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# The Impact of Intellectual Property on Entrepreneurial Outcomes:Insights from Solirance

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**ABSTRACT**
This paper investigates the crucial role of intellectual property (IP) in driving entrepreneurial success, particularly within invention-based technological ventures. Drawing upon the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT), the research explores how a holistic IP portfolio can contribute to a venture's competitive advantage and long-term performance. The study examines the multifaceted nature of IP as a valuable, rare, inimitable, and non-substitutable resource, and how dynamic capabilities – sensing, seizing, and reconfiguring – are essential for effectively leveraging IP in a dynamic environment. A case study of SOLIRANCE, an innovative apparatus for driver behavior analysis designed for insurance risk estimation and management (PCT/IB2024/062318), serves as a central example to illustrate the practical application of these theoretical concepts. The analysis explores how SOLIRANCE, protected by a combination of patents and trade secrets, functions as a strategic asset and how the venture's dynamic capabilities contribute to its potential for market success. The research highlights the importance of aligning IP strategy with business models and adapting to evolving market conditions to achieve sustainable growth in the competitive landscape of technological entrepreneurship.

**Keywords:** Intellectual Property, Entrepreneurship, Invention, IPStrategy, Competitive Advantage, Resource-Based View (RBV), Dynamic Capabilities Theory (DCT)

## I. INTRODUCTION

Intellectual property (IP) is recognized as a crucial driver of innovation and economic growth, particularly within the dynamic realm of entrepreneurship. In the contemporary knowledge-based economy, intangible assets, such as patents, trademarks, copyrights, and trade secrets, are often considered a startup's most valuable resources. Effective IP management can furnish entrepreneurs with a competitive advantage, enabling securement of funding, attraction of strategic partners, and establishment of a sustainable market position. This paper investigates the multifaceted relationship between IP and entrepreneurial success, exploring how different forms of IP can be strategically leveraged to enhance a venture's performance. Theoretical underpinnings of this relationship are

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examined, with focus on how IP can facilitate value creation, protect competitive advantage, and influence investor perceptions. Practical application of the proposed method is demonstrated through a case study based on SOLIRANCE. Empirical insights into the effectiveness of the proposed method and its potential contribution to entrepreneurial success are provided by this case study. In the following a comprehensive literature review has been provided.

A growing body of research highlights the crucial role of intellectual property (IP) in fostering entrepreneurial success, while also identifying challenges and opportunities related to its effective management and commercialization. Several studies have examined the difficulties faced by small innovative enterprises (SIEs) in leveraging IP, particularly within research institutions. Pimonova et al. (2019) emphasized the multifaceted nature of these challenges, encompassing legislative, personnel, financial, infrastructural, and informational factors, with administrative barriers posing significant impediments. Their work underscores the need for streamlined regulatory processes and enhanced IP protection mechanisms to facilitate successful innovation commercialization by SIEs[1].

The relationship between corporate entrepreneurship (CE) and innovation performance (IP), which can be significantly influenced by IP strategy, has also been a subject of considerable research. Cherif (2022), for example, explored the mediating role of employee engagement and the moderating influence of leadership styles on the CE-IP link. This research highlights the importance of organizational factors in maximizing the impact of CE on IP and innovation performance[2].

Furthermore, research has explored the down streaming of research outputs through IP commercialization as a mechanism for maximizing research impact and contributing to societal and economic development. Riyanto (2024) investigated this optimization, emphasizing the importance of aligning academic endeavors with policy reform, industry partnerships, and effective legal frameworks. This work highlights the need for a holistic approach to research commercialization that integrates academic, industrial, and policy perspectives[3].

Recognizing the need for support in navigating the complexities of IP and innovation, Cuddihy et al. (2021) described a collaborative program designed to enhance training and funding mechanisms for innovative ideas within academic health centers. This initiative underscores the importance of targeted interventions to bridge the gap between innovation and implementation[4].

Beyond the specific challenges faced by SIEs and academic institutions, broader institutional factors also play a significant role. Motiei (2022)analyzed legal and jurisdictional barriers to financing technological entrepreneurship, identifying deviations from financing rules, weak IP protection, and lengthy financing processes as key obstacles. This study emphasizes the need for institutional reforms to strengthen financial markets, revise legal frameworks related to IP and business operations, and streamline loan processes[5].

