Supporting Technology Investment Decisions for the Sustainable Development of a Country Through Patent Data Analysis: A Case Study on Blockchain-Related Technologies

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Technology investment decisions are vital for a country or an organization to set project priorities to uplift sustainability. Predicting of the future direction of technological advances can help investment and technology choice decisions. At present, there is a high dependency on expert opinions in technology trend predictions. As such, a data-driven approach is needed within the technological trend prediction process to support technology investment decisions. Many studies have been conducted on technology trend prediction using different methods and techniques. Patent analysis has been identified as an effective trend analysis method as a patent is rich with technology-based information. This research aims to investigate blockchain technology as a case study to explore its trends by applying text mining and machine learning techniques. Blockchain is potentially a key technology in a new technological paradigm of increasing automation and integrating physical and virtual worlds. This research focuses on two unsupervised approaches: clustering and topic modeling. Initially, patent data are divided into several timeframes according to the publication time. In the clustering approach, keywords are extracted from patents by text mining, and the keywords with similar semantics are grouped together to form clusters. The Latent Dirichlet Allocation (LDA) model extracts topics from the patent data in the topic modeling approach. Then, the process of identifying emerging technology areas is satisfied by the clustering and topic modeling results using data visualization techniques like scatter plots and distribution plots. The results from both approaches were usually complimentary. The study found that Distributed Ledger Technology for Cryptocurrency Transactions and Smart Contracts are the emerging technologies in the blockchain domain. It is depicted that the cryptography technology area has evolved to ensure the data security of transactions.

Keywords: Machine Learning, Patent Analysis, Technology Transfer, Technology Trend Analysis, Text Mining