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A Network Perspective on Collective Media Choice

Research Proposal



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1 Introduction

Teams are the fundamental unit of the organisation (Bergiel et al. 2008; Riemer and Filius 2009). Workers are part of distributed virtual teams, multiple teams and projects, or a mix of both, which leads to an increasingly complex work environment (Bélanger and Watson-Manheim 2006; Chudoba et al. 2005). In this work environment, communication is essential and enabled via communication and collaboration tools (Lee et al. 2007). According to Bélanger and Watson-Manheim (2006), the number of virtual teams in organisations and subsequently the number of communication and collaboration tools is increasing. As a result, workers choose their communication and collaboration media from a heterogeneous media landscape. In this media landscape, workers do not rely on a single tool to fulfil their tasks, but instead employ a combination or set of tools (Lee et al. 2007; Stephens 2007). The combination of tools can lead to positive or negative effects on productivity (Chudoba et al. 2005; Majchrzak et al. 2000). To understand the effects of combined tool use and media choices in an organisation, a better understanding of the selection process and its antecedents is needed (Bélanger and Watson-Manheim 2006; Stephens 2007). However, current research on media choice has been criticised by Riemer and Filius (2009), who argue that it is too abstract and not applicable in practice.

With the advent of cloud solutions like Office365, event and trace data of communication and collaboration media usage is stored and available for analysis. Inspired by the food flavour network of Ahn et al. (2011), we explore how analysing this data by drawing on the methodology of network science can illuminate the media choice in organisations. We aim to identify patterns of media tool co-use and factors influencing media choice in the data. Based on the results, we plan to conduct interviews to complement the quantitative results. Our perspective on the antecedents of media choice considers the dynamic and interplay between individual workers, their tools and assigned teams and projects based on activity data.

2 Related Work

Research on media choice matured over time with the emergence of two perspectives. Early works developed rational media choice models, which inquired about fixed, objective media use (Fulk et al. 1990). Decisions about media were thought to be independent and rational, to get the best fit between media and the task at hand (Fulk et al. 1990). Later, collective choice models were proposed, which argue that media use is contingent and decisions made are subject to social influence and perceptions of media appropriateness (Fulk et al. 1990). The collective models draw from the Adaptive

Structuration Theory of DeSanctis and Poole (1994), in which technology use is socially constructed, i.e. media choice is informed by and routinized into social structure and norms, and the continuous use of such media adapts the norms and structure retroactively.

2.1 Rational Choice Models

Short et al. (1976) published an early work on media choice and proposed the social presence theory. It maps the level of awareness required by a particular task to the level of awareness a medium provides. If the two levels are aligned, the effectiveness of the communication increases, so that from a rational point of a view, workers always choose the best-fit medium for each task. Daft and Lengel (1986) suggest the media richness theory, which has been widely discussed. The tasks are characterised along the two dimensions (1) equivocality and (2) uncertainty. For tasks of high equivocality or high uncertainty, a rich medium is needed, while for low equivocality or uncertainty a non-rich medium is sufficient. The authors provide a ranking of media according to their richness with face-to-face being the richest medium and numeric documents the least rich medium (p. 560). However, media richness cannot be objectively defined and Fulk et al. (1990) review multiple studies, which find contradicting evidence to the media richness theory. A first advancement from the media richness theory is the media synchronicity theory, originally proposed by Dennis and Valacich in 1999 and extended upon by Dennis et al. in 2008: synchronicity of media enables individuals to work together “at the same time with a shared pattern of coordinated behaviour” (2008, p. 576). They analysed five media capabilities leading to synchronicity. The synchronicity, the communication context and individual factors, such as experience and social influence, determine the fit of the medium and eventually the communication performance. While their theory already takes into account social influence, the objective media capabilities are still their focus.

2.2 Collective Choice Models

Instead of rational choice models, Schmitz and Fulk (1991) propose a social model as communication tools are inherently social and thus affected by social context. They suggest various antecedents such as perceived media richness, media experience and the social influence of co-workers, but do not take into account organisational factors. Stephens (2007) considers organisational factors and summarises the antecedents from Fulk (1993) and Fulk et al. (1990) as media traits, social influences, organisational influences and individual differences. Stephens and Davis (2009) extend this list by task experience and situational factors.

Besides a focus on the selection of a single medium, various authors argue that workers employ more than one tool to solve their tasks leading to the selection of a combination of tools, which we refer to as media landscape. Bélanger and Watson-Manheim (2006) find that the landscape of media tools has been researched under different terms, including but not limited to “media ecologies” (Nardi and Whittaker 2002), “media toolbox” (Woerner et al. 2004), “communication portfolio” (Lee et al. 2007), or “media repertoires” (Watson-Manheim and Bélanger 2007), which all belong to the collective choice models.