Finally, the role of digital technologies and the attitudes towards IP within innovation ecosystems have also been explored. Huang et al. (2024) investigated the impact of innovation and entrepreneurship training programs on students' entrepreneurial intentions, noting the association between university IP rights and training program objectives [6]. El Houssamy (2020) explored approaches to innovation within makerspaces, examining knowledge-sharing, attitudes towards IP, and scaling strategies [7]. These studies highlight the evolving landscape of innovation and entrepreneurship, shaped by digital technologies and the increasing importance of understanding and managing IP within these dynamic environments. Collectively, these studies highlight the multifaceted nature of IP's role in supporting and driving entrepreneurial success.

A study by Seungku et al.(2022) investigated the drivers of technological innovation within Korean technology-based startups, responding to criticisms regarding the efficacy of public R&D investments. Adopting a resource-based view (RBV) framework, the research revealed a significant positive relationship between a startup's technological capabilities and its level of technological innovation. Specifically, the study found that patents and overall technological competitiveness were key factors contributing to innovation outcomes. Furthermore, the authors identified entrepreneurship as a crucial driver, demonstrating that it not only directly influences technological innovation but also moderates and strengthens the positive impact of technological competitiveness. Notably, the research yielded a counterintuitive finding: the presence of an in-house R&D department did not exhibit a

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significant effect on technological innovation. This result suggests that strategically leveraging existing resources, rather than simply possessing internal R&D capabilities, is crucial for driving innovation in this context. The study underscores the importance of focusing on developing and strategically deploying core technological competencies, including securing patents and enhancing competitiveness, alongside fostering an entrepreneurial mindset, to achieve successful technological innovation within startups [8].

Another study by Gonzalez-Samaniego et al (2023) examined the development of dynamic capabilities theory, a prominent theory in business strategy, through a meta-analysis incorporating bibliometric analysis and a systematic literature review. The research analyzed publications indexed in Scopus and Web of Science between 1997 and 2023, utilizing VOSviewer software for analysis. From the initial pool, 49 documents met the inclusion criteria. Keyword co-occurrence analysis, based on 222 identified co-occurrences, further refined the dataset to 26 keywords with at least two co-occurrences. These keywords facilitated the clustering of the documents into six groups, which were then analyzed to assess the theory's developmental stage. While the study observed widespread adoption of dynamic capabilities theory across diverse scientific disciplines, indicating considerable popularity and a high degree of development in that respect, it also identified a significant gap: a lack of theoretical consistency in defining and measuring key constructs for empirical research. This inconsistency, the authors argue, hinders the comparability and generalizability of research findings. Consequently, the theory is considered not yet fully developed due to limitations in internal coherence, falsifiability, and predictability. The authors emphasize the need for theoretically and empirically validated measurement tools for dynamic capabilities constructs to ensure consistent application across various research contexts. They suggest that comparing results obtained using such validated tools in diverse settings will contribute to the further refinement and development of dynamic capabilities theory [9].

Amirzadeh Vajargah A. et al. (2024) focus on developing an entrepreneurship development model with a value-adding approach specifically for the beauty, healthcare, and skin industry. Recognizing the competitive nature of this sector, the authors employ a qualitative approach, using expert interviews to identify key themes and sub-themes related to industry evaluation, value creation strategies, implementation, and the development of entrepreneurial knowledge and skills. Their model provides a framework for entrepreneurs seeking to succeed in this dynamic market[10].

The increasing importance of digital technologies in business is evident in several studies. Basiri S. et al. (2023) examine the influence of artificial intelligence-based electronic customer relationship management (e-CRM) capabilities on digital innovation and competitive advantage in online businesses. Their quantitative analysis reveals that technical, service, and interactive capabilities of AI-based e-CRM all have a positive and significant effect on competitive advantage, which in turn drives digital innovation. This highlights the transformative potential of AI in enhancing customer relationships and fostering innovation in the digital realm[11].

Izadi Jorshari et al. (2023) investigate the impact of creativity and positive emotional advertising on user engagement in virtual spaces, focusing on Instagram users of a cosmetics brand. Their findings, based on structural equation modeling, demonstrate that perceived creativity positively influences user emotions, commitment, and interaction. This underscores the importance of creative and emotionally resonant advertising strategies for engaging consumers in the digital environment[12].

