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Conceptualizing the "Corporate Nervous Net"

Decentralized strategic communication based on a digital reporting indicator framework

The digital revolution challenges strategic communication. Artificial Intelligence (AI), Big Data, and the Internet of Things (IoT) create a rapidly changing environment for organizations as well as system complexities. To fulfill its task in ensuring the long-lasting success of organizations strategic communication needs to continuously adopt to this revolution. This article approaches the question of how strategic communication can adopt to the digitalization. In order to do so the article conceptualizes the corporate nervous net and a predictive reporting indicator module with real-time feedback loops. As a result, the article contributes digital assisted, decentralized strategic communication to the theoretical body of strategic communication. Decentralized strategic communication proposes a self-organizing, bottom-up approach of strategic communication under the principle of subsidiarity. It keeps complexity at a manageable level and enables the usage of local knowledge and quick adaptation to rapid changes. The proposed resilient approach to strategic communication uses the driving forces of the digital revolution of big data, AI and IoT in its favor instead of trying to control them.

Keywords: Decentralized Strategic Communication, Complex Systems, Digital Revolution, Corporate Nervous Net, Indicator, AI, Big Data, Internet of Things, Planetary Nervous System

Introduction

Digitalization revolutionizes society and corporations globally. Today, more than 95 % of all data exists digital (Helbing, 2015). Masses of data, also pictured as the oil of the information age and called big data (Arthur, 2013; Helbing, 2015), fuel the digital revolution. ICTs like smartphones, computer, cameras, machines, cars, sensors among many more generate and store masses of data in all areas of life. All the contents collected in the history of humankind until the year 2003 are estimated to amount to five billion gigabytes. The same amount of data volume that is now produced approximately every day (Helbing, 2015). As a consequence, the generation and storage processes create a parallel digital universe that influences heavily the 'real' world (Bernik, 2014). Along with the digitalization come technological tools available to many people and corporations (Bernik, 2014; Greengard, 2015).

The digital revolution destabilizes the economy, society and corporations because of the inability to control it (Helbing, 2015; Rifkin, 2011, 2014). The rapid growth of data volumes creates information overloads and complexity. The high connectivity between system components combined with high interaction strength can cause increasingly system breakdowns through cascade effects similar to chain reactions in atomic bombs as soon as they reach a critical mass (Buldyrev, Parshani, Paul, Stanley, & Havlin, 2010; Helbing & Lämmer, 2005). We argue in line with other scholars that attempts to run corporations like perfect clockworks in a digital revolution are doomed to fail, including pure centralized top-down content controlling strategic communication approaches (Buldyrev et al., 2010; Dörner & Kimber, 1996; Greengard, 2015; Haldane & May, 2011; Helbing, 2013).

Based on big data, AI and the creation of the IoT the digital revolution triggers a wave of automation leading to a "second machine age". These developments, also described as the third economic revolution, cause the emergence of the economy 4.0, a digital sector driven by information and knowledge production (Brynjolfsson & McAfee, 2014; Rifkin, 2011, 2014). This revolution results in increasing communication and information fueling the core of strategic communication and creating complexities as well as critical vulnerabilities (Buldyrev et al., 2010; Haldane & May, 2011; Peters, Seidel, Lämmer, & Helbing, 2008). Vast information production in continuous evolving and increasingly powerful communication systems calls for strategic communication to manage and to adopt to them. Strategic communication links organizational communication and the public sphere as main task and builds fine-tuned sensors into the organizational environment. In doing so communicators must link the organization with its stakeholders, its strategy and decision-making in multi-agent settings (Holtzhausen & Zerfass, 2015). Already today the conversion of raw data into useful knowledge increasingly challenges strategic communication. Also, the management of the increased amount of crucial communication for the survival of a corporation challenges professionals. The digital revolution has not yet fully reached the field of strategic communication even though it might change the profession to its roots through automation and big data analytics (Hopkins, LaValle, Lesser, Shockley, & Kruschwitz, 2011; Wiesenberg, Zerfass, & Moreno, 2017).

Industry 4.0 exemplifies the digital revolution in corporate production processes and stands for the marriage between mechanization and communication, enabling machines to directly communicate with each other needing only a few production workers. Examples range from the VeChain-technology to the Radio Frequency Identification technology (RFID). VeChain is a cloud product management solution working with blockchain technology, enabling stakeholders to verify product information in an unchangeable database (Meraviglia, 2018). RFID technology uses electromagnetic fields to automatically identify and track tags attached to objects. Supply chain management uses RFID technology for its production and logistics control (Zhong et al., 2015).

After the steam engine, the conveyor belt for mass production and the introduction of robots in production lines, forming industry 1.0 to 3.0, industry 4.0 describes the next step of automation potentially leading to self-organizing production systems. The Internet of Things drives this development and builds its communicative backbone by using data generating networked sensors enabling production management in real-time (Armbruster, Kaneko, & Mikhailov, 2005; Greengard, 2015; Seidel, Hartwig, Sanders, & Helbing, 2008).

