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Innovation in the Era of IoT and Industry 5.0: Absolute Innovation Management (AIM) Framework

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Abstract: In the modern business environment, characterized by rapid technological advancements and globalization, abetted by IoT and Industry 5.0 phenomenon, innovation is indispensable for competitive advantage and economic growth. However, many organizations are facing problems in its true implementation due to the absence of a practical innovation management framework, which has made the implementation of the concept elusive instead of persuasive. The present study has proposed a new innovation management framework labeled as "Absolute Innovation Management (AIM)" to make innovation more understandable, implementable, and part of the organization's everyday routine by synergizing the innovation ecosystem, design thinking, and corporate strategy to achieve competitive advantage and economic growth. The current study used an integrative literature review methodology to develop the "Absolute Innovation Management" framework. The absolute innovation management framework links the innovation ecosystem with the corporate strategy of the firm by adopting innovation management as a strategy through design thinking. Thus, making innovation more user/human-centered that is desirable by the customer, viable for business and technically feasible, creating both entrepreneurial and customer value, and boosting corporate venturing and corporate entrepreneurship to achieve competitive advantage and economic growth while addressing the needs of IoT and Industry 5.0 era. In sum, it synergizes innovation, design thinking, and strategy to make businesses future-ready for IoT and industry 5.0 revolution. The present study is significant, as it not only make considerable contributions to the existing literature on innovation management by developing a new framework but also makes the concept more practical, implementable and part of an organization's everyday routine.

1. Introduction

In recent decades, the business environment has changed dramatically due to rapid globalization and technological advancements, especially in information technology. The business environment has become more dynamic and hypercompetitive. To deal with this scenario business models are also evolving at a considerable pace and businesses are now relying more heavily than ever on innovation for survival. In other words, in today's fast-changing business environment abetted by IoT and Industry 5.0 the only way to survive is to introduce new products and services continuously that can create value for both customers and enterprise. Having an innovation-supporting culture and employees with an innovative mindset make the organizations capable of getting the maximum benefit out of the opportunities that lie ahead and becoming ambidextrous [1]. Moreover, the emergence of concepts like IoT and Industry 5.0 poses new opportunities and challenges for business. Although

continuous innovation is of the utmost importance, it must be implementable; this means innovation should result in user/human-centered products or services that are technically possible, financially viable and can create value for both customer and business (marketable). However, upon review of models and frameworks of innovation, it was found that generally, businesses are struggling in innovating implementable products and services. It was observed that the process of innovation is more technology-driven than user-need-driven and there is a detachment between corporate strategy and innovation process. Recent research has shown that innovation has a direct relationship with growth in productivity and sustainability in output, especially for developing countries [2,3].

With the increasing advent of interconnected devices, sensors and objects, substantial challenges have also emerged with respect to the innovation management and business model [4]. In order to make the management of these IoTs simple and ensure their seamless integration into the business processes, a new type of innovation management framework is required. The study of [5] further stated that technological advancements and business applications of IoT are rapidly increasing and giving birth to the next industrial revolution, i.e., Industry 5.0, hence necessitating human/user-centered, technically feasible, financially viable, and marketable products that can create value for both customers and entrepreneurs. Thus, now the focus is not just on innovation, but also on the implementation of innovation. Innovation can only be implemented through human/user-centered financially viable and marketable products. The concept of Industry 5.0 has come through different development stages, commonly referred to as Industry 1.0 (during the 18th and 19th century, focusing on human physical labor in industry and agriculture), Industry 2.0 (from the end of the 19th century to 1980s, characterized by electrical and mechanical technological advancements) and Industry 3.0 (from 1980 to 2000, characterized by a shift to digital from analog, modular products, and shorter product life cycles). Recently, exponential development in the field of IoT gave birth to Industry 4.0 (from 2000 to date), characterized by IoT, Big Data, electric vehicles, 3D printing, cloud computing, and artificial intelligence [6]. Parallel to Industry 4.0, the concept of Industry 5.0 (from 2016 onward, characterized by digital smart society, the integration of virtual and physical spaces, IoT, robots, augmented reality, innovation ecosystem, brain–machine interface and human centrality of technology) is also flourishing [7–9]. According to [10], the main difference between Industry 4.0 and Industry 5.0 is the increased human–machine interaction that is empowering people to express themselves in the form of personalized products and services.

According to Seppo Leminen and Mika Westerlund [11] a balanced innovation management framework is required for IoT and Industry 5.0. They further emphasized that IoT needs an innovation management framework that can strike a balance between business and customer needs and between the level of openness and privacy. In reality, the widespread use and applicability of IoT are giving shape to a new ecosystem, i.e., Industry 5.0. the work of [7] stated that Industry 5.0 is based on the synergy between humans and autonomous machines. He further added that Industry 5.0 is more human-centered as compared to Industry 4.0, as the focus of Industry 4.0 was only to improve the process for increased production; however, Industry 5.0 is more focused on combining human brainpower and creativity, keeping sustainability and ambidexterity in mind. [9] stated that the IoT revolution is fueling the emergence of Industry 5.0 and these concepts will be intertwined in the near future. He further added that a new innovation management framework that takes into consideration IoT, artificial intelligence and Big Data and human/user centeredness is required to reap the maximum possible benefits from Industry 5.0.

Keeping in mind the diversity present in innovation frameworks and the problems in its implementation [12–17], the present study decided to perform an integrative literature review of the models, frameworks, and paradigms of innovation to critically analyze them and present a new easy-to-use innovation management framework for the effective and efficient implementation of innovation. Researchers believe that the integrative literature review method is the best way to analyze the widely accepted frameworks, models, and paradigms of innovation and to come up with a new framework [6,18,19]. The present study is focused on making the concept of innovation

more implementable, practical, useful, and easy to understand, so that firms can get the maximum benefits out of it and cope with the challenges of globalization and technological advancement, e.g., IoT and Industry 5.0 [5,6,10,20,21]. The main aim and objective of the study is to present an innovation management framework that focuses on both customer and entrepreneurial value through user/human-centered products and is perfectly intermingled with the corporate strategy and "routine logic" of the firm. The study achieves this objective of making the implementation of innovation easier and fruitful by synergizing innovation, design thinking, and the corporate strategy of the firm.

The current study is significant in a number of ways; first, it has tried to clear the fog surrounding the implementation of innovation and make it more clear, comprehensive, and practical by coining a new framework labeled as "Absolute Innovation Management". Second, the absolute innovation management framework involves everyone within an organization in the innovation process, which not only makes this process rapid but also creates a sense of responsibility among employees from all levels. Third, it provides a framework through which innovation, design thinking, and corporate strategy can be synergized for maximum benefit. Fourth, instead of managing innovation as a standalone activity, absolute innovation management has made innovation part of routine organizational activities, which makes the implemention-ability of innovation smooth and seamless. Fifth, the concept of absolute innovation management reduces the side effects of discontinuities and partial understanding of innovation by making it more attached to the corporate strategy of the firm. Finally, the present study concluded by suggesting a new framework of innovation labeled as "absolute innovation". Absolute innovation links the "innovation ecosystem with the corporate strategy of the firm by adopting innovation management as a strategy through design thinking to make innovation more user/human-centered that is desirable by a customer, viable for business and technically feasible. In order to create both entrepreneurial and customer value and boost corporate venturing and corporate entrepreneurship, to achieve sustainable competitive advantage and economic growth while addressing the needs of the IoT and Industry 5.0 era".

2. Literature Review and Background

2.1. Understanding Innovation

The term innovation was first coined by the "Father of innovation", Joseph, A Schumpeter [22], in his famous book *The Theory of Economic Development*, where he defines innovation as "the commercial or industrial application of something new—a new product, process, or method of production; a new market or source of supply; a new form of commercial, business, or financial organization". Since then, innovation has become the most important element of any organization's success. Different scholars gave different definitions and understandings of the term innovation, e.g., according to [12], innovation is an outcome, a continuous process, and a mindset at the same time. His understanding of innovation is summarized in Table 1 below:

Table 1. Understanding Innovation.