Khodadadi Parashkouh A. et al. (2023) examine the impact of advertising costs and research & development (R&D) expenses on entrepreneurial orientation. Their research indicates a significant positive relationship between both advertising costs and R&D expenses and various dimensions of entrepreneurial orientation, including risk-taking and continuance. This suggests that investments in both marketing and innovation are essential for fostering an entrepreneurial mindset within companies [13].

The role of marketing and its impact on consumer behavior is further explored in several studies. Daneshfar M. et al. (2023) investigate the impact of social media activities on e-purchase intention, with a focus on the mediating role of customer-brand relationships. Their analysis confirms the positive influence of social media activities on both customer-brand relationships and e-purchase intention, with the former acting as a crucial mediator. This highlights the importance of social

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media marketing in building strong brand relationships and driving online sales[14].

Several studies focus on specific entrepreneurial challenges and opportunities. Parhizkarkhadiv T. et al. (2023) analyze the factors influencing green entrepreneurship in the waste industry. Their research, based on expert opinions, identifies key factors that both influence and are influenced by other factors, providing insights for promoting environmentally sustainable entrepreneurial activities[15].

Safari PaskehM. et al. (2023) analyze the barriers to entrepreneurship for rural women, using a case study approach and the TOPSIS method to rank these barriers. Their findings highlight the importance of addressing individual, family, and legal-regulatory barriers to empower women in rural areas[16]. Farzpourmachiani A. et al. (2023) identify and rank the factors influencing the development of digital entrepreneurship in the cosmetics and hygiene industry. Their two-stage approach, combining expert interviews and the DEMATEL method, reveals that technology, infrastructure, strategies, and environmental factors are key drivers, while managerial, individual, and content-related factors are influenced by these drivers. This provides a valuable framework for promoting digital entrepreneurship in this specific sector[17].

Collectively, these studies highlight the diverse nature of entrepreneurship research, encompassing various industries, digital technologies, marketing strategies, and entrepreneurial challenges. They demonstrate the increasing importance of digital technologies, AI, and targeted marketing in driving business success. Furthermore, they emphasize the need for understanding and addressing the specific challenges faced by entrepreneurs in different sectors and demographic groups. The studies also showcase the diverse methodologies employed in entrepreneurship research, including qualitative interviews, quantitative surveys, structural equation modeling, and expert-based approaches. While not explicitly discussed in all of these studies, the underlying importance of intellectual property (IP) is crucial for the long-term success of many of these entrepreneurial activities. In the digital realm, where much of the innovation and marketing activity occurs, IP plays a particularly vital role. Copyright protection safeguards creative content used in digital marketing campaigns and online platforms, incentivizing the creation of original material and preventing unauthorized reproduction. Trade secrets, on the other hand, protect valuable proprietary information, such as algorithms used in AI-driven e-CRM systems or unique formulations developed in the cosmetics industry. By securing these intangible assets, entrepreneurs can establish a competitive advantage, attract investment, and build sustainable businesses. Even in areas like green entrepreneurship or traditional industries like the beauty sector, protecting brand names, designs, and innovative processes through trademarks, patents, and trade secrets can be essential for long-term growth and market leadership. Therefore, while these studies focus on various aspects of entrepreneurship, the effective utilization and protection of IP rights form a critical, though often implicit, foundation for entrepreneurial success in the modern economy[10-17].

Other research articles explore diverse facets of entrepreneurship, innovation, and intellectual property (IP), spanning various sectors from architecture to medical devices. Rahmanzad Masouleh A. et al. (2025) examine the intertwined relationship between entrepreneurship and architecture, moving beyond traditional design and construction to encompass value creation within the built environment. Their work identifies different types of architectural entrepreneurship, including social, technological, and cultural, while also addressing the challenges and opportunities inherent in this field. This broader perspective on architectural practice highlights the potential for innovation and entrepreneurial thinking to shape the future of urban landscapes and built environments[18].

Farzpourmachiani M. et al. (2024) delve into the crucial role of intellectual property rights (IPR) in economic development. They argue that IPRs, while potentially limiting initial imitation, ultimately foster innovation, attract foreign investment, and stimulate technology transfer. By protecting inventions and creative works, IPRs incentivize research and development, contributing to a more dynamic and competitive economy. This protection is especially vital in today's knowledge-based economy, where intangible assets are key drivers of growth[19].