In this article we aim to conceptualize the impacts of the digital revolution on strategic communication and ask the question of how strategic communication can position itself for the upcoming storm. Theory and practice in the field of strategic communication undergo constant reinvention in the enduring search for universality and solid grounds (Nothhaft, Werder, Verčič, & Zerfass, 2018). Meanwhile corporations find themselves in an increasingly sceptic and hostile communicative environment interspersed by fake news, cyberattacks, manipulation and sensationalism with increasingly informed stakeholder (Appelbaum et al., 2015; Edwards, 2010; Kramer, Guillory, & Hancock, 2014; Paletta, Yadron, & Valentino-DeVries, 2015; Schneier, 2015). Corporations need in this fluid and dynamic environment discursive and dialectic processes in order to reach a state of authenticity as enabler of trust, the basis of any stakeholder relationship and communicative interaction (Edwards, 2010; Robert L Heath, 2001; Lock, Seele, & Heath, 2016).

We base this article on the definition of strategic communication by Zerfass et al. (2018), which encompasses all communication that is substantial for the survival and sustained success of an entity (Zerfass, Verčič, Nothhaft, & Werder, 2018). Also, we refer to van Ruler's (2018) deliberations on strategic communication defining it as the management of a communication processes amalgam in the context of strategy making. Thereby, strategic communication describes a continuous reflective learning loop of both, the presentation of strategy and its rebuilding (van Ruler, 2018). Additionally, we follow Nothhaft et al. and Zerfass et al. who define the conditions under which strategic communication operates as complex, uncertain, and with limited resources, as seen against a horizon of predictability (Nothhaft et al., 2018; Zerfass et al., 2018). Whereby ideally, strategic communication prepares a corporation for an uncertain future (Zerfass & Huck, 2007). Within these defining parameters of strategic communication, we see in line with van Ruler (2018) communication as omnidirectional and diachronic (van Ruler, 2018). And as other scholars in the field, we follow modern strategy development theory and see strategy as an emergent and continuous development process also called emergent strategy (Moore, 2011; van Ruler, 2018). Thereby the ongoing process of strategy building bases on the reflection of itself to enable adaptation to internal and external emergent changes. In doing so the involved actors can check constantly if they are still doing the right things in the right way (Moore, 2011). Following this framing, strategic communication requires continuous monitoring through the gathering of data and the sense making of the gathered data. Continuous monitoring enables needed adjustments of strategic assumptions accordingly to the gained insights about changes in the internal and external environment (van Ruler, 2018). Further we follow scholars in the field calling for interdisciplinary research to develop and innovate strategic communication, by including insights from other research areas like information technology and corporate social responsibility (CSR) (Falkheimer & Gregory, 2016; Werder, Nothhaft, Verčič, & Zerfass, 2018). We also orientate on scholars who ask for additional understanding for the management of communication in organizations (Werder et al., 2018), as well as for instruments that can be refined, replicated and reviewed by other scholars until they reach a robustness strengthening the field of strategic communication (Nothhaft et al., 2018). Thereby, we aim to support advancements for more open, dynamic and expanded approaches of strategic communication (Macnamara & Gregory, 2018). In doing so we see like others the need to expand the focus of strategic communication towards a holistic understanding of organizational complexity, but not only to co-workers, as suggested by Heide et al. (2018) but to all communicators, human and non-human (Cooren & Fairhurst, 2009; Heide & Simonsson, 2011; Heide, von Platen, Simonsson, & Falkheimer, 2018; Sandhu, 2009). In order to conceptualize the corporate nervous net with a predictive indicator module as possible answer to the digital transformation in strategic communication, we build on the definition of communication as process of meaning creation. In doing so, we focus on how the meaning creation process works (Littlejohn & Foss, 2010; Rosengren, 2000; van Ruler, 2018). Also, we build on the basic principles of communication constitutes organization (CCO) and a constitutive role of communication. CCO emphasizes the emergent organization from the bottom-up rather than from top-down, which implies that an organization and its strategy emerge from a continuous loop of sense making (Schoeneborn et al., 2014; Taylor, 2009). We chose this approach because it aligns with recent theories studying digitalization in complex dynamic systems. These studies question current hierarchical, top-down, controlling, and surveilling structures in complex dynamical systems, because of their inefficiencies and vulnerabilities in rapid changing interconnected environments (Buldyrev et al., 2010; Carvalho et al., 2014; Haldane & May, 2011; Seidel et al., 2008). Building on CCO in addition to the previous described definition of strategic communication results in a stronger focus on the actual processes and practices of strategic communication in accordance with other scholars (Heide et al., 2018; Liedtka, 2000; van Ruler, 2018). To conceptualize the corporate nervousnet we build on communication as the continuous and simultaneous interaction of a large number of variables that move, affect, change each other in the sense of Berlo (Berlo, 1977). In doing so we refer also to interaction defined by Watzlawick et al. (1967) as necessity for relationships to emerge with many kinds of interaction rules that govern communicative behavior (Watzlawick, Bavelas, & Jackson, 1967). By obeying to the set rules, the communicators approve the defined relationship. As basis for all purposeful behavior we refer to feedback as introduced by Wiener (1965) concerned with the purposeful levels of behavior within systems. All purposeful behavior requires feedback in order to be adjustable and remain purposeful (Wiener, 1965). These feedbacks enable reflexivity as introduced by Mead (1934), whereby the turning back of experience upon the communicator "enables the individual to take the attitude of the other toward himself, that the individual is able consciously to adjust himself to that process, and to modify the resultant process in any given social act in terms of his adjustment to it" (Mead, 1934, p. 134).