Consideration	Organizational Focus	Primary Question	Consideration
Considering Innovation as an outcome	End Result	What is sought?	Product innovation Process innovation Marketing innovation Business model innovation Supply chain innovation Organizational innovation
Considering Innovation as a process	Ways Methods and Means	How would you want to make it happen?	Innovation process Product development process
Considering Innovation as a mindset	Mental State or Thinking pattern	How do you want to internalize the concept within your employees?	Individual mindset Organization culture

Source: [12].

2.2. Implement-Ability of Innovation

A comparatively more practical and commonly used definition of innovation in business circles is given in paragraphs 146 and 150 of the Oslo Manual (Guidelines for Collecting and Interpreting Innovation Data), which is also cited by [23]. It states that "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations". According to the Oslo Manual, another important feature of innovation is implementation, i.e., "A common feature of innovation is that it must have been implemented. A new or improved product is implemented when it is introduced in the market. New processes, marketing methods, or organizational methods are implemented when they are brought into actual use in the firm's operations" [13,23].

2.3. Evolution in Innovation Management Theory and Models

It is an empirically established fact that innovation is very important for business, sustainability, growth, and prosperity, however, little has been done in business and policy communities to draw any systematic analysis to improve the overall innovation climate and made the implement-ability of the concept easier [16]. Moreover, Joe Tidd [16] has reviewed the most popular models of innovation, e.g., technological innovation [24], organizational innovation [25] and then tried to synthesize and synergize commercial, organizational and technological aspects of innovation [17]. [17] Highlighted five generations of innovation models, which are summarized in the Table 2 below.

Table 2. Evolution in Conceptualizing Innovation Management.

Generation	Key Features
First and Second Generation	Based on linear models where customer needs generate pull and technological advancement generates a push.
Third Generation	Based on the coupling model that works through interaction between different elements and feedback loop between them.
Fourth Generation	Based on parallel lines model that work through inter- and intra-firm integration and emphasize on alliances and linkages.
Fifth Generation	Based on continuous innovation that works through extensive networking, systems integration and quick, customized, and flexible responses.

Source: [17].

2.4. Discontinuous Innovation and Partial Understanding of the Innovation Management

Joe Tidd [16] also highlighted another important factor, i.e., the problems and consequences if we fail to understand the concept and process of innovation management completely, as this will pose difficulties in its implementation. According to him, a mental model, i.e., how we frame problems associated with innovation is of the utmost importance for the proper implementation of the concept: if we fail to frame the problem accurately, it may lead us to a partial understanding of innovation. Summary of the partial view of innovation and its consequences emphasized by [16] is given in Table 3 below:

Table 3. Problems Associated with Partial Understanding and Views of Innovation Management.

If Innovation Is Only Seen as	. . ..The Results Can Be
Strong R&D Capability	Technology or products which fails to meet customer needs and requirement and may face rejection.
The area for only specialists	Lack of organization-wide integration and involvement by others from different departments.
Understanding and meeting customer needs	Lack of technological advancement and progression resulting in a lack of sustainable competitive advantage.
Advancement in technology	Producing products and services that do not meet customer needs, requirements, and designing processes that are not useful and face resistance.
Only meant for Large Firms	Weak SMEs with too much dependence on large organizations. Too much disruptive innovation and SMEs may not be able to seize new opportunities.
Only about breakthrough Changes	Waste of potential for incremental innovation. The result and gain of radical changes may not be sustained, as the ratchet of incremental performance is not working well enough.
Only about strategically targeted projects	Missing out "by chance" or "accidental" innovations that may open up a new door of opportunities.
Only associated with key individuals	Missing out on the innovative capabilities of the rest of the employees. May face greater resistance.
Only internally generated	Missing out on opportunities lying outside of the organization which may result in wasting resources to reinvent the wheel.
Only externally generated	Non-acceptance and rejection due to the "not invented here" phenomena.
Only concerning single firms	Missing out on the opportunities otherwise available in the network.

Source: [17].

Most of the time, innovation takes place within a clearly defined set of rules that we can clearly understand and mostly involves players who try to innovate by doing what they do but in a better way [16]. Usually, we have a certain set of "rules of the game" under which innovation takes place, however, sometimes these rules of game change, and unleash hidden opportunities and challenges to existing players. According to Joe Tidd [16] this is the main concept behind the "Creative destruction" of theory of economic development presented by Joseph A. Schumpeter [22]. Joe Tidd terms these changes in the rules of the game as discontinuities. These possible discontinuities and the problems posed by them are summarized in the Table 4 below.

Table 4. Sources of Discontinuity and Problems Posed.

Sources of Discontinuities	Explanation	Problem Posed
New Market	The emergence of new markets, which cannot be predicted or analyzed through conventional market research and analysis tools and techniques.	Established players ignore them due to too much focus on existing markets or because they consider them too small or not their preferred target market.
New Technologies	Step changes or breakthrough changes	Established players do not see them because they are beyond their technology search environment. May face resistance from "not invented here" phenomena.

Sources of Discontinuities	Explanation	Problem Posed
New Political Rule	Political conditions that shape social and economic rules may change dramatically, e.g., collapse of communism	Established firms fail to understand and learn the new rules of the game due to rigid and old mindsets.
Market Exhaustion	Firms in mature industries may need to exit or undergo a radical reorientation of their business.	Face resistance from "status quo" and "steady-state" mentality.
Sea Changes in Market sentiments or behavior	Public opinion and behaviors shift slowly and then tip over into a new model.	Established players resist this due to "cognitive dissonance" and try to offer alternate explanations until it is too late.
Deregulation / Shift in Regulatory regime	A shift in the regulatory framework enables the emergence of a new set of rules, for example, liberalization, privatization	Rules of games change but the old mindset persists and established players are unable to move fast enough to seize new opportunities.
Fractures along "fault lines"	Long-standing issues of concern about minority accumulate momentum, for example, social attitude to smoking or health concern about obesity level and fast food.	Established players who are working with wrong and old assumptions and are on the wrong footing may face a tough challenge from new emerging players who are working in the background and new conditions are favoring them.
Unthinkable events	Unimagined, and therefore not prepared for, events that sometimes literally change the world abruptly and set new rules of game.	New rules of game may outsmart existing players or render their competencies unnecessary.
Business Model Innovation	Existing business models are challenged and modified by new entrants through reframing and consequently changing the rules of the game.	New entrants change the game of the rule by changing the existing business models through reframing. All the old players can do is to try to become fast followers.
The shift in the Techno-Economic Paradigm	Changes at the system level resulting out of the convergence of a number of trends and introducing a paradigm shift where the old order is replaced.	It is always hard to see these paradigm shifts beforehand. They only become visible when new rules of the game are established. Old players tend to reinforce their commitments with the old set of rules due to the "sailing ship" mentality.
Architectural Innovation	Changes at the level of system architecture rewrite the rules for those involved at the component level.	Rigid mindsets familiar with an old set of games tend to find it difficult to cope with these changes. New players generally find it easy to cope with the changes at the component level.

Source: [17].

Based on the different definitions of innovation, [14] presented a new framework of innovation labeled as the Total Innovation Model (TIM), where he analyzed different phases of evolution of innovation management frameworks. The Table 5 below summarizes the development of innovation management frameworks in different phases that is 5 is adapted from [14] with certain modifications.

Table 5. Developments in Innovation Management Frameworks.

