Review

Comparing the Evolutionary Trajectories of Industry 4.0 and 5.0: A Management Fashion Perspective

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Abstract: The concept of Industry 4.0 has received enormous levels of attention since it was introduced in 2011 and continues to be a dominant management trend. However, during the last few years, Industry 5.0 has emerged as an alternative visionary management concept. Although Industry 5.0 builds on and is related to its predecessor, it provides a different vision of the future of industry. Therefore, the aim of this paper is to carry out an in-depth examination of these two related management concepts, using management fashion theory as an interpretive framework and lens. Viewing Industry 4.0 and 5.0 from this vantage point involves analyzing and tracing the involvement activities of the suppliers of the two concepts as well as gauging the concepts' demand-side impact. Generally, the comparative analysis of the cases of Industry 4.0 and 5.0 indicates that, while the growth and popularity of Industry 4.0 appear to have plateaued, it remains at a high level. Although Industry 5.0 is growing in popularity and is gaining followers and supporters, it is still a much more marginal concept and movement. This study contributes to the management fashion literature by showing how two highly related but competing management concept movements coevolve. Furthermore, the two cases provide novel insights into the trajectories and lifecycles of fashionable management concepts, in particular, the early phase where actors are actively attempting to generate credibility and legitimacy and drum up support and enthusiasm for their preferred ideas.

Keywords: Industry 5.0; Industry 4.0; visionary concept; management concepts; management fashion; emergence; evolution

1. Introduction

The concept of Industry 4.0 (I4.0) was presented at the Hannover Fair in 2011 as a new visionary concept on how to use new technologies to automate manufacturing processes. Since then, I4.0 has garnered enormous attention and become an influential management trend around the world [1–4]. During the mid-2010s, Industry 5.0 (I5.0) was presented as an alternative concept and vision of the future of industry that was first introduced on social media and in academic research [5–10]. During the last few years, Industry 5.0 has attracted rising interest as an alternative visionary management concept [11,12].

Both I4.0 and I5.0 can be considered visionary management concepts since they provide what Meyer [13] refers to as envisionings of the future. I4.0 emphasizes how the use of new disruptive technologies (e.g., artificial intelligence, robotics, or big data) can help automate and increase the efficiency and productivity of industry [14,15]. In contrast, the more recent concept of I5.0 takes a broader and alternative view, emphasizing that industry should become more human-centric, sustainable, and resilient [11,12,16].

Industry 5.0 (I5.0) has received significant attention in Europe in large part due to the promotional efforts of the European Commission [17–21]. In general, interest in I5.0 has grown significantly since the outbreak of the pandemic, and some commentators have suggested that the pandemic has accelerated the transition to I5.0, as issues related to sustainability and resilience have become more salient and pressing [22,23].

In this paper, we aim to provide an in-depth examination of the evolutionary trajectories of these two related management concepts. For this purpose, our study utilizes the management fashion theory as a theoretical and interpretive framework [24–26]. The theory of management fashions focuses on the supply and demand side forces that shape the macrolevel evolution and popularity of management concepts and ideas over time [27,28]. Thus, in our view, management fashion theory provides an appropriate framework and lens for interpreting and analyzing the evolutionary trajectories of I4.0 and I5.0, i.e., how these concepts emerged and have evolved over time.

The focus of this paper is to compare the evolution of I4.0 and I5.0 and identify and analyze the various actors that have contributed to these two concepts' development and evolution. This comparative case study illustrates how two highly related but competing management concept movements coevolve and provides novel insights into the trajectories and lifecycles of management concepts, in particular, the early phase where supply-side actors are actively attempting to create and drum up support and interest. In addition, our study casts new light on the coevolution of I4.0 and I5.0, both of which are relatively novel concepts, and so far, not much has been documented about their development and evolution [29]. As a result, this presents an opportunity to study the evolution of new management concepts, as they are still taking shape and unfolding.

The remainder of the paper is structured as follows: Section 2 provides a brief overview of the research approach. Section 3 contains a research background which includes definitions of the two concepts and a discussion of their main similarities and differences. Sections 4 and 5 provide analyses of the supply and demand sides of the market for I5.0, respectively. Section 6 discusses the findings of this study in relation to key debates in management fashion theory. The paper ends in Section 7 with a summary of contributions, implications, limitations, and directions for future research.

2. Research Approach

In this paper, we adopt a qualitative and exploratory research approach to compare the evolutionary trajectories of I4.0 and I5.0. In order to perform a comparative analysis of the supply and demand aspects of these two concepts, we adopted a broad perspective and monitored the impact of a diverse group of stakeholders, including consultants, thought leaders, conference organizers, and business schools. Similarly, we utilized Google Trends and various types of secondary data to gauge the demand-side impact of the two concepts.

In previous studies, researchers have highlighted the challenges related to assessing the impact of management concepts and ideas [30–32]. Therefore, our aim was to construct an overall picture and narrative of the evolutionary trajectories of the two concepts. In practice, this was performed by piecing together and synthesizing a wide range of scholarly and practitioner-oriented sources on I4.0 and I5.0.

We followed what can best be characterized as a snowballing-type procedure in the search for literature on the two concepts. We used a mix of backward (looking at reference lists key of key publications on the topic) and forward snowballing (looking at newer publications that have cited key publications) [33,34]. In addition, we searched Google and various social media platforms to identify and track the activities of influential actors in the emergence and evolution of the two concepts. Finally, we drew on previous studies that have touched on the popularization of the two concepts [1,4,13,29,35–38].

Our chosen research approach has limitations, such as a reliance on desk research and secondary data, but we made these choices pragmatically given the aims and constraints of the paper. We will discuss these limitations in the final section of the paper.

3. Research Background

This section provides a brief comparative perspective on I4.0 and I5.0, focusing on (1) how the concepts are defined, (2) the key differences between the two concepts, and (3) a brief historical perspective on the origins, emergence, and role of "zeitgeist" in shaping the evolution and popularity of the concepts.

3.1. Definitions

3.1.1. Industry 4.0

The I4.0 concept is concerned with the fourth industrial revolution (4IR) in manufacturing. The term 4IR is attributed to Klaus Schwab, founder of the World Economic Forum [39], and 4IR follows the three previous industrial revolutions that introduced mechanization and steam power (first industrial revolution), electricity, assembly line, new materials (second industrial revolution), computers, telecommunications, and the internet (third industrial revolution).