A recent study revealed the unpreparedness of communication professionals for the upcoming automation and digitalization in the corporate environment, not only in a lack of competencies and ethical reflection but also in a limited use of opportunities (Wiesenberg et al., 2017). As a result, the digital revolution poses an unknown effect on the strategic communication profession and theoretical realm with the potential to severely change communication jobs and strategic communication science (Frey & Osborne, 2017; Rifkin, 2011; Wiesenberg et al., 2017).

This article aims to approach the mentioned unpreparedness in the field with the question of how strategic communication can adopt to the digital revolution. In order to do so, we conceptualize the corporate nervous net adopted from the established concept of a digital planetary nervous system (Helbing 2015). As a result, we introduce decentralized strategic communication with a distributed bottom-up approach including self-organization under the principle of subsidiarity. We structure the article in three parts, whereby the first part depicts strategic communication in the light of the digital revolution. The second part illustrates the conceptualization. While the third part enfolds a discussion. The second part containing the conceptualization of digital assisted, self-organized and decentralized strategic communication consists of four elements. First, we develop an indicator module explaining the data processing. Second, we conceptualize the corporate nervous net. Third, we embed decentralized strategic communication into the corporate nervous net. The three graphs support the understanding of the conceptualization, followed by managerial implications.

After setting the stage and defining strategic communication for the conceptualization of a corporate nervous net, we describe strategic communication in the light of the digital revolution.

Strategic communication in the light of the digital revolution

The forces behind the planetary nervous system and their effects on strategic communication

Digitalization changes the environment of strategic communication in three ways and challenges it to adopt to these changes (Holtzhausen & Zerfass, 2015). First, it creates masses of data useable for strategic communication and to be managed by strategic communication, concerning the listening of communication. Second, it provides new opportunities making the data accessible and a substantial part of goal orientated conversations, concerning the messaging of communication. Third, it enables data-based automations of communication (Helbing, 2015; Werder et al., 2018). Meanwhile the audiences become increasingly sophisticated in their assessment of intent and quality of information along with an increased skepticism in how far communicating entities can be trusted (Edwards, 2010).

The environmental change of strategic communication consists of three major developments, big data, artificial intelligence and the internet of things.

All organizations and corporations gather and store vast amounts of data but don't know how to use them properly, which becomes a problem also for strategic communication as we will also lay out further in this article (Hopkins et al., 2011). These vast amounts of data build big data, which exceed the capacities of traditional data analysis tools. Big data can help to generate better knowledge faster, more effective, with more insights. But the increasing collected amounts of data turn the extremes from not enough data in the past to too much data to process, already today. The collected data by eBay, Walmart or Facebook must be measured in petabytes – 1 million gigabytes, a 100 times more than the largest physical library in the world stores (Helbing, 2015). Evolving technology exacerbates this phenomenon, against all intuitive thinking, because the complexity and data volumes mount faster than the available computerized processing power. As a result, the relative lack of computational power will increase, while the relative amount of processable data decreases (Helbing, 2015; Lazer, Kennedy, King, & Vespignani, 2014) Strategic communication's task to keep a well-balanced overview of all communication that is substantial for the survival and the sustained success of an entity becomes therefore progressively more difficult (Helbing, 2014b, 2015; Tench, Verčič, Zerfass, Moreno, & Verhoeven, 2017; Volk & Zerfass, 2018; Zerfass et al., 2018).

Along with big data comes AI which facilitates the processing and analytics of big data. AI describes any technique enabling computers to mimic human intelligence and encompasses any device sensitive to its environment and able to act in a way that maximizes its chances of successfully achieving its goals (Russell & Norvig, 2016). A subset of AI defined as deep learning composed of algorithms permits software to train itself to perform tasks. Thereby, a predictive algorithm rifles constantly through the gathered data to find patterns where the human eye cannot find them. In doing so they produce big data-based prediction models. (Malek, 2008). Several studies prove the efficiency of predictive algorithms and their superiority to human prediction (Greengard, 2012; Hopkins et al., 2011; Kennedy, Caplan, & Piza, 2011). From the perspective of strategic communication which operates in the light of predictability the question rises how AI can support strategic communication? We aim in the course of this article with the conceptualization of a predictive reporting indicator module in a corporate nervous net to approach this question.

