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Abstract of the doctoral dissertation of *Giovanna Carrera*

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Title: Strategic frameworks for technology scouting and startup evaluation in the context of open innovation

Abstract

This doctoral dissertation explores the design and validation of strategic frameworks for technology scouting and startup evaluation within the paradigm of inbound open innovation. In an era characterized by accelerating technological complexity, global competition, and shorter innovation cycles, large organizations can no longer rely solely on internal R&D to sustain their innovation pipelines. Instead, they must engage systematically with external ecosystems of startups, SMEs, and research institutions to access complementary knowledge, accelerate technological integration, and maintain long-term competitiveness.

Despite the increasing adoption of open innovation practices, their operationalization remains fragmented and often lacks standardized processes, and data-driven support tools. This research addresses these shortcomings by developing an integrated framework that bridges theoretical insights with practical applicability, combining qualitative methodologies, quantitative analysis, and empirical validation in an industrial context.

The first part of the thesis provides an extensive review of the literature on open innovation, technology scouting, and corporate–startup collaboration. It highlights persistent gaps in the current body of knowledge, such as the absence of structured roadmaps for managing inbound innovation processes and the limited use of quantitative or AI-driven evaluation methods. Building on these insights, the second part of the research proposes a comprehensive strategic roadmap for technology scouting, organized into interdependent phases, from context analysis and trend identification to technology evaluation and collaboration structuring.

The roadmap was validated through a large-scale case study conducted in collaboration with Leonardo S.p.A., Aircraft Division. This empirical application demonstrated how structured processes can improve alignment between innovation initiatives and corporate strategy, enhance transparency and traceability in decision-making, and strengthen cross-functional collaboration. The co-design approach adopted in this study also revealed the importance of organizational readiness, leadership commitment, and cultural openness as critical enablers of successful open innovation.

To complement the qualitative framework, the dissertation introduces two data-driven methodologies for startup evaluation. First, a machine learning model was developed to support the early screening of startups based on multidimensional datasets, thereby improving objectivity, scalability, and reproducibility in identifying high-potential ventures. Second,

Thurstone's Law of Comparative Judgment was adapted to prioritize startups across multiple evaluation criteria by integrating expert opinions into a transparent and mathematically grounded decision-support tool. Together, these methods demonstrate how digital and analytical approaches can enhance human judgment and reduce bias in innovation management.

A distinctive contribution of this research lies in demonstrating that innovation and quality are not divergent but mutually reinforcing goals. Far from representing separate domains, quality management principles, such as process standardization, continuous improvement, and evidence-based evaluation, provide the structural backbone that allows open innovation to scale in complex industrial environments. The integration of "Quality 4.0" concepts into the innovation process ensures that experimentation is balanced by control, creativity is supported by measurement, and agility is coupled with reliability. In this perspective, quality acts as both a catalyst and a safeguard for sustainable innovation, ensuring that external collaborations generate consistent, traceable, and value-creating outcomes.

From an academic standpoint, the dissertation contributes an operationalizable framework that bridges conceptual and empirical dimensions of open innovation. It extends the methodological frontier by integrating machine learning and comparative judgment into the domain of startup assessment, offering replicable tools for scholars and practitioners. From a managerial perspective, it delivers actionable guidelines for structuring technology scouting, selecting partners, and designing collaborative models that reduce inefficiencies, mitigate risks, and accelerate technology transfer.

Nevertheless, the research acknowledges certain limitations. The empirical validation was primarily based on a single industrial case, which, while offering depth, limits generalizability. Additionally, the performance of the machine learning model depends on the quality and completeness of third-party datasets. Future research should therefore aim to test the framework across multiple sectors, define quantitative Key Performance Indicators (KPIs) for monitoring scouting performance, and further integrate qualitative and data-driven approaches to achieve adaptive learning systems.

Overall, the dissertation demonstrates that open innovation cannot thrive on improvisation or intuition alone. It requires structured, data-informed, and quality-oriented frameworks capable of adapting to organizational and sectoral specificities. By bridging theory and practice, this work contributes to shaping innovation systems that enable firms to systematically capture external opportunities, strengthen strategic alignment, and build long-term competitiveness within dynamic technological and industrial landscapes.