Bakhshandeh Abkenar M. et al. (2024) further explore the complexities of IPR in the context of artificial intelligence (AI). They analyze how AI-driven innovation challenges traditional patent systems, raising questions about inventorship,

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novelty, and the application of existing patent laws to AI-generated inventions. The rapid advancement of AI necessitates a re-evaluation of current IP frameworks to ensure they adequately address the unique challenges and opportunities presented by this technology[20].

Several articles showcase specific innovations and their potential for entrepreneurial ventures. Basiri et al. (2023) introduce a novel method for simultaneously measuring liquid level and conductivity, a technology with potential applications across various industries[21]. Farzpourmachiani A. et al. (2022) present a new tabletop game, "VOWA," protected by patents, demonstrating how IP can be leveraged to create and market novel entertainment products[22]. Another innovation by Farzpourmachiani M. et al. (2022) is a multi-functional adobe brick for health systems, highlighting the potential for IP-protected materials science innovations to address specific needs in healthcare infrastructure[23]. These examples demonstrate how IP protection can incentivize the development and commercialization of new technologies and products, driving entrepreneurial activity.

Seyednouri M. et al. (2025) examine the critical role of innovation and entrepreneurship in the medical device industry. They emphasize the importance of developing new technologies and entrepreneurial solutions to address the evolving needs of patients and improve the efficiency and cost-effectiveness of medical products and services. Their research highlights the challenges faced by entrepreneurs in this field and underscores the need for investment and support to foster innovation and improve healthcare outcomes[24].

Finally, Farzpourmachiani M. et al. (2022) introduce a new insole design, protected by a provisional patent, aimed at preventing lateral torque in walking for patients with diabetic neuropathic foot. This invention demonstrates how IP can drive the development of assistive technologies that improve quality of life for individuals with specific medical conditions[25].

Collectively, these studies emphasize the interconnectedness of entrepreneurship, innovation, and IP, demonstrating how protecting intellectual assets can fuel economic growth, drive technological advancement, and improve societal well-being across diverse sectors[18-25].

## II. RESEARCH GAP AND PROBLEM STATEMENT

While existing research has explored various facets of the IP-entrepreneurship relationship, a clear and comprehensive understanding of how different IP strategies contribute to entrepreneurial success, particularly in the context of invention based technological entrepreneurship, remains underdeveloped. Previous studies have often focused on individual aspects of IP, such as patenting or licensing, rather than examining the holistic IP portfolio and its strategic alignment with business models. This research aims to address this gap by providing a comprehensive image of the role of IP in entrepreneurship successfulness to make the reader able to make informed decision on investment on IP assets creation.

While prior research, such as the quantitative study by Ma X et al (2023), has established the importance of intellectual property in driving scientific and technological progress, and developed a robust measurement tool for assessing these services, a gap remains in understanding the nuanced experiences and perspectives of stakeholders regarding the role of IP in invention-based technological entrepreneurship. Their study, employing a three-stage quantitative approach involving grounded theory for item generation. However, this current research adopts a qualitative approach to delve deeper into the complexities of IP's role. Rather than focusing on quantifiable metrics, this research aims to explore the lived experiences of entrepreneurs navigating IP protection. By employing case study, this research seeks to provide rich, contextualized insights into the multifaceted ways in which IP influences, complementing and extending the findings of quantitative studies[26].

The dynamic and turbulent nature of the 21st-century business environment, characterized by rapid technological advancements and globalization, necessitates that organizations continuously adapt to survive and thrive. This constant flux renders traditional sources of sustainable competitive advantage obsolete, placing a premium on the ability to anticipate and respond to environmental shifts. Strategic thinking, the cognitive process of analyzing and interpreting complex information to formulate effective strategies, becomes crucial for navigating this uncertainty. Prior research has explored the multifaceted nature of strategic thinking and its connection to various organizational and individual

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factors. For instance, studies have investigated the relationship between strategic thinking and managerial effectiveness within specific functional areas, such as sales and marketing. Other work has examined the influence of individual cognitive abilities on strategic thinking capacity. Specifically, research drawing on Gardner's theory of multiple intelligences (verbal/linguistic, logical/mathematical, bodily/kinesthetic, visual/spatial, musical/rhythmic, interpersonal, and intrapersonal) has explored the potential link between these intelligences and strategic thinking skills. These investigations have suggested a positive correlation between certain intelligences, such as logical/mathematical, visual/spatial, and intrapersonal intelligence, and effective managerial performance. While these studies provide valuable insights into the cognitive underpinnings of strategic thinking, further research is needed to fully understand the complex interplay of factors that contribute to its development and application within organizations [27-32].