Phase	Main Contentions	Main Contributors	Key Points
First Phase	Individual Innovation Innovation Process Success factors	[26] [22] [27] [28]	An entrepreneur is a driving force at the individual level
Second Phase	Organizational promotion R&D Management Internal Sources	[29]	R&D activities were the focus and main source of innovation at the organizational level. The main focus was on internal sources of innovation
Third Phase	Outsiders Involved Users as Innovators	[30]	In this phase main focus was on the interaction of internal and external (users) sources of innovation
Fourth Phase	Portfolio Innovation Integrated Innovation Systematic innovation	[31] [32]	Based on the notion that different components of innovation should work as one system.
Fifth Phase	Total Innovation Management (TIM)	[14]	Mainly focuses on creating an innovative Ecosystem

Source: Compiled By Authors from [14].

Finally, [15] critically analyzed already available innovation paradigms and frameworks. He discussed the innovation paradigm shift in North America, Europe, and Asia by combining both western and eastern wisdom. He divided innovation frameworks into three categories and their critical analysis is summarized in the Table 6 below.

Table 6. Critical Analysis of existing Innovation Frameworks.

Innovation Framework	Main Characteristics	Shortcomings/issues
Based on Partial Elements	• User Innovation [33] and disruptive innovation [34] by American scholars • Design drive innovation [35] and public innovation [36] by European Scholars • Knowledge Innovation [37] by Japanese Scholars • Imitation Based Innovation [38] by Korean Scholars and Secondary Innovation [39] by Chinese Scholars	Focus on a single element of innovation instead of opting for a holistic approach. This approach is not suitable for the environment powered by rapid advancements in technology.
Horizontal Interaction and integration of factors	• Open Innovation (OI) by American scholars [40,41] • Total Innovation Management (TIM) by Chinese Scholars [14] • Convergence Innovation by Korean Scholars [42]	This does not consider vertical integration, and therefore may be at risk of being overly open and lacking core competency.
Focusing on conceptual, cultural and societal aspects	• Responsible innovation and public innovation by European Scholars [43–46] • Jugadd Innovation [47] by Indian Scholars • Embracing Innovation by Chinese Scholars [48,49]	Mainly focuses on conceptual, cultural, and societal aspects, overlooking the technological aspects.

Source: Compiled By Authors from [15].

According to [15], all three categories of innovation management frameworks lack the connection with corporate strategy and strategic design, therefore making the implementation of innovation and creation of value difficult. Moreover, all three innovation management framework categories lack a holistic approach that, coupled with strategic detachment, further escalate the problem of implementation. He proposed a new innovation management framework, i.e., "Holistic Innovation" which is based on four key elements, i.e., a strategic element, an element of totality, the open element, and the collaborative element. He believed that his holistic innovation framework could overcome the shortcomings and issues of three categories of innovation frameworks.

2.5. Complexity and Issues of Innovation Management in the Era of IoT and Industry 5.0

With the increasing advent of interconnected devices, sensors and objects, substantial challenges have also emerged with respect to innovation management [4]. In order to make the management of these IoTs simple and ensure their seamless integration into the business process, a new type of innovation management framework is required. [5] further stated that technological advancements and the business applications of IoT are rapidly increasing, hence necessitating human/user-centered, technically feasible, financially viable, and marketable products that can create value for both customers and entrepreneurs. Thus, now the focus is not just on innovation, but also on the implementation of innovation. Innovation will be implemented only through human/user-centered financially viable and marketable products. Moreover, [20] concluded that, with the emergence of IoT and Industry 5.0 concepts, the proper alignment of enterprise model (business model) and information systems, together with the alignment of physical and cyberspace, is very important for making innovation implementable. [21] also stated that IoT devices and products should be "people-aware" and should be driven by user needs instead of technological advancements, and design thinking mindsets, processes, tools, and techniques are crucial for what they called "people-aware" IoT applications and products. The use-ability of design thinking for implementable innovation was also endorsed by [50].

The concept of Industry 5.0 has also come through different development stages, commonly referred as Industry 1.0 (during the 18th and 19th century, focusing on human physical labor in industry and agriculture), Industry 2.0 (from the end of the 19th century to the 1980s, characterized by electrical and mechanical technological advancements) and Industry 3.0 (from 1980 to 2000, characterized by a shift to digital from analog, modular products, and reduced product life cycles). Recently exponential development in the field of IoT gave birth to Industry 4.0 (from 2000 to date, characterized by IoT, Big Data, electric vehicles, 3D printing, cloud computing, and artificial intelligence) [6]. Parallel to Industry 4.0, the concept of Industry 5.0 (from 2016 onward, characterized by a digital smart society, the integration of virtual and physical spaces, IoT, robots, augmented reality, innovation ecosystem, brain–machine interface and human centrality of technology) is also flourishing [7–9]. According to [10], the main difference between Industry 4.0 and Industry 5.0 is increased human–machine interaction that empowers people to express themselves in the form of personalized products and services. Industry 5.0 is providing customers with more customized products and services than ever before and this can only be possible with the increased engagement of humans in designing products and services. He believed that, due to increased human–machine interaction and more emphasis on human/user-centered products, Industry 4.0 is gradually giving space to Industry 5.0 as time passes. His summary of different industry revolutions, their period, and characteristics is presented in the Table 7 below.

Era	Time Period	Characterized By	Explanation
1.0	1780	Mechanization	Industrial production based on machines powered by water and steam.
2.0	1870	Electrification	Mass production using assembly lines
3.0	1970	Automation	Automation using electronics and computers
3.5	1980	Globalization	Offshoring production to low-cost economies
4.0	Today	Digitalization	Introduction of connected devices, data analytics, and artificial intelligence technologies to automate processes further.
5.0	Future	Personalization	Industry 5.0 is focused on the cooperation between man and machine, as human intelligence works in harmony with cognitive computing, resulting in human/user-centered products and services.

Source: [10].

Although businesses are still trying to cope with the challenges of Industry 4.0, due to very rapid technological advancements in the field of IoT and information technology, the next industrial revolution, i.e., Industry 5.0, is already knocking at the door [51]. Although it's still a little early to say exactly how Industry 5.0 will disrupt existing business models, one thing is certain: Industry 5.0 will break down any barriers between the real-world and virtual world. Daniel Paschek, Anca Mocan and Anca Draghici [51] further added that, "People have different opinions when it comes to predicting the start of industry 5.0, but if you consider the speed of transformation of technology, I believe it's going to be here for sooner than most people think. The future is shaping now and we need to rise to the challenges if we are to thrive in the next revolution". The European Economic and Social Committee (EESC) [52] describes Industry 5.0 as "focused on combining human beings' creativity and craftsmanship with the speed, productivity, and consistency of robots". The transition from Industry 4.0 to Industry 5.0 will take place with improved and advanced human–machine interactions, and better automation through robots with the creativity and brainpower of humans [51,53]. Industrial evolutions and their characteristics are summarized in Figure 1 below adopted from [53].

