The evolution of meanings: an empirical analysis of the social media industry

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Abstract

Purpose – Innovation dynamics have been the object of study of several researchers, focusing in particular on technological innovation and the emergence of a dominant design. However, these models have been challenged by how the pervasiveness of digital technologies is speeding up the pace at which innovation evolves. On the other hand, a growing body of literature in innovation management has started underlining the relevance of new product and service meanings as a source of innovation.

Design/methodology/approach – This research aims to study the different innovation dynamics within an industry, investigating not only how companies react to fast-changing functional advancements but rather how their behavior changes as shifts in meaning occur. To properly assess the phenomenon, this longitudinal study analyzes the social media industry, strongly subjected to continuous functional advancements, through a deep dive in the 160 innovations introduced between 2003 and 2017 by the eight leading players in the industry.

Findings – Our results illustrate the co-existence of different approaches to innovation within an industry and hint that consequent and fast cycles of innovation in both functionalities and meanings discourage the emergence of a dominant design.

Practical implications – Our results help managers and innovators acknowledge the possibility to leverage not just on the technological dimension of innovation but also the reason why people use a given product or service, innovating its meaning. Furthermore, our results recognize the co-existence of different innovation streams upon which innovators can act.

Originality/value – This research contributes to the extant literature in innovation management, extending the classical models of innovation dynamics by including the evolution of innovations of meaning in relation to technological innovation.

Keywords Innovation dynamics, Innovation cycles, Innovation of meaning, Technological innovation, Social media

Paper type Research paper

Introduction

The way innovation evolves in a market has been the object of study for several scholars. The seminal work proposed by Tushman and Anderson (1986) and Abernathy and Utterback (1978) has given rise to an entire literature stream that investigates the evolutionary dynamics of technological innovation and how technological discontinuities lead to a series of cycles of innovation. Through an era of ferment, industries see the establishment of a "dominant design" – i.e., a design that becomes the industry standard (Abrahamson and

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Rosenkopf, 1997; Anderson and Tushman, 1990; Tripsas, 1997) through a process of selection and refinement (Grodal *et al.*, 2015) – until a new technological discontinuity takes place in the market and the cycle is repeated (Tushman *et al.*, 1997).

Recent developments in the diffusion of digital technologies are somehow challenging this mechanism. Downes and Nunes (2014), through their work on Big Bang Disruption, have described the mechanisms that help companies foster innovation by generating significant impact in the market, with a specific focus on the incredible speed of their cycles. Although previous studies argued it could take years to reach a dominant design (e.g., Tripsas, 1997), the process is now happening at a much higher speed and carries potentially disruptive outcomes for incumbents.

Other studies represent the emergence of dominant designs as closely related to the technology itself. In contrast, the so-called "convergent designs" are more common in industries characterized by a substantial symbolic value of products and services, such as the design-intensive ones (e.g., Cappetta *et al.*, 2006; Magistretti *et al.*, 2019, 2020). One of the critical features of these models is their focus on entire industries, representing the evolution of innovation through the effort of different companies that rework and innovate products offered by competitors (Tripsas, 1997).

Over the last decade, scholars have pointed to another dimension of innovation: the meaning (Morillo *et al.*, 2015; Candi *et al.*, 2016; Kumar and Noble, 2016; Goto, 2017; Verganti, 2017; Verganti *et al.*, 2020). Traditional innovation theories consider product or service functionalities as the primary object of product innovation (e.g., Anderson and Tushman, 1990; Von Hippel, 1986). While design is commonly understood as the means to operate on product aesthetics and functional features, this view disregards the strategic relevance that design can assume as the source of "meaningful distinction" between one product and another (Lorenz, 1994). Building on this view, recent models suggest that a hedonic dimension, dealing with the meaning of a product or a service –intended as the reason why people buy it and use it – may play an essential role in the innovation process (e.g., Candi *et al.*, 2016; Kumar and Noble, 2016; Verganti, 2009, 2017).

Companies like Yankee Candle did not change the functional attributes of the object they produce: their candles are not brighter than their competitors' but they offer buyers a new reason to purchase them. They create a pleasant environment with their scent, awarding users with an emotional experience of the product that is different from its original functional dimension: lighting (Verganti, 2017).

The meaning dimension of innovation has indeed raised the interest of several scholars in recent times (e.g., Dell'Era *et al.*, 2017; Goto, 2017; Altuna *et al.*, 2017; Artusi and Bellini, 2020a; Verganti *et al.*, 2020). Existing studies investigate the role that new entrants' contributions play in introducing new meanings (e.g., Jepsen *et al.*, 2014; Morillo *et al.*, 2015), and the way incumbents react to it (e.g., Trabucchi *et al.*, 2017). Some scholars have investigated meanings as manifest in product languages although only providing generalizable considerations to product-centric industries and design-intensive industries (e.g., Ravasi and Lojacono, 2005). Others have focused on the way meanings can be embodied in a service (Pinto *et al.*, 2017; Artusi and Bellini, 2020a, b) or the team dynamics that may foster meaning-making within the innovation process (Bellis and Verganti, 2020). Existing studies focus on the process and the features of innovation, rather than its dynamics at the industry level: the way meanings evolve within a given industry is still unclear.

