therefore, hierarchy is culturally and cognitively anchored in the minds of organizational members (Zucker 1977, 1983): Organization means hierarchy and hierarchy means organization. The smallest cues to an organizational context are sufficient to trigger expectations how to behave appropriately. Accordingly, due to their high prevalence, bureaucratic patterns are taught, modeled, and trained at an early age in schools, military service, and other organizations of daily life (Scott 2014). In a work-related context, organizational members expect others to follow the official channels of communication and to communicate all necessary information for one's area of responsibility to one's superior (Oberg and Walgenbach 2008). Organizational members are likely to confirm with this and by showing those expectations they reproduce and restrengthen the institution. Therefore, the persistency of centrality measures in the communication network is not surprising.

Regarding social networks, Lammers and Barbour (2006) suggest that institutions are reproduced in communication. This is because social networks can be carriers for institutions (Scott 2014). Brennecke (2020), for example, found that engineers often prefer communication with their direct supervisor for problem solving. Whetsell et al. (2021) found that employees in higher formal positions receive and send more requests for information from and to peers than lower ranks. This finding is in line with Kleinbaum et al. (2008) who reported a positive relationship between hierarchical rank and numbers of sent and received emails. Furthermore, Kleinbaum et al. (2008) show that the flow of communication for those with high formal positions is less restricted in terms of formal boundaries, such as business unit, function, or co-offices. Hunter et al. (2020), as another example, studied the interrelation between several formal and informal structures. They found that informal relations bridge high power distances within chains of command. Moreover, the probability for a tie to be formed or to exist is strong and highest for the supervisor-subordinate pair; they decrease with greater chain of command distances. Apart from that, Yakubovich and Burg (2019) randomly assigned bank employees to temporary project teams and found that formal structure better explained tie creation and persistence than other known drivers, such as homophily (Dahlander and McFarland 2013). Our findings are in line with these previous findings. While overall the communication network after the change is less dependent on central individuals, individuals with higher ranks before the reorganization remain more central in the communication network than others after the change towards self-managing. Communication networks are reproduced in communication and therefore take time to change. We argue that especially advice seeking communication will be continued with the same experts when formal communication channels are removed.

Self-managing organizations try to reduce, but usually maintain typical cues to and characteristics of bureaucracy. For instance, the organization is legally registered, has contracts with employees and customers, a legally responsible CEO and owner (Oberg and Walgenbach 2008). Status differences and hierarchy (changes) still exist in self-managing organizations (Bernstein et al. 2016); as observed with temporary elective team speaker roles in our case study. As with more bureaucratic formal structures, such status differences favor and explain the formation and continuation of informal relationships (Hunter et al. 2020). Therefore, even when ordered to change to more self-managing, members are not free from cues that trigger bureaucratic communication patterns. In this context, Alvesson and Thompson (2004) state that initiatives to overcome the downsides of bureaucracy often are used more to legitimize changes

than to fundamentally change an organization's patterns. However, arguments for persistence of social structures do not suggest that institutions last forever and organizational members are "trapped" within them. Through social interaction extra-local institutions are imbued with local meaning. Consequently, institutions may differ, change, disappear, or be substituted (Hallett and Ventresca 2006). We see this in our findings; they show that the idea of self-managing is finally (after 3 years) taking hold. Members who had a higher hierarchical level before the change lost centrality, and the network was not as strongly dominated by individual actors as before the change. Concisely, if a member had a high formal position before the change, he/she would still be central in the communication network after the change but-due to the overall lower centrality-be less central than before. Thus, the promised advantages of adopting a selfmanaging organization are slowly beginning to take effect.

This development is also directly related to issues of decision-making in organizations (Csaszar and Eggers. 2013; Knudsen and Levinthal 2007). Research in this context deals, for example, with the question of how organizational structures influence decision making in organizations and how they aggregate and shape decision processes (Piezunka and Schilke 2023). Piezunka et al. (2022) show, for example, that structures in organizations that are efficient for aggregating information in decision-making processes can negatively influence participatory learning of individuals (that is, learning not through feedback regarding one's own decisions, but regarding the decisions of the organization). In light of our findings, this opens up another direct link to literature, as such a change process, as presented in our case study, may allow for a significantly higher degree of employee participation-at least in the long run.

Promotion and demotion

Our findings suggest that changes in formal position during the implementation of self-managing organization—namely promotion and demotion—affect the centrality of organizational members within the intraorganizational communication network. We argue that this results from the fact that relative differences in personal status (Stevenson and Gilly 1993), trust (Burt 2005), and acceptance are important factors in the formation of ties in networks (Cross and Borgatti 2004). Higher hierarchical positions signal higher status and thus access to higher social capital (Astely and Sachdeva 1984). During organizational change such relative differences between individuals become particularly relevant for tie formation and dissolution because organizational members look for forms of social capital (e.g., information) to cope with such uncertain situations (Srivastava 2015b).