The IoT describes the third driver of the digital revolution and builds the basis for the development of this article. It consists of sensor networks, global communication between electronic devices, globally accessible websites and social communication networks. In short it connects the infrastructure of an information society. ICTs produce data and communicate to each other, producing even more data. Further, previously offline devices like TVs, fridges, cameras, vehicles, machines, conveyor, product parts, smart wearables, and sensors connected to the internet create the IoT, also called Internet of Everything (IoE), which stands for a connected world. As a result, the IoT will enable the real-time measurement of everything by using sensor networks that communicate with each other wireless (Greengard, 2015). These developments led to the conceptualization of the “Planetary Nervous System” an intelligent information platform proposed by the FuturICT project, also called the “Nervousnet” (Helbing, 2014a, 2015; Helbing, Bishop, Conte, Lukowicz, & McCarthy, 2012). The Nervousnet aims to use the sensor networks behind the IoT including smart phones to measure the world in an open source project, forming a decentralized digital nervous system (Helbing et al., 2012). Thereby, the nervousnet contains the potential to enable real-time measurements of the world, the warning of side effects of certain actions like the amount of CO2 emissions produced, the revelation of hidden forces behind socio-economic changes, and the enabling of self-organizing systems with real-time feedbacks (Helbing, 2015; Seidel et al., 2008). The real-time feedbacks from the measurement of externalities in combination with AI and its predictive capabilities potentially help to avoid unforeseen damage (Helbing, 2015). The conceptualized nervousnet serves as blue print for the corporate nervous net with a predictive indicator module in this article.

After the description of the forces behind the digital revolution in relation to strategic communication and the planetary nervous system, the following paragraphs outline possibilities in dealing with complexity.

Adopting to complexity in strategic communication and complex systems

Digitalization produces complexity. The intuitive answer to the increasing complexity lies in simplification. But simplification by standardization and homogenization undermine innovation needed for adaptation in rapid changing environments. In the following we describe examples of simplification without neglecting the need for innovative adaptation. First, we describe opportunities for action in the context of dynamical complex systems and second, in the context of current strategic communication.

The complexity in dynamic systems challenges top-down structures because they cannot adopt timely to changes and fail if only one node in the chain of command disrupts or becomes dysfunctional. Flexible and timely adaptation occurs on the bottom with local knowledge and manageable complexities (Helbing, 2013). Control theory reveals that delayed adaptation destabilizes systems (Helbing, 2015). Attempts to control complex dynamical systems in a top-down way undermine normal functionalities of the system. The greatest improvement in airplane flight safety exemplifies the effect, because not technical control mechanisms achieved them but the introduction of a non-hierarchical culture of collaboration in the cockpit, encouraging co-pilots to question decisions and actions of the pilot (Helbing, 2015). The digital revolution produces unavoidable and unpredictable accidents. The answer to these accidents lies within resilience, because control and surveillance cannot avoid accidents from happening. Therefore, also complex communication networks and corporate strategic communication requires resilient structures to survive. Resilience stands for the ability of a system to absorb shocks and to recover from them (Carvalho et al., 2014; Chewning, Lai, & Doerfel, 2012; Weick & Sutcliffe, 2011). Resilient network designs consist of flexible governance systems with quick adaptation capabilities, achieved through decentralization, self-organization, control elements and the principle of subsidiarity. Such system designs empower staff to find innovatively solutions for themselves (Helbing, 2015).

Decentralization means to break down systems into substructures with lower levels of connectivity and interaction compared to connectivity and interaction within the substructures. These substructures reduce complexity, decrease interaction effects between them and consist of a manageable size (Helbing & Lämmer, 2005).

Self-organization builds on individual self-determination and subsidiarity stands for as little top-down control as possible. The resulting system combines centralized top-down control and distributed bottom-up organization whereby self-organization enables distributed organization (Helbing, 2015).

Digital assisted self-organization modifies the interaction rules of system components where necessary. Following this approach, a resilient complex dynamic system requires real-time information, feedback, whereby incoming information must determine how the interaction needs to be adjusted. The feedback loops of the system inform about external effects, called externalities, as for example reputation, emissions, waste or other impacts on the organizational environment (Carvalho et al., 2014; Helbing, Farkas, Fasold, Treiber, & Vicsek, 2003; Seidel et al., 2008).

After describing how scholars suggest to reduce systematic organizational complexities we refer in the following to measures reducing complexities in current strategic communicational practices like corporate performance measurement used for corporate reporting.