As the role of meaning in innovation is expanding from design-intensive industries to several other domains (e.g., technology-based, Dell'Era *et al.*, 2017; music industry, Trabucchi *et al.*, 2017; retail, Pinto *et al.*, 2017; Artusi and Bellini, 2020a, b) and that technology is often considered an enabler for new meanings (Verganti, 2009; Dell'Era *et al.*, 2017; Goto, 2017; Magistretti and Dell'Era, 2019; Magistretti *et al.*, 2020) the aim of this research is to dig into the related innovation dynamics, by not just considering the functional improvements brought

by innovation but also the shift in the product/service meaning – i.e., the *reason why* customers buy and love a given product or service (Verganti, 2009).

In other words, are the reference models that have guided research over the last decades still valuable when considering not only technologies but also meanings?

This research is based on the social media industry, proposing a longitudinal study on the eight leading players in the field (i.e., Facebook, Twitter, Linkedin, WhatsApp, Snapchat, Google +, Instagram and Pinterest). In particular, 160 innovations introduced in the field between May 2003 and June 2017 have been analyzed through the two different perspectives (i.e., respectively looking at innovation in functionality and meaning) with the aim of examining the innovation dynamics taking place within the industry.

This study contributes to traditional and established models of innovation dynamics in technological innovation by extending them to include the innovation of meaning dimension, investigating the way meanings evolve within an industry. Consequently, theoretical and managerial implications are drawn, building new theory on innovation dynamics in reaction to discontinuities generated both by functional innovation and innovation in product and service meanings while providing managers with actionable suggestions to navigate through such discontinuities.

Different kinds of innovation: technology and meaning

Innovation dynamics: a technological perspective

Tushman and Anderson (1986) define the concept of technological discontinuity by proving the existence of two main phases in the development of technology: an era of ferment and an era of incremental change. Their seminal work sets the basis for a whole stream of research dealing with the implications of innovation for market dynamics. Later works illustrate the way the phases rely on a cyclical model based on technological breakthroughs, defining four different and cyclical phases within this evolution – i.e., variation (technological discontinuity), fluid phase (era of ferment), selection (dominant design) and retention (era of incremental change) (Anderson and Tushman, 1990; Tushman *et al.*,1997). These phases repeat themselves in between technological discontinuities occurring in the market, causing the continuous redefinition of the industry's dominant design. Since Tushman *et al.*'s (1997) framework also identifies the existence of so-called *innovation streams* as products are complect systems, they identify subsystems within which products and their functionalities can be subdivided. The seminal work by Utterback and Suaréz (1993) supplements this perspective, investigating the emergence of dominant designs –innovations that take over existing technologies by setting a new industry standard – bringing most companies in the market to compete on the same technology.

Within this process of evolution, established firms seem to play an extremely important role in technology development, in particular when addressing customer needs (Christensen and Bower, 1996) since customer satisfaction plays an important role in the diffusion of technology to define a standard in the market (Abrahamson and Rosenkopf, 1997; Nokelainen and Dedehayir, 2015). Companies that are able to summarize the innovations proposed by competitors and set a dominant design are rewarded with relevance in the market (e.g., Anderson and Tushman, 1990; Tushman *et al.*, 1997; Utterback, 1993; McGrath, 1998). Several studies have built on this view. For example, Tegarden *et al.* (1999) argue that betting on the right design to become dominant in the market is a crucial driver to industry survival. The chance to set a market standard or a dominant design can enable winner-takes-all configurations (Lee *et al.*, 2006; Schilling, 2002). Companies thus work on the same technology in the pursuit of innovation until one proposes the "winning" architecture, becoming the dominant design. This view is relevant for two main reasons. First, it demonstrates how competing companies may build on the innovations introduced by other companies together.

Second, it illustrates how the company that wins the market is the setter of the dominant design (e.g., Tripsas, 1997; Tushman *et al.*, 1997).

However, although more recent research has investigated the phenomenon of technological discontinuity and its alternation with periods of stall (e.g., Perez, 2010; Sood and Tellis, 2005), these models have been challenged by digital technologies and speed of disruption, regarding the overall time taken to set a dominant design and to reach the following technological discontinuity (e.g., Ghezzi, 2013; Trabucchi *et al.*, 2019). Indeed, the impact of disruptive technologies on innovation dynamics within an industry has been widely studied in extant research (Christensen and Bower, 1996; Christensen, 1997; Hopp *et al.*, 2018; Roy and Sarkar, 2016) concluding that, as the pace of technological advancement in an industry outruns the demand for technically improved products, new entrants are likely to introduce disruptive products that are technologically inferior to existing incumbent offerings but offer a new mix of features that are better able to serve specific niches of market and progressively gain traction across all other segments (Christensen *et al.*, 2018). Encroachment patterns may not just follow a bottom-up approach as in Christensen's model (1997) but may also follow a top-down approach, where products are first introduced in the higher end of the market and then are expanded to the lower-end, too (Sood and Tellis, 2011). In particular, the current context and the pervasiveness of digital infrastructures (Autio *et al.*, 2018) have enabled the encroachment speed of innovation to rise significantly although also increasing the relevance of the competitive setting the company is immersed in (Parry and Kawakami, 2017).

