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Digitization and Phase Transitions in Platform Organizing Logics: Evidence from the Process Automation Industry

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Abstract

This paper draws on complex adaptive systems (CAS) theory to explore the transformation of an analog automation product platform as it was infused with extensive and deepening digital capacities over a 40-year period. Our case demonstrates how the deepening digitization of components and functions drives complexity by connecting the platform to multiple social and technical settings and producing new interactions and information exchanges. The increased connectivity and dynamism invited unexpected and significant architectural and organizational shifts that moved the platform toward an ecosystem-centered organizing logic. CAS theory and its notion of constrained generating procedures (CGPs) are used to analyze how new connections and interactions produced a multilevel and nonlinear change in the platform organization. We offer two main contributions. First, we provide a novel empirical analysis of how product platform digitization leads to phase transitions and show the mediating role of three mechanisms in this process treated as CGPs: interaction rules, design control, and stimuli-response variety. Second, we demonstrate the multilevel and recursive nature of digitally driven growth in physical product platforms.

Keywords: Complexity, platform evolution, phase transition, platform change, digital transformation, digital innovation, product platform, platform ecosystem, digital control systems, internet of things