

Title	エンタープライズメッセージ管理の指向的開発：電子メールトピック推論の視覚的注意（電子メールのAttLDA）およびECSとERPの統合（SuccERP）に関する研究
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論文の内容の要旨

Our dissertation is mainly focusing on several topics for improving collaboration and communication in an enterprise. Come with considering two features of collaboration, unstructured collaboration (information collaboration) and structured collaboration (process collaboration); we primarily focus on two representative applications: email and Enterprise Resource Planning (ERP) System.

In terms of an enterprise, most of the current research result struggles to achieve specific and practical goals by proposed theoretical findings in the ERP domain. To allow the managers to get a fuller picture of all the messages generated from an ERP system with the Enterprise Collaboration System (ECS) and improve collaboration and communication, we propose a complete method to develop an artifact-SuccERP based on the Design Science approach to carry out the integration. Based on exploring multiple ERP systems, we summarize our tasks into three aspects before implementing the integrations: authentication, data initialization, and specific procedures implementation; we also explain how the data-processing and integrations between the ERP and ECS.

In our perspective, we can distinguish our contribution of the proposed SuccERP into two parts: 1) We present a complete demonstration of how to get the architecture and database schema of an existing ERP system and address the internal and external hosting issues. 2) According to a series of literature reviews, we implement the integration based on the critical success factors and existing issues discussed in the previous studies. In other words, we attempt to fill up the gap in communication and collaboration capabilities by enhancing the ERP and ECS systems' integrations. Meanwhile, we fulfill the data-processing and data-sharing from an ERP system to the external resources. Given the context of the increasing demands of custom ERP, it is reasonable to provide elaborate research as a guideline to those enterprises that plan to upgrade and enhance their ERP systems.

Furthermore, based on our results, follow-up research can explore the implementation with other external resources for improving different issues.

Next, the definition of information collaboration is employees applying IT tools to communicate and request assistance (answer); email is the most standard documentation tool for communication. Although existing studies use the topic model to support users for classifying emails, they disregard that humans are not like a machine that can focus on all the words in an email to determine the distribution of email topics. The Latent Dirichlet Allocation (LDA) model forms a basis for inferring topics; our work aims to discover how each word's visual attention influences the topic inference and estimates attention to a word according to its location features.

By reviewing the visual-spatial research and the state-of-the-art visual attention models, we select the Bayesian Models to estimate attention and proposing a novel model-Attention orientation Latent Dirichlet Allocation model (AttLDA). In AttLDA, each email can regard as encoded into a two-dimensional space, taking the line length (the characters per line in an email) and window size (the number of lines in an email) into account. After that, draw the optimal display size as a visual space and assigning each word's location. Besides location, attention estimation also considers the Term Frequency and Inverse Document Frequency (TFIDF) and inferred topics for each iteration. Our aim is as follows; the readers can not completely capture all the hidden topics behind each word in an email, especially the context in the forwarded message. Moreover, our result shows each email's topic distribution and including the distribution of related words' attention in each topic by considering the visual attention as the significance of an email's topic distribution. In our experiment, we consider the public Enron email corpus as a dataset and apply the Perplexity metrics to measure the performance of AttLDA. AttLDA is outperforming the previous research on the perplexity evaluation.

Advanced technology has made the communication distance between people shorter than ever before and accumulates the number of messages quicker and quicker. People might quickly out of control for managing their messages owing to their negligence. Our research proposes the SuccERP, which builds a platform to manage ERP and ECS messages through definite guidelines to keep communication efficiency. On the other hand, we also proposed the AttLDA to effectively extract the email topics to improve email message management performance. The research findings can be regarded as a strategy for settling further tasks relating to collaboration in an enterprise.

Keywords: Latent Dirichlet Allocation (LDA), Visual Attention, Email Management, Enterprise Resource Planning (ERP), Enterprise Collaboration Systems (ECS), Design Science (DS).

論文審査の結果の要旨

Yung-Yu LIN の博士論文は、現代の企業社会において誰もが利用しつつも過剰な頻度のため

に不便を被りかねない電子メールによるコミュニケーションの問題や、煩雑な業務タスクの整理を含む、実務上の課題を背景とした研究である。デジタルメッセージを主としたビジネス場面でのスマート化に関する問題解決に資する研究成果を目指して、人の視覚的認知プロセスに着目し、トピックモデルとして、独自に考案した **Latent Dirichlet Allocation model** によるシステムを構築し、実装によりその評価を行った。このモデルは本研究が従来の手法に勝る新しい方法を検討する上で、技術的解決のみならず、その根拠となりうる人間の知覚特性にまで掘り下げて追及したことで得られたものであり、人間中心設計の理念に依拠した、優れた方策である。**Enterprise resource planning (ERP)** と **Enterprise collaboration system (ECS)** の統合を実現する **SuccERP** を構想し、実務的な有用性を示している。博士後期課程の3年間で、実際の企業活動に通用するシステムを作りあげ、使用過程における検証を行うことは、社会ニーズに対する直接的な貢献を可能とする方法であり、知識科学が議論してきた人間の知、組織の知、社会の知への総合的アプローチの事例として、有意義な取り組みであることが示されている。先行研究についても体系的に検討しており、実務的な動機を学術的知見の集積と応用に展開することに成功している。

企業のビジネス・マネジメントを効率化するシステム改革をデザイン科学の観点から議論し、自身の開発するソフトウェアによる実現にチャレンジしたことは、知識科学が課題としている、知識創造とその活用による社会的価値の創出プロセスと結びついており、技術開発の側面のみならず、マネジメント研究への貢献も認められる。

以上、本論文は、企業活動の場面で用いられるメッセージやメールによるコミュニケーションのために新規なトピック推論の仕組みを構築したものであり、学術的に貢献するところが大きい。よって博士（知識科学）の学位論文として十分価値あるものと認めた。