Philbeck and Davis [40] point out that the fourth industrial revolution and Industry 4.0 are to a large extent synonyms. The concept of I4.0 can be defined, interpreted, and understood in a multitude of ways [41]. One relatively early definition provided by the consulting firm McKinsey notes that I4.0 is a combination of several diverse managerial and technological concepts and ideas: "confluence of trends and technologies promises to reshape the way things are made" [42] (p. 1). Marr [15] points out that technological trends such as big data analytics, robotics, the Internet of Things (IoT), and artificial intelligence are used to transform production processes. In I4.0-based organizations, several technologies are integrated [43].

In the following, we provide a brief description of some of the I4.0-related technologies used by organizations. Robotics are advanced machines that can perform tasks autonomously, often in manufacturing and logistics [44,45]. Organizations also utilize technologies such as augmented reality (AR) and virtual reality (VR), which enable immersive experiences and can be used in training, design, and maintenance [46]. Another often used I4.0-related tool is big data analytics, which refers to the process of analyzing large datasets to extract insights and inform decision-making [47–49]. Finally, additive manufacturing refers to the use of 3D printing to create objects layer-by-layer, which enables the production of complex and customized parts [50].

According to Hofmann and Rüsch [14], I4.0 is sometimes referred to using other related terms, such as "smart manufacturing, "industrial internet" or "integrated industry". Overall, the concept of I4.0 reflects a very strong technological optimism in society [51]. There is a focus on the disruptive effects of using technological innovations to automate processes and ultimately improve organizational efficiency and performance [52].

3.1.2. Industry 5.0

Several authors have noted that I5.0 has roots in the I4.0 paradigm. For example, Özdemir and Hekim [53] (pp. 71–72) see it "as an evolutionary, incremental (but critically necessary) advancement that builds on the concept and practices of Industry 4.0". Similarly, the European Commission [20] (pp. 3–4) argues that I5.0 "complements the existing 'Industry 4.0' paradigm by having research and innovation drive the transition to a sustainable, human-centric and resilient European industry. It moves the focus from solely shareholder value to stakeholder value, for all concerned". In other words, while the concept of I5.0 builds on and is related to its predecessor, it provides a different vision of the future of industry. In particular, I5.0 focuses on the concepts of sustainability, resilience, and digitalization. Advocates of I5.0 emphasize the importance of sustainable development, adapting to changing conditions, and using technology to transform business processes. These concepts are essential for businesses to thrive in a complex and rapidly changing world, which is characterized by volatility, uncertainty, complexity, and ambiguity [54,55].

Although the concept of I4.0 is already 10+ years old and has generated a massive body of literature, I5.0 can still be considered embryonic, and there is relatively little available literature [29,56]. Even though the interest in I5.0 has expanded rapidly since the outbreak of the pandemic [22,23], it "may still appear a premature and visionary idea" [57]. Indeed, there is a low level of consensus and agreement when it comes to how the concept should be defined. Instead, many authors have different opinions and ideas about how the concept should be understood and developed. For example, Michael Rada who coined the term on

social media [5,10] mainly stresses the role of sustainability, while commentators advocate taking a human-centric approach [58] focusing mostly on human–robot collaboration [59].

3.2. Key Differences between the Two Concepts

Based on the previous discussion, in this section, we examine four key differences between the two concepts. As we will discuss, the concepts differ in terms of their relative emphasis on (1) humans vs. technology, (2) the role of customers, (3) automation vs. sustainability, and (4) shareholders vs. stakeholders. Lastly, the concepts of I4.0 and I5.0 differ in terms of their relative emphasis on shareholder versus stakeholder interests. In the case of I4.0, the emphasis is on how new technologies, such as robots, can improve the productivity and efficiency of organizations. In the marketing and promotion of the concept, consulting firms and other supporting actors often emphasize the economic benefits of adopting these trends and technologies. As mentioned previously, the vision for I4.0 was that automation would lead to significant increases in production efficiency and other advantages. In contrast, I5.0 adopts a comprehensive approach that considers the concerns of a diverse group of stakeholders, including workers, clients, and the local community.

Table 1 summarizes these differences.

Table 1. Comparison of the main differences between I4.0 and I5.0.

Relative Emphasis	Industry 4.0	Industry 5.0
Human vs. technology	Technology	Humans (man–machine cooperation)
Customers	Mass customization	Mass personalization
Productivity vs. sustainability	Automation	Sustainability, resilience, and human–robot interaction
Shareholders vs. stakeholders	Shareholders	Stakeholders

3.2.1. Humans vs. Technology

The I4.0 concept is a heavily technology-infused concept and, according to Kopp et al. [60], it can be considered a "technology-centered vision" of industry. I4.0 can be considered a new vision of industry in the future where the organization will reap gains from automation and improved efficiency. To a large extent, this would be realized by using machines or robots to replace humans. While issues related to human–machine interaction have been discussed in relation to I4.0 as well [61,62], the main focus of I4.0 is on connectivity between devices. In contrast, I5.0 places greater emphasis on man–machine cooperation and coworking [59]. Similarly, Özdemir and Hekim [53] argue that the focus is on how humans and machines can work collaboratively. In general, this trend has continued, and the concept of I5.0 is positioned as considerably more human-centric than I4.0 [20,21,58,63].

3.2.2. Customers

There is also a shift from mass customization (I4.0) to mass personalization (I5.0). Mass personalization refers to how the needs of individual consumers can be met [64]. Although some argue that I4.0 also enables mass personalization [65,66], the focus is arguably even stronger in I5.0. Østergaard [9] calls I5.0 the "human touch" revolution and argues that customers increasingly demand mass personalization, which is only possible if the "human touch" is brought back into manufacturing through I5.0 [53]. In achieving this, the use of collaborative robots (cobots) plays an important role. Therefore, the view of the role of robots differs slightly between the two concepts. Proponents of I5.0 point out that robots should be used for repetitive, mundane, and labor-intensive tasks and not with the sole aim of replacing employees and making them obsolete [67].