Farzpourmachiani M. and Farzpourmachiani A. (2021) introduce a novel yogurt maker with a concentration system, designed for home use. 1 This device, covered by US patent application number 63160749, simplifies the process of making concentrated yogurt, allowing users to produce this thicker, richer product quickly and inexpensively in their own kitchens using readily available milk. This invention exemplifies the connection between technological innovation and entrepreneurial opportunity. By creating a more efficient and accessible method for producing a popular food product, this device has the potential to create a new market or disrupt the existing one. Its patent protection is crucial, offering the inventors a competitive advantage and incentivizing further development and commercialization. This case demonstrates how intellectual property, in the form of patents, can be a cornerstone of successful IP-based entrepreneurship, enabling inventors to capitalize on their innovations and bring new products to consumers[33].

Farzpourmachiani M. and Farzpourmachiani A. (2024), also, introduce the concept of "Attrition Entrepreneurship Theory," a phenomenon where entrepreneurial activities, while generating income, fail to contribute to societal wealth and may even be destructive to the economy. This theory posits that certain forms of entrepreneurship, often influenced by government policies or societal factors, can lead to economic stagnation or decline. The authors cite examples such as war-driven industries, inheritance tax collection, and discriminatory practices as manifestations of attrition entrepreneurship. These activities, while potentially profitable for individuals or governments, do not foster genuine innovation or contribute to the long-term well-being of society. A crucial distinction is made between genuine entrepreneurship, which drives innovation and economic dynamism, and attrition entrepreneurship, which merely recycles existing resources or capital without creating new value. While the text doesn't explicitly mention intellectual property (IP), it can be argued that attrition entrepreneurship often neglects or even undermines the importance of IP protection. True innovation, the kind that fuels economic growth, relies heavily on securing and leveraging IP rights. Conversely, attrition entrepreneurship, by its nature, often focuses on short-term gains, potentially through imitation or exploitation of existing technologies, rather than investing in the development of novel, protectable intellectual assets. Therefore, the absence of a strong IP framework, or the disregard for IP rights, can inadvertently foster an environment conducive to attrition entrepreneurship, hindering genuine innovation and long-term economic prosperity[34].

This proposal seeks to build upon these previous investigations by providing a systemically approach toward the role of IP in technological and innovation-based entrepreneurship activities.

## III. RESEARCH QUESTIONS

1) How does a holistic IP portfolio (including patents, trademarks, copyrights, and trade secrets) contribute to the success of invention-based technological ventures, specifically in terms of attracting investment, achieving market share and generating revenue?
2) What are the key IP strategies employed by successful invention-based technological entrepreneurs, and how do these strategies align with their business models and stages of venture development?
3) How does the SOLIRANCE invention, as a specific example of IP, contribute to the success of the entrepreneurial venture built around it? What are the specific IP strategies employed in the SOLIRANCE case, and how have they impacted the venture's performance?

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4) What lessons can be learned from the SOLIRANCE case study regarding the effective management and leveraging of IP for invention-based technological entrepreneurship? How can these lessons be generalized to other similar ventures?
5) What are the critical factors that influence the relationship between IP strategy and entrepreneurial success in the context of invention-based technological ventures?

## IV. THEORETICAL FRAMEWORK

This research draws upon two complementary theoretical lenses: the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT), to understand the relationship between intellectual property (IP) and entrepreneurial success in invention-based technological ventures.

### 4-1- Resource-Based View (RBV)

The RBV posits that a firm's competitive advantage and superior performance are derived from possessing valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). In the context of invention-based technological entrepreneurship, IP, including patents, trademarks, copyrights, and trade secrets, can be considered a critical resource[35].