This wide and established body of literature can provide a glimpse of the complexity that characterizes the literature on the evolution of technological innovation. However, more recently, scholars have started to investigate how other sources of innovation can trigger the emergence and consequent evolution of innovation.

Innovation of meaning: a different perspective on innovation

For several years, innovation scholars have considered two primary sources of innovation: market needs and technological advancements (Howells, 1997). These two aspects have given birth to two prominent approaches companies can have to innovation, i.e., *market pull* and *technology push* (Di Stefano *et al.*, 2012; Dosi, 1982; Von Hippel, 1976).

In the last decades, this dyadic relationship has been challenged, also considering other triggers to innovation. Over the last years, management scholars have investigated the relevance of product meanings in the innovation management discipline, giving rise to a growing body of literature (e.g., Dell'Era *et al.*, 2017; Goto, 2017; Holt and Cameron, 2010; Norman and Verganti, 2014). In particular, to this regard Verganti (2009) adds a third perspective to the traditional market-pull and technology-push model (Di Stefano *et al.*, 2012; Dosi, 1982; Von Hippel, 1976), introducing the so-called *design-push* approach, that encompasses the role of design in giving meaning to products and services, shifting the underlying customer motives for consumption (Belk, 1988; Holt, 1997; Holt and Cameron, 2010), i.e., the *reason why* people use or buy products and services (Verganti, 2009). This approach encompasses proposing radically new elements to the market as a result of an understanding of the underlying socio-cultural dynamics, generating new directions for innovation (Verganti, 2011). As argued by Holt and Cameron (2010), innovation shifting the socio-cultural paradigm leverages ideological opportunities to propose new cultural expressions to consumers. The socio-cultural setting and players outside the company's boundaries can provide significant contributions and play a key role in developing a new socio-cultural understanding (Verganti and Öberg, 2013).

As a consequence to the introduction of a new dimension upon which companies can innovate, Verganti (2009) explores the interplay between innovation in product and service meanings and the technological dimension of innovation, arguing that, when radically new technologies and radically new meanings are embodied within a product, they constitute so-called *technology epiphanies* (Verganti, 2011; Dell'Era *et al.*, 2017; Goto, 2017; Trabucchi *et al.*, 2017). Consequently, companies need to reconsider both their business and development models to overcome their path dependency and embrace new meanings (Dell'Era *et al.*, 2020). For example, the involvement of designers in the innovation process may aid in understanding the potentialities of new meanings embedded in a technology (Dell'Era *et al.*, 2017; Magistretti and Dell'Era, 2019). Furthermore, observing new meanings proposed by new entrants may motivate companies to rethink the way they are working and to foster innovation of meaning in their field (Trabucchi *et al.*, 2017). In the end, the role of interpreters and the chance to leverage on the innovative power of criticism is fundamental to pursue this kind of innovation (Morillo *et al.*, 2015; Verganti, 2017).

Second, scholars have started considering the diffusion of meanings in the market by focusing on product languages in design-intensive industries (Dell'Era and Verganti, 2007), by observing the patterns of imitation and innovation of product languages as a firms' innovation strategy. Dell'Era *et al.* (2008) stress the importance of analyzing dominant product languages and understanding the state-of-the-art of the industry for firms to pursue a proactive – as opposed to reactive – innovation strategy by making proposals to the market.

Empirical evidence for the success of a proactive strategy in generating product proposals are proposed by Dell'Era and Verganti (2010): the authors prove that trendsetters who continually introduce new product meanings to the market also benefit from the best innovative performance. Further research (Dell'Era and Verganti, 2011) provides hints on how to forecast the evolution of new product meanings in design-intensive industries through an analysis based on the market's competitive setting, the firms' reputation and the marketing strategies they adopted.

Research gap

This brief literature overview displays a clear distinction between the technology and meaning domains of innovation. In the context of technological innovation, extant literature has paid significant attention to innovation dynamics within an industry, and the way different companies may play a role in letting a technology evolve until the definition of a dominant design. In the context of the innovation of meaning, instead, scholarly work has mainly focused on the way companies may pursue a "meaning-oriented" strategy, paying little attention to the industry dynamics and mainly focusing on design-intensive industries.

While extant work on the innovation of meaning (e.g., Verganti, 2011; Dell'Era *et al.*, 2017; Goto, 2017) has mainly adopted a product-centric, firm-level perspective, this study aims at extending the innovation of meaning discourse to how its innovation dynamics unfold from an industry-level perspective, similarly to how previous studies on technological and functional innovation have described the innovation dynamics taking place within an industry (e.g., Sood and Tellis, 2005; Tushman *et al.*, 1997; Utterback, 1993; Von Hippel, 1976). To this regard, building on these models, our study aims at shedding light on how innovation dynamics take place when also the innovation of meaning is involved. In other words, this study investigates the behavior of firms within an industry which have introduced innovations within their products and services as a response to those of competitors, comparing both the functional level and the meaning level.