3.2.3. Productivity vs. Sustainability

In general, proponents of I4.0 argue that new technologies will enable automation, which will positively affect productivity, profitability, and growth [42,68]. In contrast, advocates of I5.0 present distinct arguments that prioritize sustainability, resilience, and human–robot interaction. With regards to I5.0, it is frequently emphasized that the initial investment may be expensive in the short term, but it is necessary to achieve the long-term goals of sustainability and resilience [69]. As Yordanova [69] points out, the costs involved "does not make Industry 5.0 particularly attractive for certain types of business entities for example SMEs".

3.2.4. Shareholders vs. Stakeholders

Lastly, the concepts of I4.0 and I5.0 differ in terms of their relative emphasis on shareholder versus stakeholder interests. In the case of I4.0, the emphasis is on how new technologies, such as robots, can improve the productivity and efficiency of organizations. In the marketing and promotion of the concept, consulting firms and other supporting actors often emphasize the economic benefits of adopting these trends and technologies. As mentioned previously, the vision for I4.0 was that automation would lead to significant increases in production efficiency and other advantages. In contrast, I5.0 adopts a comprehensive approach that considers the concerns of a diverse group of stakeholders, including workers, clients, and the local community.

3.3. Historical Emergence and Evolution

3.3.1. Origins and Emergence

The first aspect that we will discuss is the origins and emergence of the two concepts. As has been documented in prior studies, there are certain differences between the concepts when it comes to origins and emergence. While a multitude of commentators have traced the origins of Industry 4.0 back to the Hannover Fair in 2011 [1,36], the origins of Industry 5.0 are far less well documented, and there are different opinions on how it started [29,70]. Several commentators, e.g., [29,56], have noted that the notion of I5.0 was first introduced by the independent thinker and futurist Michael Rada on social media platforms during the mid-2010s [5,10] and followed up by scattered discussions of the concept in academic articles and social media posts in the years that followed [6–9,53]. Others tend to skip past this early history and argue that the concept of I5.0 was coined by the European Commission, e.g., [71].

3.3.2. The Role of the Zeitgeist

The second aspect that will be discussed is the role of the zeitgeist in the emergence and evolution of the two concepts. In the management fashion literature, a variety of authors have suggested that timing plays a role in determining the success of new management concepts and ideas [26,72].

Greenwood et al. [73] talk about the importance of "precipitating jolts" as the first stage of institutional change, highlighting that these shocks can be of a social, technological, or regulatory nature. New management concepts and ideas that are in tune with the times and address pressing and salient issues in the business environment (e.g., in the aftermath of a jolt) are much more likely to attract the attention of managers. According to Kieser [26], management concepts that are seen as relevant and timely by current managers are more likely to gain popularity and widespread acceptance. In contrast, concepts that are viewed as outdated and irrelevant are less likely to be widely adopted. To be successful, a management concept must effectively address the needs and concerns of contemporary managers.

It can be useful to start by taking a brief look at how the zeitgeist shaped the emergence and evolution of I4.0. As several commentators have shown, the I4.0 concept was launched at the Hannover Fair in 2011, which took place just a few years after the "Great Recession" of 2008/2009 [36]. Pfeiffer [74] points out that the narrative behind the concept can be traced

back to the financial crisis, and the application of I4.0 was seen as a way for industrial firms to recover from the crisis by improving productivity and competitiveness [75]. I4.0 provided a new vision of a future where organizations would realize the benefits of automation, leading to increases in productivity and cost reductions.

Similarly, the zeitgeist has also played a role in shaping the growth and popularization of I5.0 in recent years. Although I5.0 was launched during the mid-2010s, it appears to have gained momentum during the COVID-19 pandemic [22,23,29,76]. Compared with its predecessor, I5.0 draws on a different type of narrative, one that shifts the focus away from a narrow focus on using technology to automate and increase productivity and towards humans, sustainability, and resilience. Hence, it could be argued that the narrative behind I5.0 fits well with the current (post-)pandemic zeitgeist in the business world and society at large, which emphasizes ideas such as agility, resilience, and sustainability. In recent years (the late 2010s/early 2020s), there has been a noticeable shift from shareholder to broader stakeholder thinking, as well as heightened sensitivity around issues such as business ethics and diversity [77,78]. Rosemann et al. [79] note that "[t]he paradigm shift from 4.0 to 5.0 describes a symbolic shift of attention". Therefore, the historical emergence of these two concepts is indicative and illustrative of a shifting zeitgeist in the business world.

4. The Supply Sides of Industry 4.0 and 5.0

In this section, we will examine the two concepts from the perspective of the supply side, which refers to the various actors who contribute to the spread and adoption of these concepts. These actors, known in the field of management fashion as the "fashion-setting community" [25] or the "management fashion arena" [80] can include consulting firms, business media organizations, management gurus, business schools, software companies, professional associations, and conference/seminar organizers, among others [73,80–82]. This analysis will focus on what roles these actors have played in the diffusion and popularization of these concepts.

These constellations of fashion-setting actors have been documented in the case of I4.0 [1,36,60,83]. Kopp, Howaldt, and Schultze [60] cite Hirsch-Kreinsen [83] (p. 432) who noted that the concept of I4.0 is promoted "by computer scientists, engineers, innovation policy-actors, influential business associations and larger technology-intensive enterprises". Over time, it has been noticed that the realm of fashion surrounding I4.0 has grown to include a larger number of participants: "actor constellations participating in the discourse have continually broadened" [36] (p. 6). Researchers have also observed that the discourse surrounding (I5.0) is shaped by a diverse group of actors, such as futurists, industry experts, and academics. These individuals and groups contribute to the conversation and help to shape the direction and understanding of I5.0 [11,29].

4.1. Consulting Firms

Management consulting firms play a crucial role in the provision and dissemination of management fashions [80]. In previous research, many of the influential consulting firms have been shown to be active in the market for I4.0 [1]. However, this pattern has yet to materialize in the case of I5.0. Overall, consulting firms have so far not been very active and visible in the I5.0 market, and most consulting firms still appear to focus on I4.0. A possible reason for this could be that the I4.0 concept is better suited to consultants who make a living selling technological solutions related to automation and efficiency [84,85]. While disruptive technologies play a role in I5.0 as well [86], the concept has a stronger emphasis on human-oriented aspects (e.g., sustainability, resilience, agility) that may be a bit harder for consultants to commodify and package as consulting products and services.