According to Seppo Leminen and Mika Westerlund [11] a new innovation management framework is required for IoT and Industry 5.0 to work efficiently. They further emphasized that IoT and Industry 5.0 needs an innovation management framework that can strike a balance between business and customer needs and between the level of openness and privacy. In reality, the widespread use and applicability of IoT are giving shape to a new ecosystem, i.e., Industry 5.0. [7] Stated that Industry 5.0 is based on the synergy between human and autonomous machines. He further added that Industry 5.0 is more human-centered as compared to Industry 4.0, as the focus of Industry 4.0 was only to improve the process of increased production; however, Industry 5.0 is more focused on combining human brainpower and creativity, keeping sustainability and ambidexterity in mind. [9] stated that the IoT revolution is fueling the emergence of Industry 5.0 and these concepts will be intertwined in the near future. He further added that a new innovation management framework, with modern technology and an innovation policy that takes into consideration IoT, artificial intelligence and Big Data and human/user centeredness, is required to reap the maximum possible benefits from Industry 5.0.
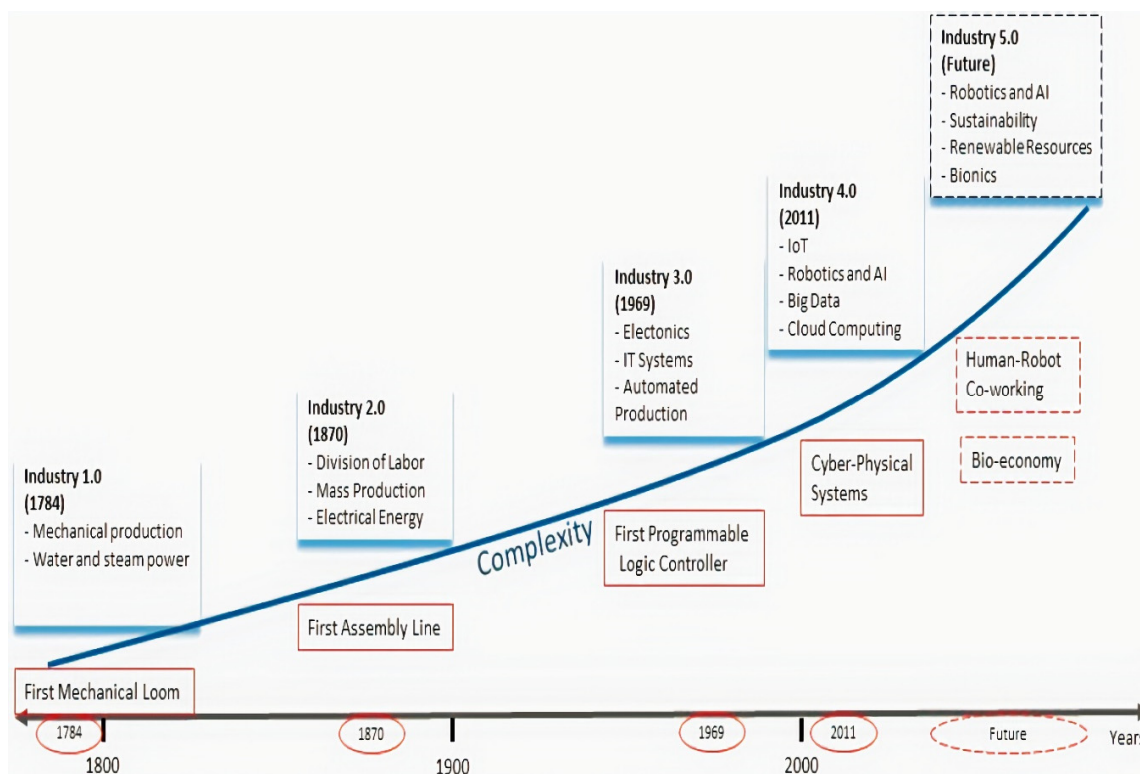
Figure 1. Graphical illustration of evolution from Industry 1.0 to Industry 5.0. Source: [53].

3. Methodology

The objective of the current study is to systematically analyze the available literature on innovation management and develop and propose a new innovation management framework to improve the understanding, implement-ability, and value of innovation for both organizations and customers. An integrative literature review technique was found to be the best-suited approach for the current study, keeping in mind the objective of creating new knowledge in the field of innovation management. According to [18], "an integrative literature review is a form of research that reviews, critiques and synthesizes representative literature on a topic in an integrated way such that new frameworks and perspectives on the topic are generated". The present study aimed to critically synthesize recent developments in the fields of innovation management, identify the problems and shortcomings making innovation management elusive, and propose an innovation management framework suitable for the era of IoT and Industry 5.0. Therefore, it was conceived that an integrated literature review methodology was best suited for the current study.

The present study followed the guidelines of [18] to conduct the integrative literature review and critically synthesize competing and complementary models and frameworks of innovation management. According to the guidelines provided by [19], a search for the relevant literature on innovation definitions, frameworks, models and paradigms began by listing as many relevant keywords as possible, such as "understanding innovation", "innovation defined", innovation frameworks, innovation models", "innovation levels", "innovation philosophies", "innovation paradigm".

Innovation is an emerging and dynamic topic and the present study specifically aimed at studying innovation management in the era of IoT and Industry 5.0. The term "internet of things" was first coined by Kevin Ashtor Executive Director Auto-ID Center at MIT in 1999 [54] and Neil Gershenfeld first uses this term in his book *When Things Start to Think* [55]. Moreover, the concept of Industry 5.0 has also come through different development stages, commonly referred to as Industry 1.0 (during the 18th and 19th century, focusing on human physical labor in industry and agriculture), Industry 2.0 (from the end of the 19th century to the 1980s, characterized by electrical and mechanical technological advancements) and Industry 3.0 (from 1980 to 2000, characterized by a shift to digital from analog,

modular products, and reduced product life cycles). Recently, exponential development in the field of IoT gave birth to Industry 4.0 (from 2000 to date, characterized by IoT, Big Data, electric vehicles, 3D printing, cloud computing, and artificial intelligence) [6]. Parallel to Industry 4.0, the concept of Industry 5.0 (from 2016 onward, characterized by a digital smart society, the integration of virtual and physical spaces, IoT, robots, augmented reality, innovation ecosystem, brain–machine interface and human centrality of technology) is also flourishing [7–9]. Keeping in mind the development of IoT, and Industry 4.0 and 5.0 concepts, it was decided to use the literature from 2000 to 2019, covering almost 20 years. Lots of literature are available on innovation; to keep our research focused, renowned databases like Emerald Insight, Elsevier, Wiley online, Routledge, Harvard Business School publications, Springer and Google Scholar were consulted.

The literature on innovation was selected according to the following criteria:

1. Only books and referred journal articles were considered for this study. Non-referred journals, random un-authentic online sources, and lay publications were excluded from the literature review;
2. Books and articles published in the last 20 years (2000 to 2019) were consulted, except for some classical work on innovation management;
3. Books and research articles meeting the above-mentioned criteria were selected from the Management, Marketing, and information technology disciplines.

Innovation management is a very dynamic field of study and scholars are continuously coming up with new models and frameworks for innovation management. The majority of the studies that have proposed a new model or framework for innovation management have used an integrative literature review methodology and have provided a critical analysis of the previously available literature. Therefore, we decided not to reinvent the wheel by going deep into the classical literature on innovation management; rather, we decided to focus on recent studies that have done a critical analysis of the classical literature in the field of innovation management. According to the guidelines of integrative literature reviews presented by [18,19], a stage review process is adopted for the literature review and tables are used for presenting the analysis [56].

4. The Need for New Innovation Management Framework- Stressing the Gap

According to [13,23], the most important element of innovation is its implement-ability. Implement-ability means that innovation should create value for customers or its users. If innovation is not creating value for customers or its users then the innovation is not implementable. If an innovation fails to meet human needs (fails to create value for customers or users), then the innovation process must be repeated. This is very important to understand, as this brings customers or users at the center of the whole innovation management process. "A new or improved product is implemented when it is introduced in the market. New processes, marketing methods, or organizational methods are implemented when they are brought into actual use in the firm's operations" [13]. In other words, this means that innovation should be human/user-centered, which create value for customer or users. This human/user centeredness is also the mainstay of Industry 5.0. [8] stated that industry 5.0 is moving from digital manufacturing and creating a digital society, which requires a new innovation framework based on value creation for both customer and business. Industry 5.0 is characterized by a digital smart society, the integration of virtual and physical spaces, IoT, robots, augmented reality, innovation ecosystem, brain–machine interface, and human centrality of technology [6].