**Valuable**: IP can be valuable by protecting inventions from imitation, creating barriers to entry, and enabling the commercialization of new technologies (Grant, 1996). It can also signal innovativeness and quality to investors, customers, and partners[36].

**Rare**: While some IP, like trademarks, might be relatively common, truly novel and groundbreaking inventions protected by strong patents are rare and can provide a significant competitive edge.

**Inimitable**: Strong IP protection makes it difficult and costly for competitors to imitate a venture's inventions, thus creating a sustainable competitive advantage. The legal protection afforded by patents, in particular, is a key mechanism for ensuring inimitability.

**Non-substitutable**: If there are no strategically equivalent substitutes for a venture's IP, its value is further enhanced. For example, a unique patented technology might be difficult to replicate through alternative means.

By effectively managing and leveraging its IP portfolio, an invention-based technological venture can create a bundle of VRIN resources that contribute to its success in terms of attracting investment, achieving market share, and generating profits.

However, simply possessing IP is not enough. The venture must also have the capabilities to utilize these resources effectively. This is where the DCT comes into play.

### 4-2- Dynamic Capabilities Theory (DCT)

The DCT extends the RBV by emphasizing the importance of a firm's ability to sense, seize, and reconfigure resources to maintain its competitive advantage in a dynamic environment,(Teece, Pisano, & Shuen 1997). In the fast-paced world of technological innovation, invention-based ventures must be able to adapt and evolve their IP strategies to respond to changing market conditions and technological advancements[37].

- **Sensing:** This involves identifying and understanding new technological opportunities and potential threats. For invention-based ventures, this includes monitoring technological trends, conducting market research, and assessing the competitive landscape. It also involves recognizing the potential value of new inventions and deciding which ones to protect through IP.
- **Seizing:** This refers to the ability to acquire and integrate new resources, including IP. This can involve filing patents, licensing technologies, acquiring other companies with relevant IP, or forming strategic alliances.
- **Reconfiguring:** This involves the ability to recombine and redeploy existing resources to create new value. For invention-based ventures, this might involve adapting their IP portfolio to new applications, licensing their technology to different partners, or using their IP to develop new products and services.

The DCT highlights the importance of dynamic capabilities in enabling invention-based ventures to effectively leverage their IP assets over time. By continuously sensing new opportunities, seizing valuable IP, and reconfiguring their resource base, these ventures can maintain their competitive advantage and achieve long-term success.

### 4-3- Integrating RBV and DCT

This research argues that both RBV and DCT are essential for understanding the relationship

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between IP and entrepreneurial success in invention-based technological ventures. The RBV explains WHY IP can be a source of competitive advantage, while the DCT explains HOWventures can effectively leverage their IP over time. By integrating these two perspectives, this research aims to provide a more comprehensive understanding of the complex interplay between IP, dynamic capabilities, and entrepreneurial success. The SOLIRANCE case study will be used to illustrate how these theoretical concepts play out in a real-world setting, examining the specific IP strategies employed by the venture and how these strategies have contributed to its performance.

## V. CASE STUDY

This research has investigated the relationship between intellectual property (IP) and entrepreneurial success in invention-based technological ventures, drawing upon the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT). The SOLIRANCE case study, "An Apparatus for Driver Behavior Analysis," serves as a central example for exploring this relationship.

### 5-1- SOLIRANCE: An Exemplar of IP and Dynamic Capabilities

The Leahy-Smith America Invents Act (AIA) introduced significant changes to US patent law, most notably shifting to a first-to-file system. This change, along with others like expanded prior art definitions, necessitates a proactive approach to intellectual property (IP) management. The first-to-file system emphasizes speed, as the first inventor to file a patent application, not necessarily the first to invent, is awarded patent rights. This underscores the importance of prompt filing to secure priority and avoid losing potential IP to competitors. Furthermore, utilizing the Patent Cooperation Treaty (PCT) offers a strategic advantage. Filing a PCT application within 30 months of the initial filing establishes a priority date that can be claimed in multiple countries, effectively extending the time available to assess market potential and secure patent protection internationally. Given the AIA's expanded definition of prior art, a thorough and timely patent search, coupled with prompt PCT filing, becomes crucial to ensure the novelty and patentability of inventions, maximizing the chances of securing and maintaining a valuable IP portfolio in the increasingly competitive global landscape [38].