However, over time, it is possible that consulting firms will enter this new 5.0 market space. After all, I5.0 is still a new topic that is not well-known in the business world. A typical dynamic in management fashion markets is that consulting firms tend to wait and see which new management concepts catch fire and then move quickly to "hitch-hike on the hype" around those concepts that become popular [87]. Another factor that

could explain the lower level of consultancy involvement in the I5.0 market is that many consulting firms are still heavily invested in the still-dominant I4.0 concept [1] and may have made substantial investments or developed their own variations of the I4.0 concept. An illustrative example is Accenture's version called Industry X.0. The way Accenture has labeled its Industry 4.0-related concept indicates that they (rightly) foresaw that a version 5.0 would quickly be introduced. Another example of an adaptation of I5.0-thinking is PwC Middle East [88] which is linking the concept to the digitalization of government.

4.2. Management Gurus

Studies on management fashions have demonstrated that management gurus have significant roles in the promotion and legitimization of novel management concepts and ideas [89,90]. Traditionally, management gurus (e.g., Tom Peters) have presented new concepts and ideas at large in-person conferences and meetings with paying audiences [91]. However, in the age of digital and social media, the power and influence of traditional management gurus are diminishing as the market has become democratized, and just about anybody can write about new management concepts and ideas on the internet and social media platforms [92,93].

The case of I5.0 is illustrative of the democratization of the management knowledge market. Actors that should be categorized as guru-like, such as futurists and visionaries, have played a pivotal role in the introduction and emergence of I5.0. Much of the early discourse and debate took place on social media platforms during the mid-2010s and appears to have been mostly dispersed initiatives by mostly independent futurists and thinkers who did not command large speaking fees on the traditional lecture circuit but rather published their thoughts via social media posts, YouTube videos, and social media forums. The prime example is Michael Rada who first wrote about Industry 5.0 during the mid-2010s [5,10]. In the era before social media, it would have been more difficult for such actors to break through, and the public management discourse tended to be dominated by established and mainstream management gurus.

4.3. Business Schools

Business schools are another influential actor in the management fashion arena [80]. Educational institutions can play a significant role in the acceptance and incorporation of management concepts and ideas into mainstream thinking. They can do this by including these concepts in their educational programs and materials, as well as promoting research on these topics. This can help to legitimize and institutionalize these concepts, making them more widely accepted and influential in the field of management [94,95].

In terms of research, business school academics have been very active in publishing research on I4.0 [96–98]. The first Scopus-indexed article about I5.0 was published as recently as 2016 [6]. However, during the last few years, researchers have started to focus more on the topic of I5.0 [29]. Although the body of research on I5.0 is still small compared to I4.0, the volume of publications on I5.0 is growing exponentially, from 37 publications in 2020 to 286 publications during the first 11 months of 2022 (Figure 1).

Overall, business school academics have been relatively active in the arena around I4.0. In the case of I5.0, it can be argued that researchers, at least in the early phase, have been more active than commercial actors, such as consulting firms. There are several possible reasons why business schools have been early movers. One explanation is that I5.0 is a topic that fits well with the current focus in business schools and accreditation bodies (e.g., AACSB, EQUIS) on integrating issues such as sustainability and SDGs into business school education [99–102].
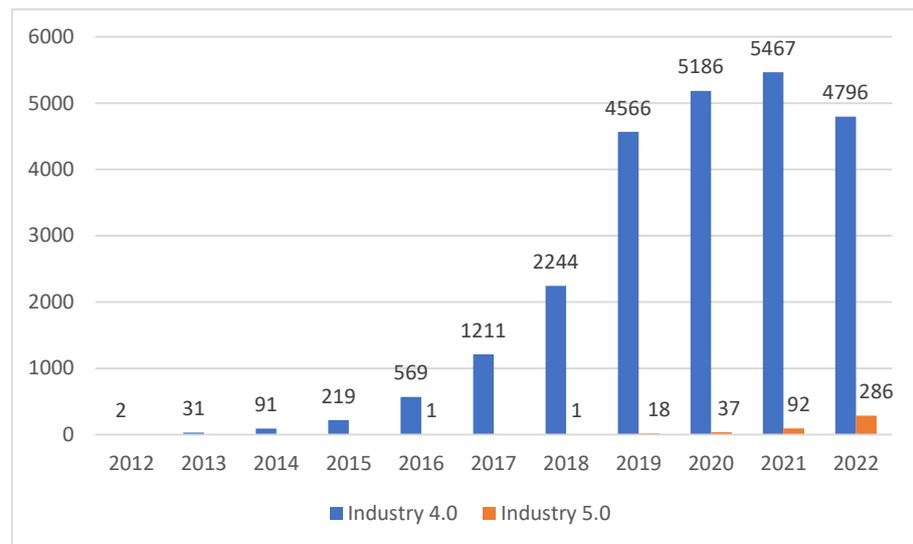
Figure 1. Volume of publications on Industry 4.0 and 5.0 (Source: Scopus).

4.4. Business Media

Business media organizations are heavily involved in the dissemination and diffusion of new management concepts and ideas [103]. This is also the case for I4.0 [1] and according to Hirsch-Kreinsen [36] (p. 6), there has been an "unrelenting increase in press articles in big dailies and newsmagazines down to local papers". As an illustration, Forbes, the business magazine, has released numerous articles on the subject matter, e.g., [15,104]. A simple search on Amazon.com indicates a significant number of management books geared towards practitioners that cover the subject of I4.0, e.g., [105].

I5.0 is currently a cutting-edge topic that is currently attracting much attention in business blogs [106] and magazines, such as Forbes [23,107]. There are also many contemporary examples of books that focus on I5.0 [108–111].

4.5. Governments

Governmental actors are generally not considered to be key actors in the management fashion arena [80] even though they have been shown to influence the spread of ideas in fields such as education [112]. In the cases of I4.0 and I5.0, several researchers have noted the importance of governments in the introduction and legitimization of these concepts as well as the related concept of Society 5.0 [1,29,113]. The emergence and growth of Industry 4.0 (I4.0) have been significantly influenced by the proactive involvement of governments worldwide in promoting and advancing the concept. National-level actors have played a vital role in the early launch and development of I4.0, as illustrated by Germany's longstanding Industry 4.0 strategy [114]. Many governments have allocated considerable resources toward supporting the research and development of I4.0 in their respective countries. This is evidenced by the implementation of policies that aim to support and legitimize the concept of I4.0. Several national strategic initiatives related to I4.0 have been undertaken by governments, such as China's "Made-in-China 2025" program [60,115] as well as similar efforts in countries such as Sweden, Belgium, Spain, Austria, and Japan [116]. These initiatives have helped to promote the adoption and development of I4.0 in different countries.