Indicators in corporate reports simplify complexity into numbers and synopses with the aim to provide digestible and communicational pieces of information. The word indicator stems from the Latin word "indicare" and stands for the pointing or directing to knowledge. Scholars define

indicator as “simplifying tools designed to capture complexity and help convey information to specialists and non-specialists alike” (Bell & Morse, 2018, p. 2).
Corporate reporting of financial and non-financial information relies on reporting indicator. Guidelines and laws structure the measurement approach behind. In the last years many corporations commenced the production of integrated reports <IR>. They show how sustainability performance and the financial performance mutually depend on each other (Churet & Eccles, 2014; Eccles & Armbrester, 2011; Eccles & Krzus, 2010, 2015). Integrated reporting defines a merger of sustainability reporting and financial reporting into a single “narrative” (Churet & Eccles, 2014). For this purpose, integrated reports integrate and combine financial and non-financial data in one document to show all stakeholders how the corporation performed in the past year. In doing so they add social and environmental matters to the economical ones as well as their interdependences (Eccles, Krzus, & Ribot, 2015; Seele, 2016, 2017). Further, scholars introduced the conceptualization of AI to reduce complexity in a reporting indicator based setting with predictive capabilities (Seele, 2017).
The academic theory provides many more and other ways how to deal with complexity but we focused on the described ones in order to set the stage for this article.
We described strategic communication in the light of the digital revolution, as well as means to deal with complexity in strategic communication and complex dynamical systems, which leads to the research objective of this article.

Research Objective

The research objective focuses on the conceptualization of a corporate nervous net and a predictive indicator module to approach the questions of how strategic communication can adopt to the digital revolution.

Conceptualizing the Corporate Nervous Net with a predictive reporting-indicator module for strategic communication

The following three chapters describe the conceptualization of the corporate nervous net and the predictive indicator module in three steps. They base on the introduced theory of strategic communication and complex digitalized systems. First, we describe the concept of the predictive indicator module. Secondly, we outline the emerging corporate nervous net in a digitalized corporation and how a predictive indicator module assists strategic communication within it. In a third step we introduce decentralized strategic communication enabled by a predictive indicator module within a corporate nervous net as a way for strategic communication to adopt to the digital revolution. Thereby, we combine the knowledge of strategic communication and complexity research within the context of the digital revolution. In order to do so, we base the conceptualization on a constitutive and emerging understanding of strategic communication in an ethnographic allegory.

Linking artificial intelligence and reporting indicator to create a predictive indicator module

Corporations gather and store vast amounts of data but don't know how to use them properly. These data amounts will increase in the further course of the digital revolution due to the increasing number of ICTs producing increasing amounts of data and their resulting increased communication with each other. Strategic communication needs to convert raw data into useful data in order to link the organization with its stakeholders, its strategy and decision-making in multi-agent settings. The following description of a predictive indicator module aims to enable strategic communication in a digitalized corporation and converts raw data into useful knowledge. Thereby current reporting guidelines for financial and non-financial information guide the collection of smart-data. Smart-data refers to the tailored measurement of temporal data for specific use. The smart data flows into a data repository which allows for real-time transparency of the measurements. After the automated preparation of the smart data, AI in form of learning predictive algorithms continuously scans the data repository for patterns humans cannot see. In result a display panel shows predictive indications based on real-time measurements. Thereby, systemized indicators in the form of a traffic light system indicate predictive signals for actionable insights. Figure 1 depicts the predictive indicator module and its data flow. The predictive indicator module assists and enables strategic communication in a digitalized corporation using the technical advancements of the digital revolution in a structured way circumventing the pitfall of information overload through smart data and the use of predictive algorithms.

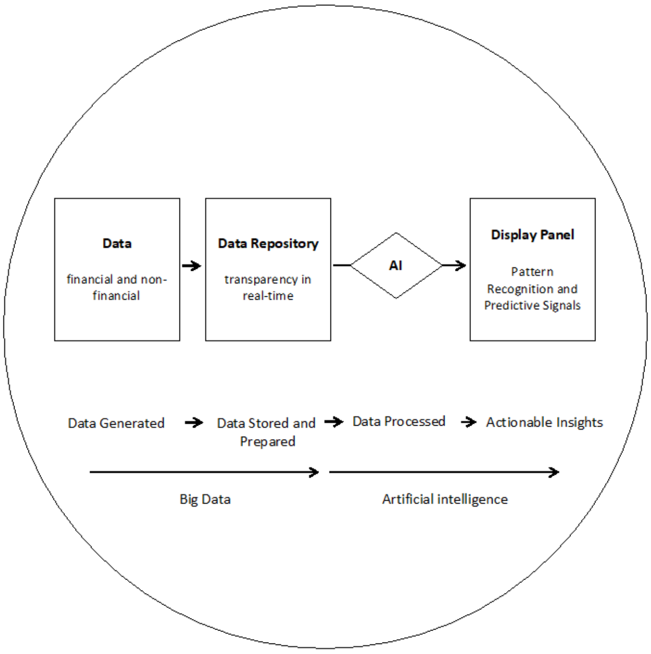

Figure 1: The predictive indicator module and data flow

Putting the pieces together: Predictive, automated, indicator based strategic communication within a corporate nervous net