SOLIRANCE, the subject of this case study, is an apparatus designed for driver behavior analysis, intended for safety purposes and, more specifically, for providing a score for insurance risk estimation and management. As described in the PCT application PCT/IB2024/062318 [39] the apparatus comprises a microcontroller, an enclosure, an accelerometer and gyroscope sensor, an e-ink display, a solar cell, and an initialization key. The microcontroller measures acceleration and rotation using the sensor, calculates a score based on a predefined formula, and displays the time and score on the e-ink display via a QR code. The apparatus is designed to be placed on the rear or back window of a car as shown in Fig-1.

Building upon the foundation laid by the innovative noninvasive speed control device detailed in US Provisional Patent 62827063 [40], this work introduces a refined approach. That prior invention utilized RF actuation, a fuel reduction mechanism, an IMU, GPS, and a microcontroller for targeted speed limitation of vehicles. This new invention leverages and expands upon that established system, focusing on insurance industries.

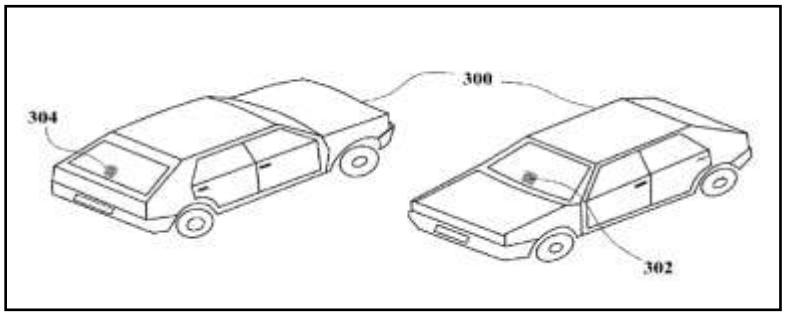


**Fig-1. SOLIRANCE Invention, An Apparatus for Driver Behavior Analysis**

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SOLIRANCE, protected by a combination of patents and trade secrets, exemplifies how intellectual property (IP) can serve as a strategic resource, and how dynamic capabilities are crucial for leveraging that resource for entrepreneurial success. This invention demonstrates the importance of strategically managing IP to achieve market differentiation and competitive advantage.

SOLIRANCE's innovative potential has garnered increasing recognition within the innovation community. This is exemplified by its prestigious gold Medal win at the Development Invention Show in the UAE in December 2024 (Fig-2), an award that highlights the significant advancements SOLIRANCE offers and its potential impact on the field. Furthermore, this initial success was followed by even greater acclaim, culminating in the prestigious Erasmus Prize Gold Medal at the European International Invention and Innovation Festival, Belgium, on December 15, 2024 (Fig-3). This distinguished accolade recognizes the significant strides made by SOLIRANCE and its potential to contribute meaningfully to the field.

Intellectual Property (IP) plays a critical role in establishing a productive framework for interaction between society and technological entrepreneurship. It provides the necessary bridge, connecting societal needs with the innovative solutions developed by entrepreneurs. By protecting inventions and creative works, IP incentivizes individuals and companies to invest in research and development, knowing their efforts will be recognized and rewarded. This framework fosters a dynamic cycle: society benefits from the resulting technological advancements, while entrepreneurs are motivated to address societal challenges through innovation. IP not only safeguards the rights of creators but also facilitates technology transfer, licensing agreements, and collaborative ventures, ensuring that innovations reach the market and ultimately benefit society. In essence, IP creates the stable and predictable environment necessary for technological entrepreneurship to flourish and effectively serve societal needs [41].


**Fig-2. Gold Medal in Development Invention Show in the UAE on December 2024 for SOLIRANCE**

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**Fig-3. Erasmus Prize Gold Medal at the European International Invention and Innovation Festival, Belgium, on December 15, 2024 for SOLIRANCE**

**5-2- The Role of IP in Entrepreneurial Success of SOLIRANCE**

So far, the research has argued that the interplay between RBV and DCT is crucial for understanding how IP contributes to entrepreneurial success. IP, as embodied by SOLIRANCE, can be analyzed through the lens of VRIN resources (RBV), while the venture's ability to leverage this IP over time depends on its dynamic capabilities (DCT).