Ilaria Vitali, Vinanzio Arquilla and Umberto Tolino [5] further stated that the technological advancements and business applications of IoT are rapidly increasing, hence necessitating human/user-centered, technically feasible, financially viable, and marketable products that can create value for both customers and entrepreneurs. [21] also stated that IoT devices and products should be "people-aware" and should be driven by user needs instead of technological advancements, and design thinking mindset, process, tools, and techniques are crucial for what they call "people-aware" IoT applications and products. Hence, it is concluded from the above discussion that, in the era of IoT

and Industry 5.0, the innovation must be human/user-centered and must create value for customers and enterprise.

The development of innovation frameworks has come a long way, as each framework tried to address the needs and problems of their times. Innovation discontinuities and partial understanding of the concept of innovation, as highlighted [17], has always proved to be problematic for innovation frameworks as most of the innovation frameworks and models are designed to work in steady and established environments, where organizations are doing the same things repeatedly but better than others. However, these discontinuities may force organizations to work outside the set routines and established frameworks when doing the same things repeatedly does not work anymore. Every new innovation framework was built upon the shortcomings and weaknesses of earlier innovation frameworks. Total innovation management (TIM) [14] was built upon the shortcomings of the fifth-generation framework [17] and focused on building an innovation ecosystem.

TIM [14] was criticized by [15] for not taking into consideration the vertical integration, and thus being at risk of overly open and lacking core competency. Moreover, it was also found that the total innovation model (TIM) is not linked with the corporate strategy of the organization and does not take into account the strategic direction and design. [15] believes that this detachment of innovation from the strategy is undesirable, especially for technological and information innovations, because these can not be regarded as a single stand-alone activity and should be embedded into the overall mission, vision and goal of enterprise development and management process. Further limitations of total innovation model (TIM) include, firstly, that it tries to define innovation based on Total Quality Management (TQM), however, unlike TQM, it lacks the tools and techniques for the implementation and does not explain how this model can be converted into practice. Secondly, TIM does not fix the responsibility of innovation within the organization, it simply states that everyone should innovate and everyone should be an innovator without explaining who will control and oversee the whole process. Thirdly, the interaction of TIM with corporate strategy is very vague and ambiguous; it is unclear how TIM will be connected with corporate strategy.

Although the holistic innovation framework by [15] has addressed most of the issues and shortcomings of previous innovation frameworks, it still has two fundamental problems. One, this innovation framework is not entirely suitable for Industry 5.0 and IoT as it does not talk about how to implement innovation, i.e., how to achieve a human/user centeredness that can create value for both customers and enterprise. Secondly, although it discusses connecting innovation management with strategic direction, in the era of IoT and Industry 5.0, where the speed of informational technological advancements is very fast, keeping pace with it is very difficult with a traditional strategic management approach. Therefore, we believe that merely linking innovation management with strategy is not enough, rather, we have to consider innovation as an overall strategy. [57] has the same view and suggested that innovation management should be adopted as a corporate strategy. According to him, when organizations adopt innovation as their corporate strategy, everything will stem out of it; everything in an organization will become innovation-driven and innovation will become part of everyone's job from top to bottom. By doing so, the organization will convert innovation into an everyday routine activity instead of an isolated activity, hence minimizing problems posed by discontinuities and the partial understanding of innovation discussed earlier, enabling the organization to reap the fullest possible benefits of innovation.

Therefore, in order to achieve the goal of human/user-centered innovation that can create value for both customers and enterprise, and to do it continuously without any latency as part of an organization's everyday routine instead of dealing it as a stand-alone single activity, a new innovation management framework is proposed in the coming section with the name of "Absolute Innovation".

5. Absolute Innovation Management (AIM)

Based on the shortcomings of the currently available innovation frameworks, the present study proposed a new innovation framework, i.e., Absolute Innovation Management. Absolute innovation

management is not meant to reinvent the wheel but to plug the loopholes in existing innovation frameworks. Therefore, the absolute innovation framework borrowed some elements from existing innovation frameworks and introduced some new elements where necessary.

5.1. Definition of Absolute Innovation Framework

The absolute innovation management framework is defined as a "framework that links innovation ecosystem with the corporate strategy of the firm by adopting innovation management as a strategy through design thinking to make innovation more user/human-centered that is desirable by a customer, viable for business and technically feasible. In order to create both entrepreneurial and customer value and boost corporate venturing and corporate entrepreneurship, to achieve sustainable competitive advantage and economic growth while addressing the needs of industry 5.0 and IoT era".

5.2. Core Elements of Absolute Innovation Management (AIM)

After rigorous analysis of the literature about innovation frameworks, and keeping the future requirements of the era of IoT and Industry 5.0 in mind, the proposed absolute innovation framework is based on three core elements: innovation ecosystem, design thinking, and innovation management as a strategy.

5.2.1. Innovation Ecosystem

The first core element of Absolute Innovation Management (AIM) is the innovation ecosystem. The concept of the innovation ecosystem is based on the illustration of Total Innovation Management (TIM), originally proposed by [14], and adopted by Holistic Innovation Management (HIM) [15], however, the innovation ecosystem in absolute innovation management framework also incorporates the characteristics of fifth-generation innovation models explained by [16,17].

The innovation ecosystem means that an ecosystem is required for innovation to take place that can be beneficial for everyone. The innovation ecosystem is based on three totalities: one is innovation in all functions including technical and non-technical aspects. The second is innovation by everyone in the organization and third is innovation at all times and spaces. Principally, the innovation ecosystem explains that innovation is not limited to technical aspects; there are many opportunities for innovation in non-technical areas. Moreover, the innovation ecosystem also spreads the responsibility of innovation all across the organization by stating that innovation is everyone's responsibility, regardless of designation and hierarchal position. Furthermore, the innovation ecosystem favors innovation at all times and spaces. By all spaces, it means innovation within and outside of the organization, which represents inter- and intra-firm networking and integration. By all times, it means that innovation is not a one-time or standalone activity, rather it is a continuous process, so firms should continuously involve themselves in the process of innovation to become ambidextrous in real terms. [16,17] define a fifth-generation innovation model as "based on continuous innovation that works through extensive networking, systems integration and quick, customized, and flexible responses". The innovation ecosystem illustrated in the preceding paragraph also requires attributes highlighted in the fifth-generation model and it will not function properly without these attributes.

5.2.2. Design Thinking—The Missing link

The most important core element of AIM is the introduction of design thinking in the innovation management framework. Although the role of design thinking is well established in all aspects of innovation management, including innovation in information technology and other technological disciplines, none of the previous innovation management frameworks has discussed or included design thinking. The inclusion of design thinking into the innovation framework is of the utmost importance to survive in the era of IoT and Industry 5.0. Design thinking is the main difference between AIM and previous innovation management frameworks, which makes AIM superior and future-ready for the IoT and Industry 5.0 era.

Organization for Economic Cooperation and Development (OECD) and Fred Gault [13,23] first introduced the concept of implement-ability of innovation, which means that innovation should create value for its users and that if innovation is not creating any value or bringing any change in the lives of its users, then it cannot be regarded as true innovation. The concept of implement-ability of innovation puts the customer or user at the center of the whole innovation management process. [21] endorsed this viewpoint by stating that future IoT products must be "People aware". [9] stressed that rapid development in the field of IoT is pushing us towards another industrial revolution, i.e., industry 5.0, which is based on man–machine co-working [51,53]. [8] believe that we are moving from digital manufacturing to a digital society in Industry 5.0, and new mental modeling is required that can create value both for customers and enterprises. [5] further stated that the technological advancements and business applications of IoT are rapidly increasing, hence necessitating human/user-centered, technically feasible, financially viable, and marketable products that can create value for both customers and entrepreneurs. [10] and [6] emphasized that the future is the human centrality of technology and personalization. The concept of design thinking is perfectly suited and future-ready to face the challenges of Industry 5.0 and IoT.