As a consequence, we formulate the following research questions (RQs):

RQ1. How do product/service meanings evolve within an industry?

RQ2. How do the innovation dynamics behave within a market when discontinuities (i.e., radical innovations in both meaning and technology) are introduced?

RQ2.1. How do firms react to discontinuities introduced by other firms?

Research method

Area of investigation and sampling

Two primary drivers guided the definition of the empirical sampling to provide a relevant answer to the defined research questions. First, to better capture the evolution of innovation dynamics, we selected an industry where the underlying meaning has significantly evolved within a limited timeframe, so to facilitate historical data retrieval (e.g. Ghezzi *et al.*, 2015). Second, we selected a relatively concentrated market to longitudinally study a limited number of companies while still capturing the overall industry perspective. After careful evaluation, the social media industry was selected as a promising empirical setting. The popularity of social media platforms has been growing steadily, reaching 3, 6bn users in 2016 from the less than 1bn users of 2010, recording a growth of more than 360% in ten years, and it is projected to reach almost 4, 5bn users by 2025 (Clement, 2020).

The market has faced important shifts in the reason why users share content on social media since the first platform (i.e., LinkedIn) went live on May 5th, 2003. At that time, the reason why users used social media platforms was mainly to be reachable online. Since then, the meaning of the service has slowly shifted toward multiple reasons – why. For example, to share significant moments with one's network (e.g., Snapchat with "The fastest way to share a moment"), to keep in touch with friends, to express an opinion (e.g., Twitter with "It's what's happening"), or to get informed, to find inspiration, to shop.

The social media industry is a highly relatively-concentrated field–i.e., only a handful of players detain the majority of the market share. This characteristic allowed us to longitudinally reach almost the totality of the market since its existence, providing an overview of all relevant competitive dynamics. The high relative market concentration has consequently brought players to keep a high level of competitiveness, continually trying to innovate by expanding toward new functionalities and new meanings. The final sample is composed of the most popular social media platforms worldwide by reach (Clement, 2017): Facebook, Twitter, Linkedin, WhatsApp, Snapchat, Google +, Instagram, and Pinterest.

Data gathering and database creation

The data gathering process consisted of the construction of a database, identifying the innovations introduced by the eight companies. The longitudinal analysis considered 160 innovations, spanning across 14 years, from May 5, 2003 to June 21, 2017. In particular, the word "innovation" is used to define all the new user-side features introduced in the main service. The data gathering process has been strongly iterative: data have been gathered through different sources to ensure triangulation and comprehensiveness. The data collection has been carried out by tracing back to the sequence of events and announcements in each platform's history, using the platforms' press blogs and press releases, supplemented by the dedicated Wikipedia timeline and description pages. These sources were integrated and verified with articles from online news, explaining meanings and functionalities contained in each innovation, academic case studies and public interviews given by the platforms' founders. Table 1 summarizes the sources employed in the data collection process.

The classification process leveraged multiple articles and announcements regarding each single innovation. For each of the 160 innovations, three pieces of information were collected: (1) *introduction date*, (2) *company* and (3) *description*. The articles were then systematized through observation and judgment of: (4) the functional advancement introduced and (5) the

Company	Primary sources	Secondary sources	Number of documents
Facebook	Facebook.com Newsroom.fb.com Developers.facebook.com	Wikipedia.org Techcrunch.com Mashable.com Adweek.com Ibtimes.com Pcmag.com Theverge.com Phys.org CNN.com	35
Twitter	About.twitter.com Blog.twitter.com	Wikipedia.org Crunchbase.com Pcmag.com Mashable.com Quartz (qz.com) Latimes.com	23
Instagram	Blog.Instagram.com Business.Instagram.com Instagram-press.com	Wikipedia.org Techcrunch.com Adweek.com Recode.net	22
Snapchat	Snap.com	Wikipedia.org Youtube.com Techcrunch.com	6
LinkedIn	Ourstory.linkedin.com Blog.linkedin.com	Wikipedia.org Inc.com Nytimes.com	6
Whatsapp	Blog.whatsapp.com	Wikipedia.org Techcrunch.com	4
Google+	Google.com/about Gmail.googleblog.com Googleblog.blogspot.it	Wikipedia.org Techcrunch.com Mashable.com Money.cnn.com Nytimes.com Tech.firstpost.com Huffingtonpost.com	11
Pinterest	Blog.pinterest.com	Wikipedia.org Adweek.com Techcrunch.com Timetoast.com	6

Table 1.
Data sources

magnitude of change in the meaning–i.e., the reason why users use the platform. This analysis was performed keeping a market focus rather than a firm focus: when evaluating an innovation's radicalness, we assessed *how new* the feature was *to the market* and not to the company that introduced it. This choice was made to ensure consistency with the aim of this research to investigate the innovation dynamics at the industry level.