**Valuable Resource (RBV) and Enhanced Entrepreneurial Success:** SOLIRANCE's ability to provide a score for insurance risk estimation and management creates value for both insurance companies (by enabling more accurate risk assessment and personalized pricing) and drivers (by potentially leading to lower premiums for safe driving). This value proposition can directly translate into entrepreneurial success by attracting early adopters, securing partnerships with insurance providers, generating revenue through sales or licensing agreements, and building brand recognition as a leader in driver safety technology. The value proposition allows the venture to differentiate itself in the market and create a competitive advantage.

**Rare Resource (RBV) and Increased Competitive Edge:** The specific combination of features in SOLIRANCE, including the integrated solar cell, the e-ink display with QR code functionality, and the proprietary algorithm for score calculation, may be unique in the market. This rarity can lead to a stronger competitive position, attracting investors who seek innovative solutions and customers who are looking for cutting-edge technology. It also creates a barrier to entry for competitors.

**Inimitable Resource (RBV) and Sustainable Advantage:** The patent protection sought through the PCT application, combined with potential trade secrets related to the algorithm and manufacturing process, makes SOLIRANCE difficult and costly for competitors to replicate. This inimitability provides a sustainable competitive advantage, allowing the venture to capture and maintain market share over time. It provides a degree of assurance to investors that their investment is protected.

**Non-substitutable Resource (RBV) and Market Leadership:** While other driver behavior monitoring solutions exist, SOLIRANCE's unique combination of features (the self-powered operation due to the solar cell, the easy installation on the rear window, the direct display of the score via QR code) may make it difficult to substitute. This lack of readily available substitutes strengthens the venture's position in the market and allows it to command a premium price or attract strategic partnerships.

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**Sensing, Seizing, and Reconfiguring (DCT) and Adaptability:** The development and commercialization of SOLIRANCE itself demonstrates the venture's dynamic capabilities. The venture may have sensed a growing demand for usage-based insurance and identified a gap in the market for a simple, affordable, and accurate driver behavior monitoring solution. They seized this opportunity by developing SOLIRANCE and securing IP protection. Future reconfiguration might involve adapting the technology to integrate with smart home systems, developing new algorithms for different types of vehicles, or expanding into new geographic markets. These dynamic capabilities are essential for long-term success in a rapidly evolving technological landscape.

## VI. CONCLUSION

This research has demonstrated the critical role of intellectual property (IP) in fostering entrepreneurial success within invention-based technological ventures. By integrating the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT), the study has provided a comprehensive framework for understanding how IP, as a valuable, rare, inimitable, and non-substitutable resource, can be strategically leveraged to achieve a competitive advantage. The SOLIRANCE case study, focusing on an apparatus for driver behavior analysis, has served as a practical example to illustrate the complex interplay between IP, dynamic capabilities, and entrepreneurial outcomes.

The analysis of SOLIRANCE has highlighted several key insights: First, the invention's unique combination of features, including the integrated solar cell, e-ink display with QR code functionality, and proprietary algorithm, positions it as a potentially valuable and rare resource. Second, the patent protection sought through the PCT application, combined with potential trade secrets, enhances the inimitability of the invention, contributing to a sustainable competitive advantage. Third, the venture's ability to sense the market opportunity for driver behavior analysis, seize this opportunity by developing and protecting SOLIRANCE, and its potential to reconfigure its resources in the future underscores the importance of dynamic capabilities.

The SOLIRANCE case study offers valuable lessons for other invention-based technological ventures. It emphasizes the need for a holistic IP strategy that encompasses various forms of IP protection, aligns with the business model, and is adaptable to changing market dynamics. Furthermore, it highlights the crucial role of dynamic capabilities in sensing new opportunities, seizing valuable IP, and reconfiguring resources to maintain competitiveness.

Future research could expand on this study by examining a larger sample of invention-based ventures to identify broader patterns and trends in IP management and entrepreneurial success. It could also explore the influence of different industry contexts and regulatory environments on the effectiveness of IP strategies. By further developing our understanding of the relationship between IP and entrepreneurial success, we can empower entrepreneurs to make more informed decisions about IP management and contribute to innovation and economic growth.

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