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## **PROBLEMS IN THE DEVELOPMENT OF THE SOFTWARE PRODUCTS MARKET**

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The software products market has become one of the most dynamic segments of the global digital economy, playing a crucial role in technological innovation, industrial modernization, and business efficiency. However, despite its rapid growth and potential, the sector faces a number of challenges that slow down its sustainable development, especially in emerging economies.

Research on the software products market converges on a common theme: fast technological progress is offset by structural frictions that constrain sustainable growth, particularly in emerging economies. Classical strategy and innovation scholarship frames software as a knowledge-intensive, cumulative, and platform-dependent industry where appropriability, complementary assets, and dynamic capabilities determine outcomes (Teece, 1986; Nelson & Winter, 1982; Schumpeter, 1942). Within this landscape, demand-side network effects, compatibility, and switching costs can entrench incumbents and raise barriers for entrants (Katz & Shapiro, 1985; Shapiro & Varian, 1999), shaping both competition and the diffusion of new products.

A first cluster of problems concerns human capital and the skills pipeline. Studies document persistent shortages of advanced software engineering, product management, and cybersecurity skills, with gaps most visible in rapidly digitizing economies (OECD, 2019). Capability frameworks and process maturity models (e.g., CMMI) were proposed to mitigate quality and coordination failures (Paulk et al., 1993), while empirical work on Agile/DevOps shows that modern sociotechnical practices can lift throughput and reliability but require organizational enablers that many firms lack (Forsgren et al., 2018).

A second cluster involves innovation financing and R&D investment. Evidence shows that early-stage, intangible-heavy software ventures depend disproportionately on venture capital and complementary assets; weak VC ecosystems and limited absorptive capacity depress original product development,



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nudging firms toward services, customization, or outsourcing (Gompers & Lerner, 2001; Arora & Gambardella, 2005). Open innovation and user-driven development can lower costs and accelerate learning (Chesbrough, 2003; von Hippel, 2005), yet translating community outputs into monetizable, defensible products remains a hurdle (West & Gallagher, 2006).

A third challenge is appropriability and intellectual property (IP). High piracy rates and weak enforcement erode expected returns and deter formal R&D (Danaher, 2016). Firms respond with cloud delivery, subscription models, and technical protection measures, shifting the revenue logic from one-off licenses to recurring access. Meanwhile, platform governance and boundary resources controlled by dominant ecosystems (e.g., app stores, APIs) shape who captures value and under what terms (Gawer & Cusumano, 2002; Cusumano et al., 2019).

Market structure and standards present additional hurdles. Interoperability constraints, path dependence, and standards wars slow diffusion and fragment markets (Farrell & Saloner, 1985; Bresnahan & Greenstein, 1999). In B2B contexts, lock-in to legacy systems and high switching costs impede adoption of new software products despite superior technical performance. Cloud computing lowered entry costs through elastic infrastructure (Armbrust et al., 2010), but also introduced platform dependence and concentration risks that can limit bargaining power for smaller vendors.

Regulatory and institutional factors further complicate growth. Data protection regimes (e.g., GDPR) raise compliance costs and engineering complexity, especially for SMEs (European Union, 2016). Public procurement practices in some countries privilege lowest price over lifecycle value, disincentivizing quality and innovation (UNCTAD, 2021). In developing regions, underdeveloped digital infrastructure and limited domestic demand constrain scale economies (Heeks, 2002), while export expansion faces certification, localization, and trust barriers (WTO, 2020).

Finally, security and trust are recurring constraints. The externalities of insecure software - breaches, liability, and reputational damage - create underinvestment in secure development practices unless countered by regulation, standards, or market discipline (Anderson, 2008). Empirical work suggests that secure-by-design and



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continuous delivery can coexist, but require disciplined automation, testing, and governance - capabilities that many firms are still building (Forsgren et al., 2018). In sum, the literature portrays a market shaped by reinforcing frictions: skills shortages, thin innovation finance, weak appropriability, standards and platform constraints, regulatory complexity, and security externalities. Addressing these problems calls for coordinated policy and firm-level responses: strengthening advanced skills formation, improving access to risk capital, balancing IP enforcement with open innovation, promoting interoperability and fair platform governance, calibrating regulation to firm size, and institutionalizing secure, data-driven engineering practices.

In order to highlight the interconnection between existing challenges and potential solutions in the software products market, a conceptual framework has been developed. The model reflects how identified problems can be addressed through specific mechanisms, ultimately leading to positive outcomes for sustainable industry growth.

### **Conceptual Model: Problems → Mechanisms → Outcomes**

**Problems in the Software Products Market:** The development of the software products market faces several challenges such as skills shortages, low levels of R&D investment, weak intellectual property protection and high piracy rates, lack of interoperability and common standards, regulatory complexity, and persistent security and trust issues.

**Mechanisms / Solutions:** To address these problems, a number of mechanisms can be applied. These include expanding professional education and training programs, increasing R&D funding and attracting venture capital, strengthening intellectual property enforcement while promoting new business models such as Software as a Service (SaaS), encouraging interoperability and the use of open standards, calibrating regulation with a special focus on supporting SMEs, and embedding secure-by-design practices in software development.

**Outcomes:** If these mechanisms are effectively implemented, they will lead to multiple positive outcomes. These include sustainable growth of the software industry, increased innovation and competitiveness, higher global visibility for



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domestic producers, stronger trust and reduced piracy, improved adaptability and resilience to global market changes, and an overall stronger contribution to digital transformation at the national and international levels.

The analysis of the software products market demonstrates that its development is constrained by several systemic problems, including insufficient human capital, weak R&D investment, inadequate protection of intellectual property, lack of interoperability, regulatory complexity, and security concerns. Addressing these issues requires the implementation of comprehensive mechanisms such as strengthening education and training, increasing innovation financing, promoting open standards, enforcing intellectual property rights, and embedding secure-by-design approaches. The effective application of these measures is expected to ensure sustainable industry growth, enhance competitiveness, expand global visibility, and reinforce trust in the market, thereby contributing significantly to the broader process of digital transformation.

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