This thorough and punctual assessment provided the basis for classifying each of the 160 innovations through two different measures, so to account for the two dimensions of innovation following Verganti (2011): *functional radicalness* (FR) – intended as the extent to which an innovation is new to the market in terms of functionality and *meaning radicalness* (MR), intended as the extent to which the meaning, and thus the reason why users use the platform, has shifted from the extant meaning in the market. It is important to highlight how these measures aim to assess the radicalness of each innovation, rather than distinguishing between an incremental and a radical innovation. Indeed, the literature on this matter is often

focused on technology, linking the concept of radical innovation to technological breakthroughs. However, in the service domain, the concept of radical innovations refers to innovation in the configuration of activity chains or of the activities within the service itself (Sawhney *et al.*, 2005).

Table 2 provides an excerpt of the database and the five dimensions through which each of the innovations has been characterized. The scores scale ranges from 0 to 4 (from 0: no innovation-pure imitation to 4: functional turnaround or 4: Radical shift in the reason why users use the service). As the literature suggests (e.g., Verganti and Öberg, 2013), product and service meanings are proposals made by companies to customers, the scores were assigned evaluating the radicalness of the meaning *proposed*, rather than perceived. For example, the innovation "Snapchat Stories" (see Table 2) introduced in October 2013 has been evaluated to have a FR score of 3 as the new feature encompassed associating a series of pictures that would be public for only 24 hours with each users, coupled with a MR score of 3 as it provided users a new reason to use Snapchat, such as sharing low-quality and quick pictures with friends. Similarly, the feature "My Day", introduced by Facebook in August 2016 to share disappearing pictures with Facebook Messenger contacts for 24 hours, has been evaluated with lower functional and meaning radicalness (both having a score of 1). While the first innovation marked the introduction of a new meaning in the service use and a significant addition in functionality, the second only provides an additional reason to use Facebook for its users, i.e., a novelty for the platform, but not for the market, with no significant functional advancement.

To ensure inter-rater reliability (Armstrong *et al.*, 1997), a panel of three experts in design-driven innovation validated the scores. Three independent scholars with strong knowledge in innovation dynamics and innovation of meaning were asked to classify a subsample of the innovations (see for example Trabucchi *et al.*, 2019). The validation was done on a random subsample, representing 13% of the total entries. The classification given independently by

Innovation	Date	Company	Description	FR score	MR score
Snapchat launch	Jul-11	Snapchat	Snapchat launches as an app to send contacts photos that disappear after being seen	1	4
Snapchat stories	Oct-13	Snapchat	Launch of stories, a space to publicly share pictures lasting for 24h that can be replayed as many times as the viewer wants	3	3
Disappearing messages	May-14	Snapchat	Possibility to send disappearing text and pictures from the phone's gallery introduced	2	2
Instagram Stories	Aug-16	Instagram	Users get the possibility to share pictures that disappear after 24h with their followers, as well as see other users' "Stories"	2	3
Facebook "my day"	Sep-16	Facebook	Users can publicly share pictures that disappear after 24h on Facebook Messenger through a function called "my day"	1	1
Private disappearing content	Nov-16	Instagram	Users can privately send each other disappearing photos and videos	0	0
Facebook stories	Jan-17	Facebook	Facebook Stories introduced as pictures that can be shared with Facebook friends lasting 24h	0	0
Whatsapp status	Feb-17	Whatsapp	"Status" feature introduced, giving users the possibility to share photos with Whatsapp contacts lasting 24h	1	1

Table 2.
Excerpt of the database of innovations

each expert had a 94% overlap with that performed by the authors, depicting excellent reliability of the codification protocol employed.

Data analysis

Following the suggestions provided by previous contributors to the observation of innovations as *innovation streams* (Tushman *et al.*, 1997), we investigated the presence of subsystems within the sample. As a consequence, we identified 12 *innovation streams*, defined as sets of subsystems of innovation that concern comparable features of a given product or service. For example, the innovations listed in Table 2 represent an excerpt of the innovation stream named "*Ephemeral content*" as all of the innovations contained in the stream encompass content that is meant to disappear within a specific amount or time, such as pictures or text messages that disappear after being seen, photos and videos that are visible to followers for 24 hours only or temporary user pictures to honor an event or support a cause.

Each stream was then analyzed to investigate the innovation dynamics taking place within it. Leveraging on Verganti's (2011) framework, for each stream, the initiatives were mapped on the two dimensions of radicalness –*meaning radicalness* (MR) and *functional radicalness* (FR). As in Verganti's matrix (2011), four quadrants emerge: the *incremental quadrant* (FR and MR $\leq$ 2); the *radical function quadrant* (FR > 2 and MR $\leq$ 2); the *radical meaning quadrant* (FR $\leq$ 2 and MR > 2) and the *epiphany quadrant* (FR > 2 and MR > 2).