According to the definition of the wicked problem by [58,59], innovation is considered a wicked problem due to its characteristics. Therefore, unlike a tame problem, innovation, being a wicked problem, requires a different and unique way of thinking, process, and tools for its solution. According to [58,59], design thinking is the answer to the wicked problem of innovation. [60,61] Define the wicked problem as a complex and open-ended challenge and offer design thinking as a solution. [4,5,7,20,21,50] have emphasized the importance and role of design thinking for modifying the innovation management framework and creating an ecosystem for the IoT and Industry 5.0 era with a focus on human/user centeredness. Similarly, [7–9,11] discuss the role and importance of design thinking in Industry 5.0, which is more human-centered as compared to Industry 4.0. Design thinking helps to connect innovation and technological policy with the corporate strategy of the firm, thus creating a suitable environment and ecosystem for IoT and Industry 5.0.

According to [60], a proper mental model and the proper framing of the situation is the key by which design thinking can be applied to solve the wicked problem of innovation. Design thinking, a mental model and the framing of a situation can also solve the problem of partial understanding of the concept of innovation as highlighted by [16], discussed in the earlier sections. [60] Explains this mental modeling and framing of the situation with the help of the equations summarized in Table 8 below.

Table 8. Framing the Problem through Design Thinking.

Equation	Approach	Explanation
WHAT + HOW Leads to RESULTS (things) + (working principle) Leads to (Observed)	Mental Modeling and Framing of situation	If we know WHAT and HOW we can safely predict RESULTS.
WHAT + HOW Leads to ????? (things) + (working principle) Leads to (Observed)	Deduction	Predicting RESULTS on the basis of known WHAT and HOW
WHAT + HOW Leads to RESULTS (things) + (???????) Leads to (Observed)	Induction	Guessing about HOW on the basis of known WHAT and RESULTS
WHAT + HOW Leads to VALUE (things) + (working principle) Leads to (aspired)	Abduction	Changing RESULTS with VALUE
????? + HOW Leads to Value (things) + (working principle) Leads to (aspired)	Abduction-1	Creating VALUE when WHAT Is not known.
???? + ???? Leads to VALUE (things) + (working principle) Leads to (aspired)	Abduction-2	Creating VALUE when only VALUE is known.
WHAT + HOW Leads to Value _____Frame_____	Combination of Deduction, Induction, and Abduction.	Striving to create VALUE by framing the problem with Design Thinking by moving back and forth between deduction, induction, and abduction.

**Source:** Compiled by Authors from [60].

Tim Brown [62] explained that just having new or innovative products or services is not enough; organizations also have to think about ways to develop a marketplace for their innovative products. Simply put, innovation should be implementable and the resulting products should be marketable, as highlighted by [13,63,64]. The study further stated that design thinking is "all about collaborating 'designers' sensibility and methods to match people's needs with what is technically feasible and what a viable business strategy can convert into customer value and market opportunity". [65] define design thinking as "a way of finding human needs and creating solutions using the tools and mindset of design practitioners'.

Walter Brenner and Falk Uebernickel [66] inferred from the definitions of design thinking by [62] and [65] that "Design thinking starts with human needs and uses suitable technologies with the aim of creating entrepreneurial value through customer value". Two very important aspects highlighted in this definition are entrepreneurial value and customer value. Innovation can create customer value only if it fulfills customer needs and wants, subsequently generating entrepreneurial value. These two aspects also correspond to the definition of innovation provided by [13], which states that innovation must be implementable and marketable. [67] is of the view that the above-stated definitions of design thinking shows that it can be in total "contrast point to analytical management". Design thinking is an important tool in the era of IoT and Industry 5.0 for human/user-centered products that are technically possible, financially viable, and marketable.

In his famous article "Beyond Good: Great Innovations through Design", [68] explained that design thinkers have complete insights about customer needs, the available technology to fulfill those needs and their viability about the business. In other words, design thinkers know how to generate entrepreneurial value through customer value within available technology. He further explains the concept of creating entrepreneurial value (business viability) through customer value (customer desirability) with an example of a movie. According to him, promotion and advertisement may get a

box office success in terms of revenue generation (entrepreneurial value), but box office success alone does not correspond to a great movie (customer value). A quality movie (good customer experience and value) will generate buzz (customer recommendations) that will create a continued growth in revenue (entrepreneurial value). After one year, both movies (one with buzz and other without buzz) may be able to generate the same amount of revenue, however, the customer will only remember and recommend the movie the created the buzz to others. In the short term, the customer appreciates the great products, generates buzz by recommending the products to others, and, in the long run, becomes loyal to the product and company.

The products without buzz only create entrepreneurial value, whereas the products with buzz create more sustainable entrepreneurial value through customer value [31]. Martin [69] labeled the ability to generate entrepreneurial value as "reliability" and the ability to generate customer value as "validity". He further labeled innovations only generating entrepreneurial value (reliability) as "good innovations", whereas innovations generating both customer and entrepreneurial value (reliability and validity) were labeled as "great innovations". In sum, design thinking enables organizations to introduce great innovations beyond good innovations and enables them to strike a balance between reliability and validity. Figure 2 below summarize the essence of design thinking adopted from [68].
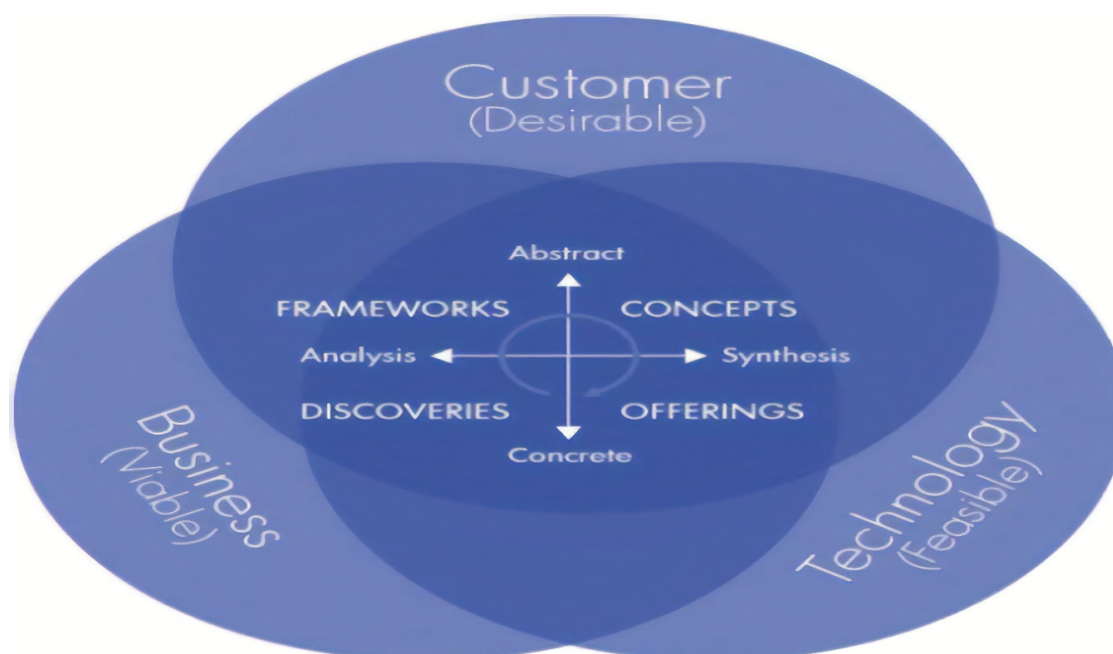
Figure 2. Design Thinking Framework. Source: [68,70].

