

An Analytical Model for Communication Networks Based on the Multi-Factor Information Channel Approach

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Abstract

In general, the "duality of ambiguity"—comprising randomness and fuzziness inherent in human information processing—persistently underlies organizational communication processes. Consequently, analyzing the characteristics of organizational information processing and communication necessitates a research perspective that incorporates this duality. Building on this perspective, the authors have previously developed analytical models for information allocation ratios in Communication Networks (CN) based on fuzzy entropy, which captures the combined nature of randomness and fuzziness. In this study, we extend this line of research to construct an estimation model for information allocation ratios. This model incorporates not only the formal CN structure—specifically, the average path length and load density derived from formal connections—but also informal factors absent from the formal structure: the information processing capability and trustworthiness of each member. The proposed approach aims to estimate allocation ratios that maximize fuzzy entropy while minimizing the constraints imposed by these multi-factor variables. Thereby, we seek to establish a more versatile theoretical framework and verify the model's validity through analyses of simple CN structures representing hypothetical small groups.

Keywords

duality of ambiguity, human information processing, fuzzy entropy, information allocation ratios

Biographies

Nyunho Jung currently serves as a Professor in the Faculty of Regional Management at The University of Fukuchiyama, Japan. He obtained both his Master's degree and Ph.D. in Commerce from Meiji University. His research expertise encompasses Organization Theory, Communication Networks, Human Resource Management, Management Quality Science, Behavioral Science, and Management Modeling. He maintains active memberships in the Japan Association for Management Systems, the Japan Industrial Management Association, the Association for the Study of Industrial Management (Japan), the Japan Academy of Management Behaviors, and the Japan Society of Business Ethics.

Takaaki Kawanaka holds the position of Associate Professor at the Institute for Innovation in International Engineering Education, within the Graduate School of Engineering at The University of Tokyo, Japan. Having completed his Bachelor's and Master's degrees in Engineering at Waseda University, he earned his Ph.D. in Engineering from The University of Tokyo. His research pursuits are centered on Industrial Engineering, Management Modeling, and Information Security Management. He is a dedicated member of the Japan Association for Management Systems, the Japan Industrial Management Association, the Japan Society of Security Management, and the Information Processing Society of Japan.