AI on Drugs: Can Artificial Intelligence Accelerate Drug Development? Evidence from a Large-Scale Examination of Bio-Pharma Firms

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Abstract

Advances in artificial intelligence (AI) could potentially reduce the complexities and costs in drug discovery. Using a resource-based view, we conceptualize an AI innovation capability that gauges a firm’s ability to develop, manage and utilize AI resources for innovation. Using patents and job postings to measure AI innovation capability, we find that it can affect a firm’s discovery of new drug-target pairs for preclinical studies. The effect is particularly pronounced for developing new drugs whose mechanism of impact on a disease is known and for drugs at the medium level of chemical novelty. However, AI is less helpful in developing drugs when there is no existing therapy. AI is also less helpful for drugs that are either entirely novel or those that are incremental “follow-on” drugs. Examining AI skills, a key component of AI innovation capability, we find that the main effect of AI innovation capability comes from employees possessing the combination of AI skills and domain expertise in drug discovery as opposed to employees possessing AI skills only. Having the combination is key because developing and improving AI tools is an iterative process requiring synthesizing inputs from both AI and domain experts. Taken together, our study sheds light on both the advantages and the limitations of using AI in drug discovery and how to effectively manage AI resources for drug development.

Keywords: Artificial intelligence, drug discovery, IT Innovation, biotech & pharmaceutical industries, AI capability