Although governmental actors were not involved in the initial introduction and emergence of I5.0 on social media and in research during the mid-2020s, the European Commission has in the last few years played a key role. The Commission has published several reports on the concept [19–21] and even announced and presented an award for the best-funded project related to I5.0 [17,18]. The European Commission is a power agenda-setter in Europe, and it has been pushing the I5.0 agenda hard. This has helped legitimize the new concept and created awareness in Europe and elsewhere. The European

Commission has even announced and presented an award for the best-funded project related to I5.0 [17,18]. Overall, the evidence suggests that, in recent years, the European Commission has also taken an active and leading role in shaping the discourse around Industry 5.0 by describing and defining the concept [19–21].

4.6. Conferences and Seminar Organizers

Conference and seminar organizers play a significant role in setting the agenda and shaping the discourse in the management fashion arena [80]. The conference and seminar scene can be considered as an arena within an arena and serves as a meeting point where both suppliers and consumers of new management concepts interact, network, and are exposed to novel management concepts and ideas [117].

Conferences and seminars have played an important role, particularly in the diffusion of the I4.0 concept. After all, the concept was launched at the Hannover Fair in 2011. Later in the lifecycle, the concept had taken the center stage at high-profile conferences. An illustration of this is the concept of the fact that I4.0 was the leading topic of the World Economic Forum 2016 in Davos [118]. It has also been noted that there has been a rapid growth in the number of conferences and congresses about I4.0: "conferences, congresses and expositions on the topic are now so many as to hardly permit any concise overview" [36] (p. 3).

In the case of I5.0, Nahavandi [58] noted that "many conferences and symposia are being held with a focus on Industry 5.0". This trend seems to have continued, and web searches reveal that there is considerable activity related to I5.0. Another factor that favors I5.0 as a topic of conferences and seminars is that conference and seminar organizers prefer new ideas and quickly abandon yesterday's stale ideas.

4.7. Internet and Social Media

Although not considered a traditional actor in the management fashion arena [80], social media platforms have become very influential in the diffusion of management concepts and ideas [93,103]. In a commentary, Fox [119] (p. 9) noted that social media have "brought debate about new technologies more into the public domain". In the case of I4.0, it has been observed that much of the discourse is taking place online [1,119].

The case of I5.0 provides an even clearer illustration of the role that the internet and social media play in the introduction and emergence of new management concepts and ideas. During the mid-2010s, the I5.0 concept was discussed on social media platforms such as LinkedIn, Medium.com, and various blogs where futurists and visionaries presented and debated their views on the I5.0 concept [5,7,9,10,120]. In doing this, these thinkers shaped the early trajectory of the concept by carrying out theorization of the concept.

One reason why the internet and social media may have played a particularly significant role in the promotion and adoption of I5.0 is the timing of its emergence. I5.0 was introduced in the mid-2010s at a time when social media and smartphones were widely used by individuals and organizations. In contrast, I4.0 was also introduced during the digital era, but the role of the internet and social media was not as prominent in its early stages. Instead, traditional in-person events, such as the Hannover Fair, were some of the key events that helped to spread information about I4.0 [1].

5. The Demand Sides of Industry 4.0 and 5.0

In this section, we provide an overview of I5 from a demand-side perspective. We focus on (1) interest in the concepts measured by Google search activity and (2) studies focusing on the adoption and diffusion of the two concepts in different parts of the world.

5.1. Interest

In past research, it has been demonstrated that the analytical tool Google Trends can be employed to gauge the level of interest in management concepts and ideas [121]. Google Trends contains data going back to 2004, and therefore it is well-suited for examinations

of I4.0 and I5.0 since the entire lifecycle of these two concepts is covered by the dataset. In a previous study of I4.0, Madsen (2019) found that even though the I4.0 concept was introduced in 2011, there was minimal search interest until 2013–2014. From 2015–2017, there was a significant increase in search interest that persisted until 2019. Figure 2 displays the interest in I5.0 in the period 2015 to 2022. It shows that interest in the I5.0 concept has steadily increased in the period of 2015–2019, and since 2020, there has been a surge in interest.
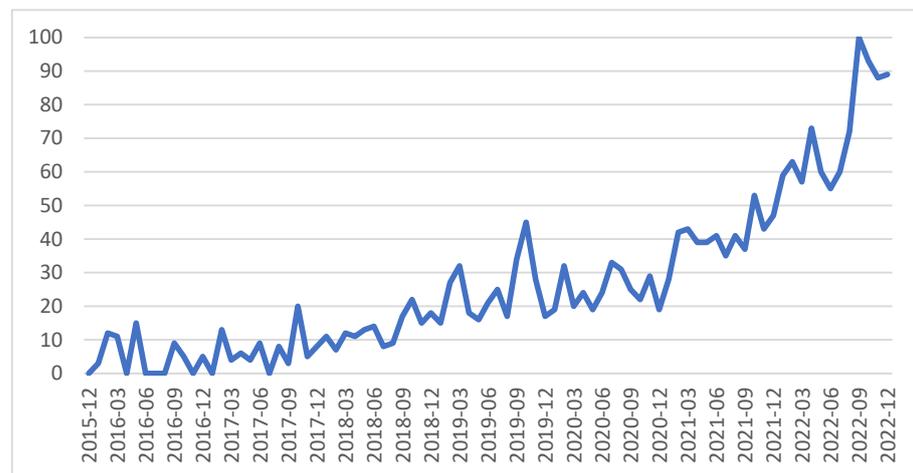
Figure 2. Google Trends for the term "Industry 5.0" in the period of 2015–2022 (Source: Google Trends).