Each innovation has been represented in the matrix representing its innovation stream. at the intersection of its scores that introduced it. Then, numbered arrows were drawn to describe the chronological path, followed by the innovations. Finally, the arrows have been colored to distinguish between the different cycles (Tushman *et al.*, 1997): whenever a radical innovation takes place right after an incremental innovation (or a series of), a new cycle begins and continues until the same condition is verified again. To keep track of new "cycles", the arrows' color shift whenever a radical innovation takes place (steps 4 and 8). As an example, Figure 1 represents each of the innovations belonging to the "Ephemeral content" innovation stream in the matrix.

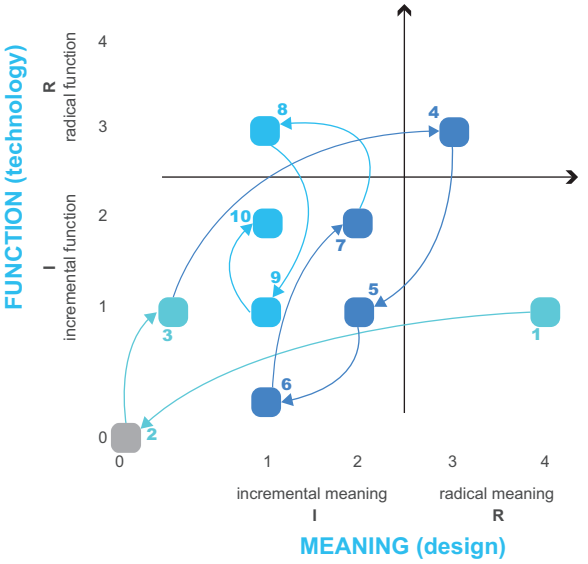

Figure 1.
Example of data analysis in the "Ephemeral content" innovation stream

The matrices were visually inspected to understand the distribution of innovations across the quadrants and the innovation strategies adopted by all different players. The streams were then grouped, identifying which quadrants of the matrix hosted most innovations and the path followed by the innovations across the four quadrants.

Finally, the first mover's and followers' strategies were analyzed to investigate the diffusion of both functionalities and meanings along the period of analysis.

In addition to plotting the results on the matrix, we analyzed the 12 innovation streams through descriptive statistics (as shown in Table 5 in the results section), to understand common patterns and differences between each of the streams. On the one hand, we observed the competitive dynamics taking place between players, such as (1) the number of followers in each innovation stream, (2) the average number of players that took part to each cycle–i.e., following a radical innovation on either dimension with incremental ones, (3) the number of cycles that took place in each innovation stream, (4) the number of cycles that did not see incremental innovations following it and (5) the average duration of the cycles. These data were used to make better sense of the dynamics taking place into each innovation stream and facilitate interpretation, giving the authors an overview on the 12 innovations streams.

Results

The 12 innovation streams identified by leveraging on the definition provided by the literature (Tushman *et al.*, 1997) are summarized in Table 3. Building on these 12 innovation streams, we structure the following section responding to our RQs.

First, the twelve innovation streams are analyzed according to the innovation approach that characterizes them, i.e., whether innovation is driven by technology or by meanings (Verganti, 2011). Second, the streams are analyzed according to their internal innovation dynamics, representing the evolution of innovation within the same stream by relying on cyclical models of innovation (Tushman *et al.*, 1997).

Innovation approaches

For each innovation stream, the dynamics and the typologies of improvements introduced by the different players lead the definition of the dominant innovation approach within each stream. Namely, we identified three different innovation approaches out of the 12 innovation streams investigated: (1) *design-oriented*, (2) *technology-oriented* and (3) *balanced* (see Figure 2).

Design-oriented. Three streams (25% of the overall sample) display a high incidence of initiatives in the bottom-right quadrant: the radical meaning/incremental functional innovation quadrant (R-I) (Figure 3). These streams have been identified as *design-oriented* because of the predominant approach to innovation, mainly focusing on the radical meaning-incremental functional innovation strategy.

In particular, the three innovation streams adopting this approach are (1) *social media as news sources,* (2) *ephemeral content* and (3) *reactions*. Entry to the stream happens almost exclusively in the bottom two quadrants, either radically operating on the meaning and incrementally on the functionality, or incrementally on both dimensions. Furthermore, it is interesting to notice how stream-opening innovations have a score of 4 in MR, and incremental (1 or 2) in FR. Therefore, design-oriented streams are more likely to see first movers following a design-push strategy.