2.3 Construction of Media Landscapes

The use of media landscapes is associated with positive outcomes such as increased effectiveness, improved information sharing, problem solving or performance (Majchrzak et al. 2000; Stephens 2007), but also with negative outcomes for performance (Chudoba et al. 2005). Therefore, we are interested in a further inquiry of the antecedents and outcomes of the construction of media landscapes. Previously researched antecedents include a mix of social and technical factors leading to the establishment of a media landscape (Stephens and Davis 2009) or the perceived communication risks, entailing technical risk of failed transmission, semantic risk of failed understanding and risk of inaction, for the construction of the media landscape (Lee et al. 2007). Bélanger and Watson-Manheim (2006) discuss the availability and capability of media in conjunction with the strategic goals of the workers and in which context the communication is embedded. They distinguish media according to sequential or concurrent use and according to complementary, redundant or independent use. The same authors propose media repertoires as a “collection of communication channels and identifiable routines of use for specific communication purposes within a defined community” (Watson-Manheim and Bélanger 2007, p. 268). Alongside, they provide a framework to analyse media repertoires, which focuses on the structuring conditions, the norms of usage and the perceived consequences of media use as the influencing factors. The continuous use of media over time retroactively influences the factors (analogous to DeSanctis and Poole, 1994). Other papers look at different antecedents of the construction of media landscapes. Bélanger and Watson-Manheim (2006) as well as Riemer and Filius (2009) include a review of other theories in their articles.

2.4 Research Gap

Riemer and Filius (2009) criticise the collective choice models, because they are not applicable in practice. The proposed models try to be as general as possible, but due to

many possible combinations of variables and influencing factors including social embeddedness and context, the models become abstract. As a result, they are of little value to practitioners and the authors suggest looking at each media choice or media landscape individually using a detailed genre analysis. However, their approach has other limitations, because it requires rigorous manual collection and interpretation of data. We follow their argumentation in part, but disagree when they argue that media choice cannot be “analytically dissected”. Our goal is to develop an analytic approach for revealing and understanding media landscapes in organisations as it does not require manual collection and processing of data. The approach is based on the analysis of large-scale activity data and tries to identify patterns in social and concurrent media use. Based on this analytical approach, decision support systems can be built, which enable managers to take deliberate and informed actions about the institutional provision of communication and collaboration media.

2.5 Network Theory

Our approach is inspired by the food flavour network of (Ahn et al. 2011), which is a data-driven approach to identify patterns in culinary practice. By gathering data on recipes, the authors build a bipartite network graph from ingredients and map which ingredients contain which food flavours. By projection and backbone extraction (Lee et al. 2010; Serrano et al. 2009), they created the food flavour network, which interconnects the different flavours. Their goal was to check the food-pairing hypothesis, whether there are any quantifiable and significant patterns for pairing food preferred by cooks. For this, they compared different geographic regions, i.e. Northern America, Western European, Latin American, Southern European and East Asian. They checked the flavour principle, which claims that a few particular ingredients contribute the most flavour and identified different dominant ingredients for the geographic regions. They conclude that the flavour pairings play one role in culinary practices, but other contributions are more dominant. For example, to give texture, bind food or the overall structure of the dish. Culinary is complex art, and thus their data-driven network approach cannot capture everything.

3 A Network Perspective on Collective Media Choice

With the food flavour network in mind, we go back to the collective choice models. The reviewed theories regarding collective choice of media are of qualitative nature. At the core of these theories is the analysis of interactions and relationships between workers, taking into account the situational context and institutional norms. Inherent to these approaches is that researcher manually look into detail and analyse the factors

thoroughly, which requires human effort. One central subject of these approaches is to scrutinise the social influence and analyse social interactions between workers. We argue that network analysis can be an effective alternative to the manual collection and interpretation of data. In 1993, Fulk integrated social network analysis into her media choice model – albeit using a survey method to construct the network. Social network analysis is also of increasing relevance in the research of enterprise social networks using social capital and other theories (Wehner et al. 2017).

With the cloudification of tools, e.g. Office365, rich usage trace data is available for analysis. Our goal is not to provide in-depth analysis of a particular actor’s choice of media, like the other approaches, but in a first step, we aim to find general patterns of media choice in the data, which apply to different groups of people in the network. We plan a complementary mixed-method approach to explain the identified patterns with interviews (sensemaking).

3.1 Network Model

Similar to Ahn et al. (2011), we build a tripartite weighted undirected network model, which maps workers to tools and projects. The workers are connected via edges to the tools and the workers are connected to their assigned project or team. The weight for the tool-worker edges is given by how much time the worker spent using a particular tool.