However, Figure 3 shows that although interest in I5.0 is surging, the search activity is still relatively low compared to I4.0. The interest in I4.0 peaked in 2019, and since then, there has been a modest decline. While I4.0 is clearly still the most searched-after concept, it is interesting to note that 2020 appears to be an inflection point, after which searches for I4.0 have started to fall, while searches for I5.0 are increasing.
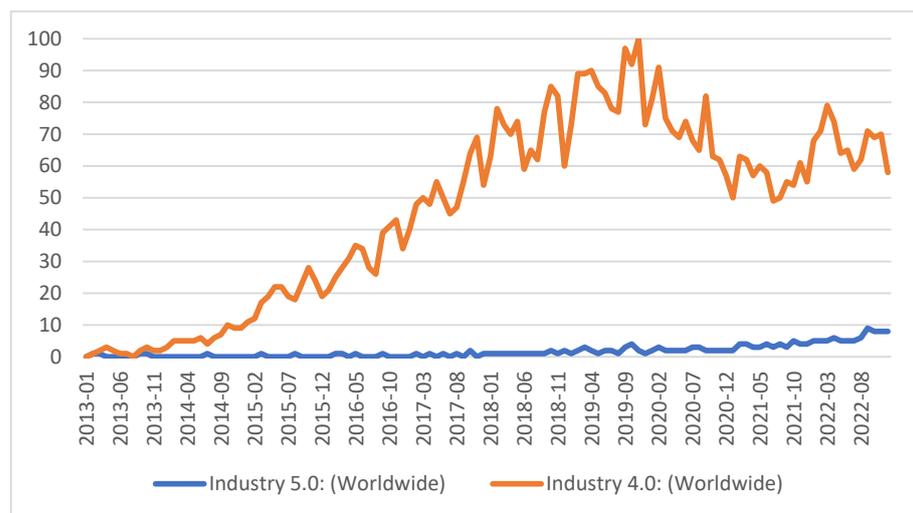
Figure 3. Google Trends for the terms "Industry 5.0" and "Industry 4.0" (Source: Google Trends).

Although it is challenging to predict the future trajectories of the two concepts' Google Trends curves, it is probable that the search activity regarding I4.0 may diminish over time as the concept has become relatively well-established among organizations on the demand side, resulting in less need for managers to search for a familiar term. In contrast, I5.0

is less well-known, so it is conceivable that the interest in the concept may persist in the coming years.

5.2. Adoption and Diffusion

In general, there is limited evidence on the impact of the I4.0 and I5.0 concepts on the demand side.

As noted earlier, there is a massive body of literature on I4.0. However, it has been noted that there is relatively little evidence of I4.0 adoption rates in different parts of the world [1]. However, there are some studies that have examined the adoption of the concept in different countries, such as Denmark [122] and Norway [35].

There is much research that can shed light on the processes shaping the adoption and diffusion of I4.0. For example, in past studies, researchers have examined issues of whether organizations in different countries are "ready" for I4.0 [123–126] and the various drivers and barriers related to adoption and implementation. Factors that may hinder the diffusion of I4.0 in practice include managerial and organizational challenges [127], inertia forces [128], and attitudinal and decision-making issues [116].

In the case of I5.0, the lack of available evidence is particularly pressing, but it can be explained by the fact that the concept is new and that there is relatively little research on its adoption and diffusion [29]. However, some studies have recently emerged, looking at the diffusion of the concept in the financial industry [129].

In both the cases of I4.0 and I5.0, the analysis of the supply side has shown that there is a spectrum of actors that have been involved in the diffusion and popularization of these concepts. In addition, there are other factors that can explain differences in the appeal and acceptance of the concept. Some of this may be related to geographical and societal differences. For example, there are regional differences in the emphasis and preference for shareholders versus stakeholders [130,131]. For example, it is possible that I5.0, with a more explicit focus on stakeholders and sustainability, may resonate better with managers who operate in stakeholder-oriented business environments.

6. Discussion

In this section, we will discuss the findings in relation to key themes in the management fashion literature. The discussion is centered around three main themes: (1) the emergence patterns, (2) conceptual trajectories, and (3) popularity trajectories.

6.1. Emergence Patterns

The emergence pattern differs between I4.0 and I5.0. The concept of I4.0 was, to a larger extent, a top-down, externally imposed vision presented at the Hannover Fair in 2011 and later endorsed by the World Economic Forum. On the contrary, I5.0 was launched by lesser-known actors [5,10] who have offered their visions and perspective. The emergence and growth also appear to have happened organically, at least in the early phase. However, it is notable that the concept has been co-opted by the European Commission [20,21].

Overall, the emergence pattern differs from what has been seen in the case of I4.0, which was launched in a more controlled and orchestrated way at the 2011 Hannover Fair and promoted in Davos some years later.

As others have noted [1], it is interesting to observe that the shift to I5.0 is happening so soon after the emergence and rise of I4.0. After all, it has only been a little over a decade since the emergence of I4.0 in Germany in 2011. Therefore, the natural question is: What can explain the need to transition to yet another industrial revolution? Some of it can be linked to perceived limitations of I4.0.

6.2. Conceptual Trajectories

Another issue that is relevant to the discussion of the evolutionary trajectories of I4.0 and I5.0 is the way in which the two concepts have evolved conceptually over time. Three

aspects of the conceptual trajectories will be discussed: (1) definitions, (2) variations, and (3) versioning.

6.2.1. Definitions

One key aspect of the conceptual trajectories is how the concepts are defined. In the case of I4.0, much literature has shown that there is a plethora of definitions in the literature [1].

In the case of I5.0, a similar relative development can be observed. Since the concept was introduced in the mid-2010s, different authors have proposed definitions of the concept, and naturally different authors have emphasized different aspects of the concept. Demir and Cicibas [8] note that there are different visions of what I5.0 should be since the I5.0 concept is in an embryonic phase [29] and "may still appear a premature and visionary idea" [57]. Therefore, there is no clear consensus on the definition of the concept. It has been a contested idea with different actors involved. Alter [132] notes that "a fundamental issue regarding Industry 5.0 is the difficulty of separating research, punditry, consulting hype, and science fiction". However, the recent strong involvement and cooptation of the concept by the EC could change this trajectory since the concept is pushed in a distinct direction.

6.2.2. Variations

The second aspect of the conceptual trajectory concerns the introduction of variations. In the case of I4.0, researchers have documented that there is a multitude of variations of the generic I4.0 concept and a multitude of subvariants tailored to different industries and contexts, such as Tourism 4.0, Banking 4.0, and UpSkill@Mgmt 4.0 [1,2,133].