For example, the innovation stream "Ephemeral content" (refer to Table 2 for an excerpt of the innovations included in the stream) represents a design-oriented stream in that, after being opened by a radical innovation in the reason why users would use a social media platform – i.e., for sharing with each other quick and low-quality pictures that would

Innovation stream	Description	Example	Starting date	Number of innovations
Basic sharing	Innovations that make up the basic sharing functions of a social media platform	Possibility to share posts on Facebook's "Wall"	May 2003	28
Messaging	Innovations related to instant private messaging between users of a social media platform	Introduction of a private messaging function on Facebook	November 2007	19
Indexing and collecting	Innovations enabling the organization and saving of items	Introduction of hashtags (#) by Twitter	August 2007	11
Mobile technologies	Entries related to the expansion of the platform to mobile devices	Launch of Linkedin mobile app	January 2007	13
Social media as news sources	Innovations aiming at making social media a news outlet, a reliable source where the community gets information from	Possibility to share external links on Facebook	September 2008	11
Conversion into purchases	Innovations apt at creating making social media platforms closer to e-commerce	Introduction of shoppable photo tags that redirect to seller websites on Instagram	December 2013	12
Live content	Innovations involving the process of sharing content in real-time	Introduction of live streaming of stories on Snapchat	March 2006	6
Location services	Advancements involving GPS and geographic locations	Possibility to geographically tag Instagram photos	February 2010	9
Video content	Innovations involving sharing of videos as self-standing content	Launch of Vine video app by Twitter	October 2006	9
Ephemeral content	Contents related to disappearing pictures and videos, the conversational and quality-regardless of use of social media	Introduction of Snapchat Stories enabling users to share pictures lasting 24h	July 2011	16
Connecting to anybody	Advancements apt at creating public profiles and pages, such as business or celebrities, giving the community the potential to reach out to anybody	Making Linkedin profiles public	February 2006	11
Reactions	Advancements related to the interactions users can have with posts shared by other users	Instagram eliminating the possibility to view the number of likes in a post	June 2008	17

Table 3.
The 12 innovation streams identified

disappear after being opened – it sets a new standard in the market, seeing the following of several different platforms that decided to adopt the same paradigm. As this "ephemeral" kind of sharing became widespread, the following innovations introduced predominantly leveraged the meaning dimension of innovation. For example, the introduction of the "Stories" function by Instagram allowed users to share (and on the other hand, see) moments of their day for 24 hours in parallel to the "steady" content posted on their feed. Through this

Table 4.
Relationship between innovation approach and entry strategy of each stream

Innovation approach	Innovation stream	Entry Strategy
Balanced	Basic sharing	Technology epiphany
	Messaging	Technology epiphany
	Indexing and Collecting	Technology epiphany
	Mobile technologies	Technology epiphany
	Conversion into purchases	Technology epiphany
	Live content	Technology epiphany
	Location services	Incremental
	Connecting to anybody	Technology epiphany
Design-Oriented	Ephemeral content	Design-driven
	Social media as news sources	Design-driven
	Reactions	Design-driven
Technology-Oriented	Video content	Technology-push

innovation, the company offered its users a new glimpse into influencers' and friends' everyday lives, giving them a new reason to use the app.

Technology-oriented. In the second innovation approach, the majority of initiatives are present in the upper area of the matrix. In these areas, radically new functions are coupled with either incremental or radical meaning changes (I-R and R-R), representing what was defined as a *technology-oriented* approach (Figure 4).

Only one innovation stream (8% of the total sample) follows this approach – the one based on *video content*; for this reason, making a strong case about this innovation approach is difficult. Entry to the stream happens almost exclusively in the top two quadrants, either radically operating on the functionality and incrementally on the meaning, or incrementally on both directions. The first mover opened the stream with a 0–2 innovation (0 in MR and 2 in FR). This shows how, despite not radical, the innovation was a functional advancement rather than a shift in meaning.

This innovation stream has predominantly seen innovations in the functional aspects of the apps, including advances in video duration and usability – e.g., Snapchat's integration of videos to their disappearing content possibilities.

Balanced. The last innovation approach embodies the majority of the sample (67%). These innovation streams are labeled as *balanced*. A relevant number (in some instances, even totality) of initiatives lies between the R-R and I-I quadrants (Figure 5). This distribution depicts and interestingly high number of technology epiphanies (R-R quadrant) (Verganti, 2011) followed by their imitations (I-I quadrant). The innovation streams following this approach differ slightly from one another. In some cases, the R–I (radical meaning – incremental function) quadrant is also populated. In contrast, in some other cases, initiatives are present in both R–I and I–R quadrants and again other times the two quadrants are empty. This innovation stream also has an outlier: its configuration is conceptually coherent with the approach, but it does not present the majority of initiatives in the epiphany quadrant. For this reason, it will not be commented on any further in the text.

Eight innovation streams follow this innovation approach: (1) *mobile technologies,* (2) *indexing and collecting,* (3) *messaging,* (4) *conversion into purchases,* (5) *basic sharing,* (6) *connecting to anybody,* (7) *live content,* and (8) *location services.* Entry to the stream happens either with an epiphany or through imitation, while the first movers always open the stream with an epiphany.