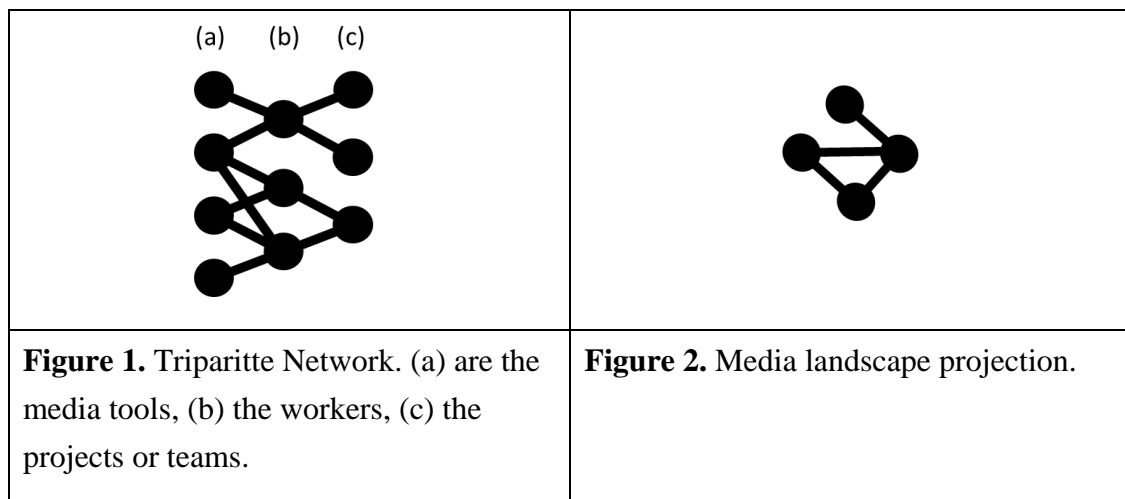


Figure 1 shows how the tripartite network and the connections between tools, workers and projects. The projection in Figure 2 is created by linking all tools together, which are used by the same worker. We can create projections like Figure 2 for each worker, or over the whole organisation. Another possible projection is based on the media use in projects. Based on the projections, different analyses of the media landscape based on meta data of the worker (e.g. country or job title) or the project (e.g. size, goals, domain) can be performed.

4 Research Questions

Although we propose a network model for the media landscape, it requires fine-tuning. Therefore, our first goal is to find an adequate network representation of the communication and collaboration media tool landscape, which allows practitioners and scholars to describe and analyse the media landscape with network methods. With such a representation, we plan to identify, amongst others, the linkages between tools, individuals, teams and projects; central tools for the organisation, tools co-used in projects; and factors influencing the composition of the media landscape.

- How can the media landscape be adequately modelled as networks?
- What factors influence the composition (topology) of the media landscape? How does it differ for projects, teams and workers?
- What different kinds of media landscapes can be identified? What media tools are used in combination?
- What effects do different kinds of media landscapes have on performance, well-being, and other individual outcomes?

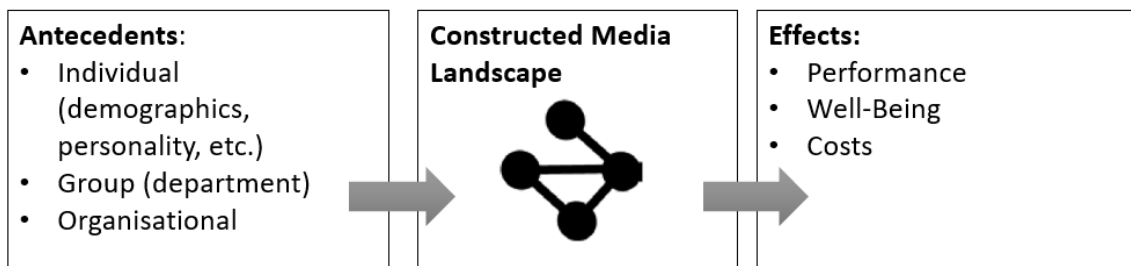


Figure 3. Research Model.

The study's contributions are two-fold: First, the study aims to provide a methodological contribution as it advances the field with quantitative methods that enable automated analysis of digital trace data related to media use. Because of the automation, we can build tools (e.g. dashboards or reporting solutions) on top, which serve the academic as well as the practitioner communities. Second, the study seeks new insights on the construction of media landscapes (c.f. Figure 1), including the antecedents and effects of different kinds of media landscapes (assuming there are different patterns in the data). Management can use our insights to inform staffing (who is proficient with which tools), procurement (which tools are needed and effective), or other decisions.

5 Case Description

We have achieved a preliminary agreement with a global IT company to provide access to their organization and usage data of the Office365 cloud. Our partner is operating in over 40 countries across Europa, Africa and the USA with over 25.000 employees. They focus on the digital workplace and reimagine the way employees live, work, and collaborate. The usage data contains the history of media access by the employees including the name of the used tool, device used to access the tool, meta data about the tool, employee and project context.

6 Limitations

So far, we have identified several limitations of the study. Despite looking at media landscapes, the collected data is limited to Office365 access and does not include any tools outside of the Microsoft domain. Currently, it is unclear which level of access we get. As with every exploratory study, we do not know if we will find interesting and systematic patterns in the data. Privacy issues and changing regulations pose a risk to the study. Depending on the projection, we have either a complex network model or a Markov model, which both require different knowledge and skill sets to work with. Although the model captures a bit of context, e.g., the project in which access occurred, it is mostly an analysis of meta data.

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