The corporate nervous net consists of a sensor network similar to the previously described planetary nervous system. Thereby the sensors anywhere in the corporation measure corporate performance in real-time. Just like nerve cells in the human nervous systems they send their measurements in form of data to the brain. The brain in the presented concept stands for a data repository where the data gets filtered, prepared and processed. Digitalization in corporations connects everything with everything building a nervous net with signals in form of communicated data. The human nervous system serves as warning system for the brain. Similar in a digitalized corporate context, the corporate nervous net has the potential to deliver risk indications as well as impact measurements of externalities. The corporate nervous net as real-time measurement of corporate interaction combined with a predictive indicator module as brain function and sense making operator enables strategic communication to link stakeholders with strategy and decision-making in a multi agent setting. At the same time, it serves as feedback loop for strategic communication and enables the basic requirement for purposeful communication, namely to be adjustable and remain purposeful. Also, the feedback loops with real-time measurement enable reflexivity which enables strategic communication not only to take the attitude of a stakeholder toward himself but the ability to consciously adjust to that process and modify the resultant process in any other interaction. This way strategic communication adopts to the digital revolution by using the forces at play conceptualized as a corporate nervous system to make sense of information and adjust to rapid changing environments.

Depicting organs as organizational functions extends the allegory of the corporate nervous net. The organs interact with each other and connect through the corporate nervous net. Thereby, their communication and information in form of data flows towards the brain where strategic communication locates with a predictive indicator module to convert raw data into useful knowledge. At the same time the predictive indicator module provides an automated feedback possibility. Figure 2 depicts the corporate nervous net including strategic communication assisted by a predictive indicator module.

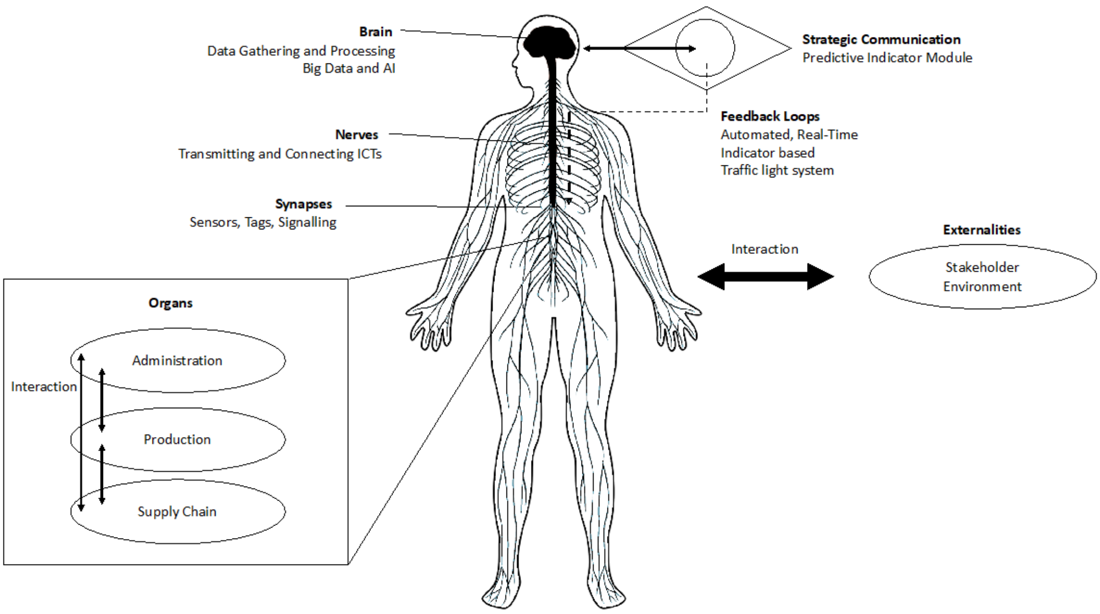

Figure 2: The corporate nervous net and strategic communication

The conceptualization of the corporate nervous net and the predictive indicator module provide strategic communication with the means to enable emerging strategic communication as well as its foundational need of feedback. But by themselves they do not solve the complexity issues of complex dynamic network systems, which leads to the third step and the decentralization of strategic communication in a corporate nervous net.

Digital assisted, self-organized and decentralized strategic communication within a corporate nervous net

Traditional hierarchical structures experience their limits in the digital revolution. The disruption of one node in the structure breaks the system, delayed adoption from top-down threatens the survival of the system, and cascade effects in strongly interconnected networks endanger corporations and their communication networks in the digital revolution.

The scientists of complexity studies suggest a resilient organizational design based on self-organization and decentralization under the principle of subsidiarity. In the following we integrate these organizational design principles into strategic communication assisted by the predictive indicator module within a corporate nervous net to elucidate how strategic communication can adopt to the digital revolution.