Individual differences in both human capital—such as intelligence, education, attractiveness, or eloquence—and

social capital are also known to affect who is promoted and rises in rank (Burt 2000; Boxman et al. 1991). Besides, depending on how people are socialized and embedded, they associate ascribed (e.g., demographic variables) and achieved social categories (e.g., promotion) differently (Jung et al. 2017). Typically, employees who have received promotions are more accepted by other organizational members and are classified as trustworthy (O'Hara et al. 1994). At the same time, an achieved hierarchy rank acts as a selffulfilling prophecy: thus, achieving a higher formal position emphasizes and signals differences in skills and access to resources, for example greater decision-making responsibility, and legitimacy (Slade Shantz et al. 2020; Magee and Galinsky 2008), which in turn affects tie formation and dissolution.

Regarding self-managing organization, Bernstein et al. (2016) note that proponents often romanticize self-managing as "entirely bossless", while opponents cannot grasp the meaning of self-managing and therefore deny alternative organization modes. Both extreme positions are imbued with several widespread misconceptions: first, while the idea of self-managing implies delayering and participation, it does not mean that status differences disappear, nor that they are forever persisting. For instance, even radical forms of self-managing organization like holacracy entail achievable badges and lead roles that signal different expertise, capabilities, and positions. Similarly, making decisions more participative does not mean full democracy or equality of voices. Decisions of many can be withdrawn by a single member if she brings serious pleas. Second, despite the often-suggested absence of hierarchy, it still exists in self-managing organizations, but in another form (Reitzig 2022). Previous research confirmed that hierarchy may prevail independent from the organizational model, but takes different forms of (in)formality (Diefenbach and Sillince 2011; Slade Shantz et al. 2020). In fact, the amount of sub- and superordination's increases when changing the shape of the organization chart from pyramids to circles (Bernstein et al. 2016). This aligns with our observation that individuals being promoted to a temporary team speaker role become more central in the communication network, supporting the notion that status differences do matter in self-managing organizations. Adding to this, while individuals are confronted with new forms of status in self managing organizations, they not yet know about the benefits resulting from a tie with such a new role, even if it is only temporary.

Theoretically, members can already possess a network that makes promotion more likely, or they can develop their network upon promotion (Brass and Burkhardt 1992). Kleinbaum and Stuart (2014) found employees whose individual networks are already suitable for coordinative activities are more likely to be promoted than others, for example, they already had a large network and/or a broker position before. Also confirming this notion, individuals who meet culturally shared expectations for higher formal positions are more likely to achieve them (Jung et al. 2017). Similarly, several studies by Brass and Burkhardt showed that simple network measures such as in-degree, closeness, and betweenness are related to power and promotion (Brass 1984; Burkhardt and Brass 1990; Brass and Burkhardt 1993). According to these studies, a high (in)degree intuitively signals who is influential and confirms that influential members also have larger individual networks (Brass and Burkhardt 1993; Podolny and Baron 1997). Having relationships with many other actors provides information that the employee can use strategically to forge coalitions for promotions.

Previous studies, however, have not allowed to analyze the above effects independently; cross-sectional analyses cannot answer this question (Brass et al. 2004). In our longitudinal single firm case study, we only observe cases of promotion that already were central in the communication network before the reorganization toward a self-managing organization. This implies that the promoted employees likely did not develop their network during their promotion (at least, as far as the number of contact persons was concerned) but rather relied on their existing network. According to our results, a suitable network position precedes advancement in hierarchical rank. We contend that in a self-managing organization the management role relies less on fiat and control based on formal position but more on brokerage. Therefore, selecting candidates for promotion in a self-managing organization is likely to be based on criteria such as expertise (advise seeking) and personal authority (friendship, trust). This explains why individuals who received a promotion after the reorganization are more central in the communication network than employees who were not promoted.

Members who were demoted in rank during the reorganization were not more decentralized than others in the communication network-they neither did lose centrality nor did they lose central positions in the communication network. In general, the persistence of networks is not an unusual phenomenon but is probably the rule rather than the exception. In their quest for more flexibility, organizations typically first change their formal structure (Chandler 1962), such as by implementing self-managing concepts and reducing hierarchy levels, as in our case study. While a formal structure can be changed rather quickly and easily (Lynch and Mors 2019), the informal structure usually lags behind formal change (Gulati and Puranam 2009; Srivastava 2015a). Moreover, Lynch and Mors (2019) found that relationally embedded ties are maintained even when the formal structure of the organization changes. Rank (2008) also showed that vertical ties following the organization's formal structure are less prone to be disregarded and, regarding informal ties, are much more frequently built and maintained compared to horizontal ties. From the perspective of those organizational members who get demoted, it is very interesting, that they seemingly don't have to fear losing their social position within the intraorganizational communication network. More importantly, based on the fact that during our observation period only two out of ten demoted managers chose to leave the organization, the social capital of demoted individuals may enable former managers to position themselves for new roles that may evolve and become important when following the rationale of a self-managing organization.

Summarizing the above discussion, we contribute to answering the question of how strongly communication structures follow formal organizational structures and to what extent this can be influenced by the implementation of a self-managing organization (McEvily et al. 2014). Our study reveals that while the promised advantages of adopting a self-managing organization take time to take effect, they can be achieved. Furthermore, our study is an important step toward broadening the weak understanding of change between different types of organizations.

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Data availability The datasets generated during and/or analyzed during the current study are not publicly available due to privacy concerns of the case study firm but are available from the corresponding author on reasonable request.

Declarations

Competing interests The authors declare that they have no competing interests.

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