Although I5.0 is a newer concept, the I5.0 concept has already inspired several similar variations and neologisms. As can be seen from Table 2, the thinking behind I5.0 has already been applied and "translated" to a wide variety of different contexts, including education [134,135], banking [136], events [137], tourism [138–140], hospitality, news [141], employment [142], urban planning [79], and government [143]. For example, Pillai, Haldorai, Seo, and Kim [67] introduced the term "Hospitality 5.0", which is based on the I5.0 concept. These authors looked at how I5.0 technologies can be used to improve customer journeys in hotels (e.g., hygiene, cleanliness, safety).

Table 2. Variations of the generic I5.0 concept.

Context	Industry 5.0	References
Banking	Banking 5.0	[136]
Hospitality	Hospitality 5.0	[67]
Tourism	Tourism 5.0	[138–140]
Meetings, Incentives, Conferences, Exhibitions	MICE 5.0	[137]
News	News Industry 5.0	[141]
Education	Education 5.0	[134,135]
Urban planning	City 5.0	[79]
Retail	Retail 5.0	[144]
Government	Government 5.0	[143]
Employment	Employment 5.0	[142]

6.2.3. Versioning

A third aspect of the conceptual trajectories of I4.0 and I5.0 is related to versioning. In research on I4.0, it has been suggested that the label I4.0 is a "reminiscence of software versioning" [145].

As the I4.0 concept continues to age, there may be efforts to reintroduce it to sustain its relevance and portray it as novel. The use of the number 4.0, denoting the fourth version, suggests that the concept is a fresh and substantial advancement over previous iterations,

such as 3.0. However, with the advent of new versions, such as 5.0 (and even 6.0), it is uncertain if this perception will endure.

The perception of newness is still there when it comes to I5.0, as the number 5.0 (i.e., the fifth version) implies that the concept represents something new and a significant improvement over I4.0. As Madsen [1] has suggested, the use of a version number on the label may not be optimal from a management fashion setter's perspective since it implies that the last word has not been said about the topic. In a way, it invites other actors to propose new versions of the concept (e.g., 6.0, 7.0), which has already happened with Industry 6.0 [146–152].

The question arises as to why a version-based label (i.e., X.0) was utilized, and this can be partially explained by the fact that the I4.0 concept did not originate from a typical fashion-setting actor, such as a consulting firm, and was not likely to have been intentionally created to introduce a new trendy concept, such as for the purpose of selling books and seminar tickets. We have seen some actors have used strategies to label their variations of the concept differently. Examples include Industry 4.0+ [153] and the Industry X.0 label used by Schaeffer [154] and the consulting firm Accenture [155]. Alter [132] (p. 3) speculated that Accenture "uses the term Industry X.0, perhaps to avoid seeming outdated when Industry 6.0 comes along".

6.3. Popularity Trajectories

6.3.1. Current Status

Based on the evidence reviewed, it appears that Industry 4.0 (I4.0) has gained widespread popularity and remains a significant trend in management. The concept has experienced a very rapid rise in popularity [1,36] and continues to be influential in business research and practice. According to the definition provided by Jung and Kieser [80] (p. 329), management fashions are those "management concepts that relatively speedily gain large shares in the public management discourse". I4.0 undoubtedly meets this description, as the concept has rapidly gained substantial attention in public discussions on management across various channels, including print and social media, as well as conferences.

Although there are strong indications that I5.0 is emerging as an alternative vision of industry, it is hard to predict to what extent the concept will catch up with the highly popular I4.0 concept. The I5.0 concept is still early in the lifecycle and the trajectory is, at present, pointing upwards with a strong increase in the volume of publications. That said, the level of interest and activity related to I4.0 is at present much higher. Therefore, several interesting questions can be raised regarding I4.0 and I5.0. For example, will I4.0 be able to sustain its current popularity, or will it decline? Will I5.0 be able to steal market share from I4.0, or can two concepts coexist? It could be argued that proponents of I5.0 have exploited the shift in the zeitgeist during the pandemic to argue in favor of I5.0.

6.3.2. Future Trajectories

As discussed earlier in the paper, I4.0 has experienced strong growth over the last decade-plus. While there are signs that the concept is entering a period of consolidation and stabilization in terms of popularity, it is difficult to speculate about the future trajectory. Taking a cue from the history of previous management fads and fashions [156,157], it is likely the concept's popularity will start to decline at some point. However, recent research has indicated that some popular management concepts succeed in becoming institutionalized and may persist for quite some time [28,158].

Turning to I5.0, it is still an emerging concept with an unclear future trajectory. The future trajectory is likely to be shaped by the structure and dynamics of management fashion markets. As the concept is picking up steam, we may observe many new actors flocking to this space and "hitch-hiking on the hype" [87]. Experts and thought leaders position themselves by authoring books and articles and by presenting and discussing the concept in conferences and seminars.

It is uncertain if the appeal of prioritizing stakeholders in organizations will endure or if there will be a shift in the zeitgeist. Previous research on popular management concepts has demonstrated that managers are generally drawn to ideas that pledge significant performance enhancements, such as cost reductions [26,159]. The proponents of I5.0 do not appear to follow this playbook and instead appeal to other stakeholder-oriented considerations. However, it is possible that the current strong emphasis on sustainability and sustainable development in the business world could outweigh narrow shareholder-focused concerns [160,161]. The emphasis on sustainability in Industry 5.0 is even more prominent, suggesting that some of the underlying principles of I5.0 may already be implicit in sustainable business practices. In many ways, the concerns raised by I5.0 advocates are philosophical and existential in nature, which is illustrated by this quote from Sachsenmeier [6] (p. 229): "Industry 5.0 discussions touch on the very essence of humanity's existence, physical integrity, and relationship with nature".

Another development that should be followed is future versioning. Looking back, it is interesting to note that I5.0 emerged so quickly (just a few years) after I4.0. After all, Industry 6.0 (I6.0) is already talked about [146–149,152,162]. This can be seen as an indication that actors attempt to position and differentiate their thoughts and views. In the words of Duggal, Malik, Gehlot, Singh, Gaba, Masud, and Al-Amri [148] (p. 521): "era of Industry 6.0 will be one of renewable energy, total machine independence, interplanetary resource gathering and manufacturing, aerial manufacturing platforms, anatomical enhancements, quantum control".