First, we apply the organizational design of decentralization. Instead of just one brain, meaning one strategic communication function for the entire corporate nervous net, the function splits up into substructures "units". These units dock on reasonable corporate functions schematic depicted as organs. Similar to the human nervous system they enable organs to interact purposeful on their own with each other or externalities. Thereby, they can rely on predictive feedback loops enabled through the predictive indicator module and interaction frames. These interaction frames consist of two parts and remain similar or adjust simultaneously. One part describes the reporting indicator frame and with it the kind of gathered local smart data. The other part outlines the displayed reporting indicator structure in real-time feedback loops with risk predictions.

Secondly, we apply the principle of self-organization. Instead of a pure top-down hierarchical organization for strategic communication, strategic communication emerges within the previously described set frame. The strategic communication "units" remain as independent as possible to adopt as fast as possible to environmental change and to stay as loose as possible in its connection to the corporate nervous net. This design provides resilience to cascade effects and unmanageable complexities. But in order to maintain consistency and a degree of alignment strategic communication sets and modifies the interaction rules of system components where necessary, whereby the predictive indicator module assists to align goal formulation and the overall alignment with it. Thereby the principle self-organization follows subsidiarity which stands for as little top-down control as possible but emphasizes the combination and complementation of both, top-down control and distributed bottom-up strategic communication.

Decentralized strategic communication focuses on interaction rules of the system rather than on content control enabling the emergence of strategic communication. Thereby, digital assisted self-organization supports strategic communication in the setting of the interaction rules. Each unit possesses its own predictive indicator module, smart data collection and AI with individual results. Interaction rules and the indicator framework build the universal components of strategic communication which remain the same or get simultaneously adjusted in each unit. As a result, strategic communication within the corporate nervous net consists of digital assisted decentralized units providing real-time measurement and AI supported predictive actionable insights fed by their local collected smart data. Similar to different human organs who communicate through the nervous system with each other, perform reflexes or problem solving to a certain degree. Corporate functions with strategic communication units can communicate strategically independent within a certain frame and with interaction rules given by the overall strategic communication. Only in severe crisis or emergency the central brain function gets activated through an emergency signal to adjust the frame or interaction rules. In a case of shock or overall system failure the units remain operational. Figure 3 visualizes in a schematic model the organization of decentralized strategic communication. The next chapter outlines how decentralized strategic communication works in a digitalized corporate environment.

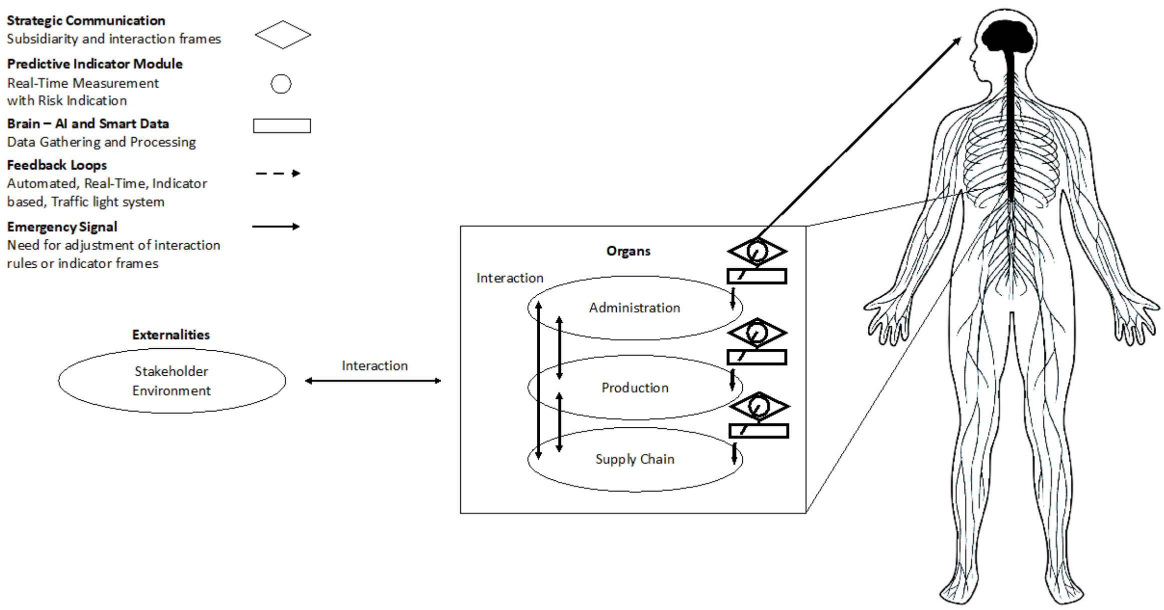

Figure 3: Digital assisted, self-organized and decentralized strategic communication

Managerial implications: How to use a modular predictive indicator module for decentralized strategic communication