5.2.3. Adopting Innovation Management as Strategy

The third and last core element of AIM is adopting innovation management as a strategy. Total Innovation Management (TIM) [14] has this major shortcoming as it emphasized the innovation ecosystem more, but has a detachment between the innovation ecosystem and corporate strategy. Holistic Innovation Management (HIM) [15] tried to address this issue and connect the ecosystem with the strategic direction and design of the firm. However, we believe that this approach is not suitable for an environment dominated by IoT, and Industry 5.0, as [15] tried to connect the innovation ecosystem with the well-established strategic direction and framework, however, the routine logic of the firm will resist this connection. Moreover, previous innovation frameworks were also missing the glue that can stick the innovation ecosystem and corporate strategy together. [66] is also of the view that design thinking can be used as a tool for strategic management and linking the firm's strategy directly with the customer or user. In essence, he is referring to a customer/user-driven firm's strategy. He is also of the view that design thinking works perfectly in different strategic environments and is well suited for

all kinds of firms. Based on these notions, we moved forward with the strategic intent of innovation management and proposed that instead of trying to connect the innovation ecosystem with a firm's established strategy through the glue of design thinking, firms must adopt innovation management as their corporate strategy. Adopting innovation management as a strategy, instead of aligning innovation management with existing strategy, will enable firms to become robust, responsive, and future-ready for the IoT and Industry 5.0 era. Moreover, we believe that having design thinking as a glue or bridge between an innovation ecosystem and a firm's strategy is helpful in adopting innovation management as a strategy, as design thinking tries to strike a balance between what is desirable for the customer, valuable for business, and technically feasible, as stated by [70]. The concept of adopting innovation management as a strategy is further explained in the following paragraphs.

Though the discussion in the above paragraphs, we are able to establish a link between design thinking and the implementation of innovation by concluding that one of the main factors of fruitful innovation is its implement-ability and commercialization in the market, and design thinking can play a decisive role in this. However, as [57] highlighted, innovation is highly related to 'corporate venturing' and 'corporate entrepreneurship', and these aspects always get resistance from 'routine logic'. In other words, the routine operations of an organization always pose problems for corporate venturing and corporate entrepreneurship. Implementing innovation through corporate venturing and corporate entrepreneurship without disturbing the routine operations of an organization is like doing a by-pass surgery on a beating heart or installing new equipment in the vehicle engine while it is running. The best way to implement human-centered innovation that can be commercialized without disturbing the routine operations of the organization is to consider innovation management as the strategy instead of considering it as a tool that supports the strategy. This is easier said than done. It requires lots of hard work and a shift in mindset to adopt innovation management as a strategy.

Wim Vanhaverbeke and Nico Peeters [57] used a case study of a Dutch Chemical company, DSM, who successfully adopted innovation management as a strategy. According to them, the first thing DSM did was to make a strategic vision that is driven by innovation by stating, "Innovation is believed to be the key to the long-term profitability of the firm". Through this, DSM sent a clear message across the organization that everything DSM did from that point on would be driven by innovation. Furthermore, strategy formulation was done through a fully interactive process embracing all hierarchal and functional levels of the organization, i.e., general management, business groups, the board of directors, corporate R&D. For that purpose, DSM has institutionalized two very important forumsg i.e., 'Corporate Strategy Dialogue' and 'Business Strategy Dialogue'. This arrangement enhances informal discussion and debate within the organization for new innovative ideas and the firm's strategic direction. This also ensures a bottom-up stream of innovative ideas within the DSM on both a corporate and business level. Additionally, DSM also set up a 'Business Technology Analysis' unit that monitors and studies both internal and external technological developments and can give new dimensions for company strategy. Finally, DSM signs a 'Strategic Contract" with the board of directors after 'Corporate Strategy Dialogue' and 'Business Strategy Dialogue, whereby commitments were made on long- and short-term financial performance and on both radical and incremental innovation initiatives. Through this 'Strategic Contract", DSM tries to strike a balance between short-term business performance and long-term sustainability.

Wim Vanhaverbeke and Nico Peeters [57] further stated that making a good strategic vision and incorporating innovation into this vision is not enough. The DSM case study showed us the way to build a system for maximum exploration of innovation and technology and at the same time ensure the maximum commercial exploitation of them. For the commercial exploitation of innovation, DSM has set up a 'Corporate Research Board' consisting of corporate R&D and business group R&D directors that discuss novel ideas. This corporate research board not only ensures the bottom-up flow of novel innovative ideas but also increases the willingness level of business groups for the adoption and exploitation of innovations. Moreover, DSM has also set up a 'Research Counsel' consisting of corporate and business group directors that make project proposals based on new innovative ideas.

These project proposals were then presented to the 'Corporate Research Board' that, based on the company's strategy, made the final 'go' or 'kill' decision. If the innovation gets a 'go' decision, then DSM allocates it to any business group with the firm commitment of the provision of required resources. If the innovative idea does not fit any existing business group then it is assigned to the 'DSM venturing and Business Development' unit that is responsible for both internal and external venturing.

DSM follows a philosophy of 'fit' and 'stretch', which means fitting the innovation to a strategy where possible, or fitting (or stretching) the strategy for a new innovative idea. DSM has a 'moving target' strategy where innovation either fits the strategy or the strategy is stretched for innovation. This philosophy also guides DSM's culture, system and structure, procedures and processes and management practices. Innovation always brings a certain amount of uncertainty and risk to the existing system due to discontinuities it possesses, as highlighted by [17]. DSM's 'fit and stretch' philosophy gives a tool through which DSM strikes a balance and an alignment between 'control and stability' and the 'uncertainty and risk' posed by discontinuous environmental change.

Ron Adner [71] discuss adopting innovation management as a strategy from the perspective of dynamic capability theory and resource-based theory. He considers strategy as a "moving target" which should be fluid and flexible and can be changed easily when required. He believes that strategy is a firm's dynamic capability that can create a resource that is rare, unique, valuable, and imperfectly imitable. He further stated that traditional corporate strategy fails to deliver in turbulent times and this traditional strategic approach is decaying very fast due to replication (when strategy lost its distinctiveness), supplantation (when strategy is in danger of being superseded), exhaustion (when strategy reaches the point of exhaustion) and evisceration (when increasing customer power is eviscerating margins). He concluded that if firms adopt innovation management as their corporate strategy and visualize strategy as a "moving target", then innovation could become a corporate capability, integrating into the entire organization. By adopting innovation management as a strategy, firms can make innovation systematic and thus focus on making the future instead of defending the past. [72] concluded that innovation strategy should be linked and matched with the innovation ecosystem. The detachment between the innovation ecosystem and strategy can cause the business to face the same fate as Nokia, Polaroid, and Yahoo.

