

Thesis title: "Beneath the Surface: Unveiling Real-World Organizations Hidden Digital Communication Networks"

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Abstract:

In the era of hybrid and digital work, the increasing adoption of digital communication tools has led to the accumulation of vast amounts of unstructured data, providing organizations with new opportunities to understand the intricacies behind the wants, needs, and behaviors of employees. This can be crucial to improving people's well-being and overall organizational success. This thesis investigates how digital communication data, such as asynchronous (i.e., email) and synchronous (i.e., audio/video calls), can be leveraged to study organizational behavior and social capital within firms. The work, as a first deliverable, provides the design and implementation of a comprehensive and robust framework which consists in the acquisition, processing, and analysis of large-scale digital communication, organizational and survey based data. The framework integrates multiples steps: from data extraction and anonymization to network modeling and validation. As a result, this study introduces a novel large-scale dataset related to two real-world banking companies, including 3,108 and 1,149 employees for Company A and Company B, respectively. While preserving data privacy, this work integrates socio-demographic and organizational attributes, employee surveys with large-scale digital interaction organizational networks, including email messages, and audio/video calls. Building on this novel and unique dataset, in addition to the methodological contribution provided by the framework, this work presents three empirical contributions as research case studies. The first focuses on uncovering hidden informal communication networks and comparing them to formal organizational structures by applying state-of-the-art community detection algorithms. Our findings show that, while informal communities may overlap with the formal structure to some extent, they often diverge in ways that may reveal organizational dynamics, communication flow, and interdepartmental collaboration that are not apparent from the formal structure alone. The second research case study investigates the effects of social capital, analyzed through digital communication, on employee well-being and work performance. The results indicate that, while increased email connectivity is positively associated with employee performance and well-being, the benefits diminish beyond a certain level of centrality. Employees with low centrality experience notable gains in engagement, satisfaction, and performance as their connectivity increases. However, highly central employees do not continue to see performance gain, suggesting the presence of an optimal range of digital communication activity. To our knowledge, this is the first study simultaneously exploring the performance and employee well-being in relation to digital communication patterns, offering a comprehensive vision of the integration of these two perspectives. Finally, the third case study examines mixed-modal communication (e.g., email and audio/video calls), showing that synchronous and asynchronous channels complement each other differently across socio-demographic variables, indicating that employees have different communication behaviors within the company. Furthermore, by applying supervised machine learning models, the study achieves high accuracy in distinguishing managers based on communication features. Feature importance analysis through SHAP values further uncovers behavioral signatures of managerial activity. Together, the comprehensive framework and these studies, aim to pave the way for future research on exploring how computational social science methods, such as Organizational Network Analysis based on digital communication data, can foster research on organizational behavior and enhance human resource management practices. This work contributes both methodological and practical implications for human resource management and organizational behavioral studies.