In the following we exemplify how decentralized strategic communication works for the production function of a corporation producing textiles. The sensor network behind the ICT infra-structure of the corporate production produces big data. The data flows into an own data repository which allows for real-time transparency of the measurements. After the automated preparation of the smart data, AI in form of learning predictive algorithms continuously scans the data repository for patterns. In result a display panel shows predictive indications based on real-time measurements. The systemized indicators display a form of traffic light system for each indicator. It shows for example the greenhouse gas emissions in real-time with a green traffic light if the manager's actions lie within his goals also in the near future. Thereby the actionable insight enables the manager to engage into strategic communication. The real-time measurement allows for continuously adaptation and adjustments in the units' strategic communication. If for example the AI within the predictive indicator module finds the pattern for the high risk of a system failure due to the breakdown of a production sight and the set interaction rules and frames mandate in such a situation an emergency signal to top-management, the responsible manager can do so.

Decentralized strategic communication within a corporate nervous net enables decision-makers on all levels to find solutions to their actions and to engage into strategic communication coordinated by interaction rules.

After the pragmatic implications of decentralized strategic communication, the next chapter discusses how this concept contributes to the theory of strategic communication, as well as how it provides strategic communication with answers to deal with the digital revolution.

Discussion

Strategic communication in the light of the digital revolution reveals the challenges of the field to adopt to the expected grave changes. At the same time professionals lack capabilities to deal with the situation. With this paper we aim to approach this gap.

Decentralized strategic communication contributes to the theoretical body of strategic communication a distributed bottom-up approach of strategic communication including self-organization under the principle of subsidiarity. We argue based on the principle of trust and the proven instabilities of rigid top-down controlling and surveilling system approaches, for the long-lasting success of an organization with quick adjustment at the bottom and a resilient communication system design. Whereby resilience bases on decentralization and self-organization.

Decentralized strategic communication keeps complexity to a manageable level, it enables the usage of local knowledge and quick adaptation through self-organization. Thereby interaction rules and an indicator frame keep the body from losing itself into single parts. Also, each subunit can send emergency signals if interaction rules or the indicator module need adjustment, as well as when risks occur endangering the entire corporation. If accidents occur, maybe even caused by the digitalization in form of network failures, cyberattacks or unmanageable information complexities, strategic communication maintains operational thanks to the decentralized design and the self-organization. The design enables rapid adjustments on a local level on the bottom. Thereby, it contains diversity to a certain degree which leaves room for innovation and solutions. It reduces top-down control to needed modifications in interaction rules and the indicator preset of systemized indicator. At the same time decentralized strategic communication supports a constitutive and emerging approach of strategic communication that holds also for self-organizing intelligent systems of non-human actors.

The digital revolution creates possibilities like the introduced concept but challenges ethical behavior. The technology itself cannot be good or bad but the usage determines its impacts. Considering the introduced digital possibilities of tools and instruments with many more to come to surveil, manipulate and influence, strategic communication approaches a crossroad and has to decide how to position itself. Scholars developed already several alternatives to the evident usage of digitalization as means of top-down surveillance and manipulation. Also, the introduced digital concept for digital assisted, self-organized strategic communication does not protect from misuse. Although, the decentralized design with a bottom-up focus and self-organization reduces the magnitude of harmful behavior. With the development of decentralized strategic communication, we emphasize the usage of digitals tools for sustainability and shared strategic communication. Also, the planetary nervous system as blue print for this concept builds on a participative platform with the aim to solve global socio-economic problems. Further developments of decentralized strategic communication in a corporate nervous net potentially contribute to these traditions.

As implied we propose the usage of proven indicators, especially proven corporate reporting indicator from established guidelines like the GRI etc., within the predictive reporting indicator module to measure and compare financial and non-financial performance. Proven financial and non-financial indicators potentially guide the gathering of temporal smart data and their visualization of knowledgeable insights. As pointed out, the indicators for this conceptualization should contain the ability to change due to their process orientation towards evolving ideals to reduce complexity. We propose the usage of these reporting indicator frameworks, because they present the state of the art of corporate performance measurement in socio-economic realms. At the same time the indicators need to remain open for adjustments as well as for insights from the self-learning AI.

Once decentralized strategic communication proves its promises it can serve as door opener for further thoughts. For example, it supports the theory of shared strategic communication by aligning organizational and corporate interests. It enables also the anonymous sharing of information and data with the global society and the planetary nervous system, whereby global insights always produce insights for corporations as well. Digitally assisted decentralized strategic communication potentially allows all stakeholders to participate in the emerging of strategic communication. Also, it builds the infrastructure for further means of strategic communication like "preports" whereby a corporation discloses not only corporate performance based on past data but on real-time data with predictive insights.

Limitations and Future Research

This article is a conceptual starting point. The concept needs further research for its refinement, operationalization and technical application. Future research can use this article as starting point to explore ways of shared data ontologies and global open access data. We hope with this article to support research into a planetary nervous system as well as possible ways to solve global problems in dynamic socio-economic systems.

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