We believed that there are numerous possibilities and alternative ways of adopting innovation management as a corporate strategy. We have discussed a case of DSM just for reference to explain the concept; however, every firm can decide on its own how to adopt innovation management as corporate strategy and how to strike a balance between innovation management as a strategy and existing established strategy. We want to emphasize that the true essence of this concept is a shift in mindset, regardless of the methodology adopted. This was also endorsed by [72], who stated that there is no one system that can fit all companies and can work under all circumstances, and adopting innovation management as a strategy help firms to formulate a system matching its specific competitive needs. He concluded that dividing R&D into decentralized autonomous teams, setting up corporate venture capital units, pursuing external alliances extensively, embracing crowdsourcing, open innovation and collaboration with customers and frequent prototyping, as suggested by [57], can provide a good starting point in adopting innovation management as a strategy. However, personalization, while adopting innovation management as a strategy and seeing it as a "moving target", can be more fruitful. Graphical illustration of Absolute Innovation Management (AIM) framework is presented in Figure 3 below.
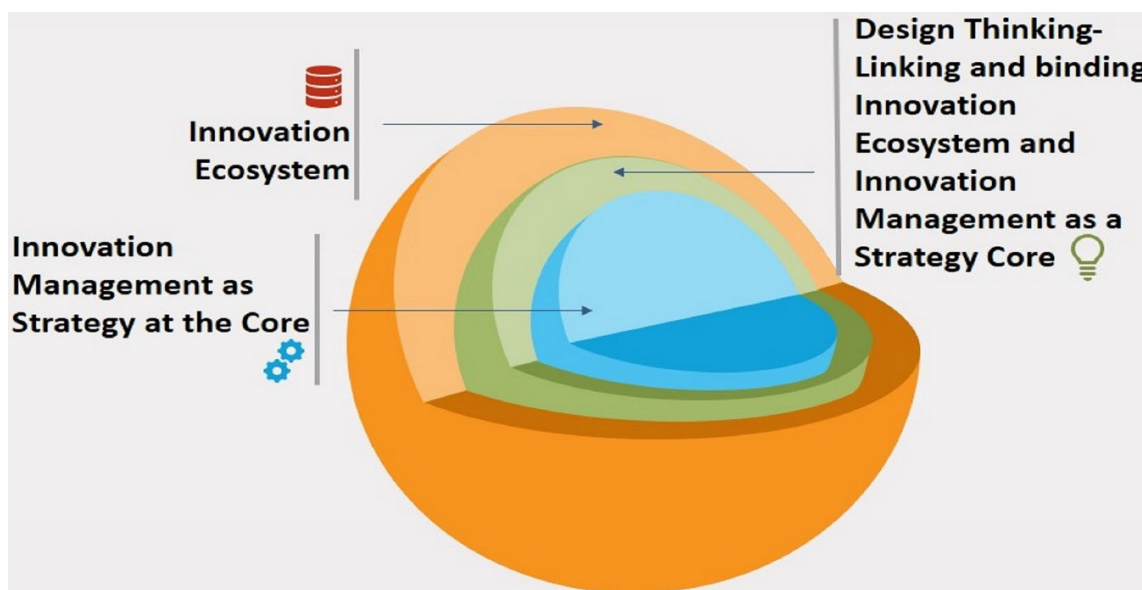
Figure 3. Absolute Innovation Management Framework. Source: Authors' Own Research

6. Discussion and Conclusions

The absolute innovation management framework explains innovation management in a very easy, practical, and implementable manner, overcoming the limitations of previous innovations frameworks. In absolute innovation management, the firm will adopt innovation management as a strategy, which will make innovation part of the everyday routine of the organization instead of considering it as a standalone activity that needs to be managed separately. In the absolute innovation management framework, innovation management becomes the part of organizational strategic vision and mission, which makes the organization innovative from the very root. When innovation becomes part of the corporate strategy of the organization, top management will be fully committed to innovation, which will ultimately make the whole organization committed to innovation through the trickle-down effect of this commitment. Furthermore, the responsibility of everyone regarding innovation in the organization will be automatically fixed, as when the organization's objectives and targets are set in the light of corporate strategy, everyone will have their role well defined, because individual objectives and targets will be derived from organizational objectives and targets. Furthermore, as we learn from the DSM case study, responsibilities can be fixed through setting up 'corporate strategy dialogue' and 'business strategy dialogue' forums, where everyone is involved and committed to innovation.

Another important element of absolute innovation management is the incorporation of design thinking into the model, which makes the whole model more realistic, practical, and people-centered. It will ensure that the innovations introduced are implementable and are not just mere ideas, according to the guidelines given in Oslo Manual [13], which states that the most important element of innovation is its implementation. Additionally, design thinking will encourage free and open thinking in a systematic manner, which will produce productive results and will save the organization time and effort.

Detailed analysis of the existing innovation management framework reveals that these innovation management frameworks are not future-ready and not suitable for the business environment abetted by IoT and Industry 5.0 phenomenon. Recently, exponential development in the field of IoT gives birth to Industry 4.0 (from 2000 to date, characterized by IoT, Big Data, electric vehicles, 3D printing, cloud computing, and artificial intelligence) [6]. Parallel to Industry 4.0, the concept of Industry 5.0 (from 2016 onward, characterized by digital smart society, the integration of virtual and physical spaces, IoT, robots, augmented reality, innovation ecosystem, brain–machine interface and human centrality of technology) is also flourishing [7–9]. According to [10], the main difference between Industry 4.0 and Industry 5.0 is increased human–machine interaction that is empowering people to express themselves

in the form of personalized products and services. Industry 5.0 is providing customers with more customized products and services than ever before and this can only be possible with the increased engagement of humans in designing products and services. It is believed that, due to increased human–machine interaction and more emphasis on human/user-centered products, Industry 4.0 is gradually giving space to Industry 5.0. This personalization and increased human–machine co-working in Industry 5.0 have rendered existing innovation frameworks ill-suited for Industry 5.0, as these innovation management frameworks do not take personalization into account, which is only possible by the increased interaction of man and machine that puts the human or users at the center. Therefore, we believe that absolute innovation management is the most suitable and future-ready innovation management framework for IoT and the Industry 5.0 era, being the only innovation management framework that takes personalization and human-machine co-working into account and incorporates a tool in the form of design thinking to make innovation more implementable.

Moreover, the absolute innovation framework tries to overcome the problem of discontinuity of routine operations faced by firms in implementing innovative ideas, as highlighted by [16] and discussed in detail in earlier sections. As innovation is considered a wicked and open-ended problem [58–61] and poses a threat to routine operations, it usually requires unique and out-of-the-box thinking for its true implementation. In addition, innovation always brings a certain amount of risk and uncertainties with it, which sometimes becomes difficult for organizations to handle within their routine operations. The concept of absolute innovation management integrates design thinking and learning from a case study of DSM [57], where DSM adopts innovation management as a strategy, to overcome the problem of discontinuity.

Moreover, the absolute innovation framework will help organizations become ambidextrous, which means that, through this framework, organizations will be in a position to explore and exploit opportunities simultaneously. Through the ability of ambidexterity, the organization will become more agile and responsive and the time period from idea generation to commercial launching of the product will reduce, which is considered the main tool for sustainable competitive advantage in a current business environment. Additionally, absolute innovation will also make products more user/human-centered, which will increase the chances of the product's commercial viability and success in the market.

7. Contribution and Practical Implications

This study has contributed to the literature in a number of ways. First, it has tried to clear the fog surrounding the implementation of innovation and tried to make it more clear, comprehensive, and practical by coining a new term labeled "Absolute Innovation Management". Second, the absolute innovation framework involves everyone within an organization in the innovation process, which not only makes this process rapid but also creates a sense of responsibility among employees from all levels. Third, it provides a framework through which design thinking, innovation ecosystem, and corporate strategy are synergized for maximum benefit. Fourth, instead of managing innovation as a standalone activity, absolute innovation makes innovation part of routine organizational activities, which makes the implement-ability of innovation smooth and seamless. Fifth, the concept of absolute innovation can reduce the side effects of discontinuities and partial understanding of innovation.

The present study is useful for managers and leaders at all levels, as it tries to propose a new innovation framework labeled as absolute innovation management encompassing everyone within the organization at all levels and from all functional areas at all times and spaces. Especially, higher-level leaders and managers who want to make their organizations innovation-driven and are concerned about human/user centeredness of innovation in the era of IoT and Industry 5.0 can get the maximum benefit out of it. Furthermore, the new framework of innovation presented in this study involves everyone within an organization; functional managers and non-managerial staff will feel themselves involve in the innovation process, which fosters a sense of ownership and responsibility. Additionally,

absolute innovation also eases the fixation of responsibility for innovation, as, through this approach, innovation is made part of the routine activity of an organization instead of a standalone activity.

8. Future Direction

This study has presented a new and novel absolute innovation management (AIM) framework, however, there is a need for further research on this to establish the authenticity of the framework, and there is a need to test the framework empirically. AIM calls for more attention from scholars and practitioners on how to integrate it with business processes without disturbing routine operations, which is the main essence of AIM. The integration of AIM with business processes may require additional experimentation to assess and validate its usefulness. Absolute innovation is a path, not a destination; it has opened a new horizon for further research in this direction.

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