7. Conclusions

The aim of the current study has been to carry out an in-depth examination of the evolutionary trajectories of I4.0 and I5.0, two important contemporary management concepts that are attracting much interest in the business and organizational world. In the following, the theoretical, methodological, and practical implications of this study are discussed in more detail before the paper ends with reflections related to limitations and future research directions.

7.1. Theoretical Implications

This study offers theoretical implications by shedding new light on the evolutionary paths of new and emerging management concepts. We have performed a comparative analysis of the emergence and evolution of I4.0 and I5.0 from a management fashion perspective. Viewing Industry 4.0 and 5.0 from the vantage point of management fashion theory involves analyzing and tracing the involvement activities of the suppliers of the two concepts as well as gauging the concepts' demand side impact.

The cases are illustrative of the coevolution of two highly related but competing management concept movements. In the management fashion literature, it is increasingly recognized that management concepts do not evolve in a vacuum, but their popularity is influenced by how a concept relates to other existing concepts [163]. We suggest based on our findings that there are both inter- and intramovement dynamics at play. Different concept movements (e.g., Total Quality Management, Business Process Reengineering, Benchmarking) compete, and actors may try to undermine other concepts by highlighting shortcomings and their own concept's superiority. There are also intramovement dynamics. Management concept movements often splinter and fracture, resulting in a number of different submovements. For example, this has been observed related to a concept such as Total Quality Management where there are different submovements with their own gurus and teachings [164]. Similarly, within the Agile movement, there are submovements and the concept exists in many different forms [165].

Our study provides novel insights into the trajectories and lifecycles of management concepts, in particular, the early phase where actors are actively attempting to create a wave of interest and drum up support for their particular concept [26,166]. The evidence reviewed in this paper shows that the supply side has been configured differently in the

two cases. Although the emergence of the I4.0 concept was much more top-down and orchestrated by powerful players, such as consulting firms, the I5.0 concept emerged organically because of the work of independent actors. These findings, therefore, provide empirical illustrations that the management fashion arenas [26,80,166] around management concepts are configured differently and that these differences may shape the evolutionary trajectory of a particular concept.

Generally, the comparative analysis of the cases of Industry 4.0 and 5.0 indicates that the two concepts are at different stages in their lifecycle. The I4.0 concept appears to have entered a stage of consolidation after a period of strong growth. However, the fact that interest and popularity remain high suggests that the I4.0 concept, at least to some extent, has become institutionalized. The case of I4.0 is therefore indicative that management fashion can persist, which has been suggested in the literature on management fashions [28,158]. The concept of I5.0 is a younger concept and earlier in the lifecycle. Although Industry 5.0 is growing in popularity and is gaining followers and supporters, it is still a more marginal concept and movement.

This case study analysis also puts the spotlight on how different supply side actors launch a new vision of the future in business and society and mobilize support for their ideas by latching on to salient issues and influential narratives in the business world and society at large around, for example, sustainability and resilience. These developments illustrate the points made by management fashion researchers that concepts and ideas that capture the zeitgeist or spirit of the times are more likely to prevail in the marketplace [26,167]. Finally, this study also provides an interesting example of versioning in the market for management concepts and ideas. Madsen [1] noted that version "4.0" invites new versions in the future (5.0, 6.0, X.0). As this review has shown, not only have we seen the growth of I5.0, but some actors have already suggested that 5.0 is passe and that we are entering the age of Industry 6.0 [146–149,162].

7.2. Methodological Implications

This study also holds implications for the methodology of researching management concepts and ideas. Several previous studies have highlighted the methodological challenges associated with studying management concepts [32,168]. The study of emerging concepts presents researchers with some unique challenges, as there are fewer sources available that can be used as secondary data. Moreover, the fields around new concepts are often fast-moving and in flux, which makes it harder to identify the key players and actors.

Studying concepts early in the lifecycle (which I5.0 is a prime example) is important since it avoids sampling only on the dependent variable, that is, studying concepts that have become popular management fashions [169]. After all, it is the case that far from all management concepts succeed in attracting attention in the marketplace and instead quietly die off without leaving a lasting imprint on management discourse or practice [170].

7.3. Practical Implications

Our study carries practical implications that may not be immediately evident to all readers. Specifically, our in-depth comparative analysis of the I4.0 and I5.0 concepts using management fashion theory has practical relevance even though some may find it initially challenging to see. However, we argue that this type of examination could be useful for the practice domain since it offers an outside-in view of these two related concepts. This could potentially be useful for practitioners since it can invite reflection and make managers and other organizational decision-makers more critical and informed consumers of new management concepts and ideas. This is useful when you are faced with the next big hyped-up concept or idea.

7.4. Limitations and Future Work

As is the case with any study, this study has limitations. As noted at the beginning of the paper, the objective has been to examine the emergence and evolution of the two concepts:

I4.0 and I5.0. However, what has been documented in this paper is not a complete picture since it is not realistic to account for all the actors and activities that have taken place during the lifecycles of these two concepts. In the case of I5.0, the concept is still very early in its lifecycle [29], which means that the field is evolving rapidly and is in a state of flux. The concept is heavily contested by different actors who try to position themselves in the market and shape how the concept is defined. This analysis has focused mainly on the supply side of I4.0 and I5.0, as there is currently limited data available on the demand side, particularly in the case of I5.0. The lack of demand-side data is a common challenge in studies of management fashions [171]. However, it is likely that more data on the demand side will become available in the future, and it would be valuable to further explore how these concepts are being adopted and applied by organizations on the demand side of the market. This would provide a more complete understanding of the impact and diffusion of I4.0 and I5.0.

The theoretical lens employed in this study to interpret the findings can also be viewed as a limitation. It is likely that management fashion cannot fully explain the phenomena of I4.0 and I5.0, but it is an important aspect. In the future, researchers could draw on other theoretical lenses to cast light on the adoption, diffusion, and evolution of management concepts and ideas such as I4.0 and I5.0 [172].

This study has been limited by the use of desk research methods and secondary sources. In the future, it would be beneficial to conduct more primary research on I4.0 and I5.0 using methods such as interviews and/or surveys with individuals involved in the field. Qualitative interviews with experts could provide a deeper understanding of the events and activities that have shaped the development of the two concepts, while quantitative surveys could give a broader picture of the impact of the two concepts across different organizations, sectors, and countries. This would help to build a more complete and sophisticated understanding of I4.0 and I5.0 and the role and status of these concepts in the field of management research and practice.

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