For example, the innovation stream "*Conversion into purchases*" has been classified as one of the *balanced* streams, in that it has seen a continuous shift between technology epiphanies and consequent cycles of incremental innovations and imitations. For example, after the

Innovation approach	Innovation stream	Number of followers (companies)	Average number of players per cycle	Number of cycles	Number of cycles with just one (radical) innovation	Average number of innovations per cycle	Average duration of the cycle [months]
Balanced	Basic sharing	4.0	2.0	10.0	4.0	3.6	24.2
	Messaging	5.0	3.0	9.0	5.0	3.5	24.3
	Indexing and collecting	4.0	3.0	3.0	1.0	5.0	84.0
	Mobile technologies	7.0	2.8	5.0	1.0	2.8	29.0
	Conversion into purchases	3.0	2.3	4.0	1.0	4.0	17.5
	Live content	3.0	2.0	4.0	2.0	2.0	12.0
	Location services	3.0	2.3	4.0	1.0	4.0	17.5
	Connecting to anybody	5.0	4.0	2.0	0.0	4.5	57.0
	Average	4.25	2.49	5.13	1.88	3.68	33.19
	Standard deviation	1.39	0.44	2.85	1.73	0.95	24.69
Design-Oriented	Ephemeral content	3.0	2.3	3.0	0.0	4.3	30.5
	Social media as news sources	3.0	2.0	5.0	1.0	2.7	28.3
	Reactions	5.0	3.5	2.0	1.0	8.0	92.0
	Average	3.67	2.60	3.33	0.67	5.00	50.27
	Standard deviation	1.15	0.79	1.53	0.58	2.72	36.16
Technology-Oriented	Video content	4.0	3.0	2.0	1.0	4.0	31.0
	Average	4.0	3.0	2.0	1.0	4.0	31.0
Overall statistics along the 12 streams	Average	4.08	2.56	4.42	1.50	4.03	37.28
	Standard deviation	1.24	0.52	2.61	1.51	1.50	26.22

Table 5.
Overall analysis of the twelve Innovation Streams identified

introduction of "Buyable pins" on Pinterest, where users could click on the content they saved and be directly sent to the seller's website and purchase the product, other platforms have adopted the same possibility. For example, Instagram's clickable "Photo tags" on Instagram picture would similarly direct users to purchasing products on the seller's website.

Innovation dynamics

The analysis of the innovation matrix reveals different entry strategies, which can be classified as follows: (1) *design-driven first mover*, the firm opens a new innovation stream through a radical innovation of meaning, building on existing functionalities; (2) *incremental first mover*, the firm launches a new innovation stream, likely unknowingly, through an

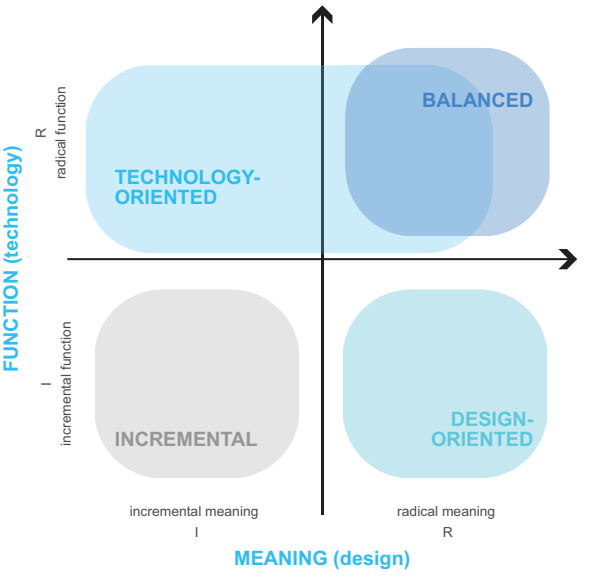

Figure 2.
Innovation approaches (adapted from Verganti, 2011)

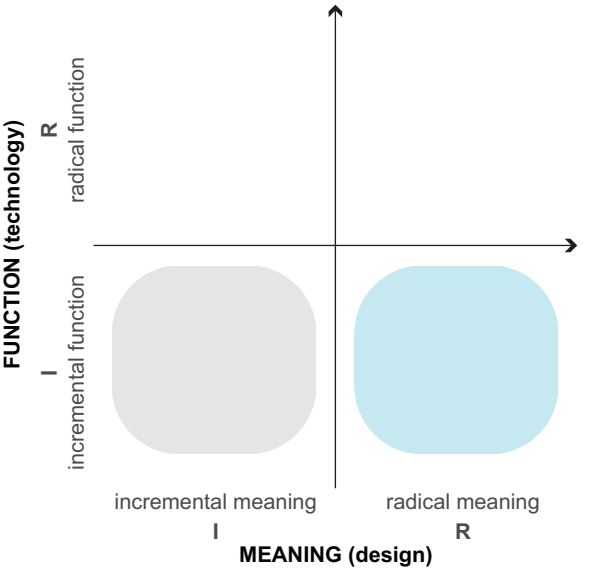

Figure 3.
Distribution of innovation in design-oriented streams

incremental functional advancement; (3) *technology epiphany first mover*, the firm opens a new innovation stream through a technology epiphany (summarized in Table 4).

Innovation streams that had a design-driven first mover all adopt a design-oriented innovation approach; for example, looking at the "*Ephemeral content*" innovation stream (see Table 2 and Figure 1), the innovations introduced and the origin of the stream lie mostly in shifts in the reason why users share on a given social media platform – i.e., sharing lower-quality images from their everyday life as they will disappear – rather than leveraging on

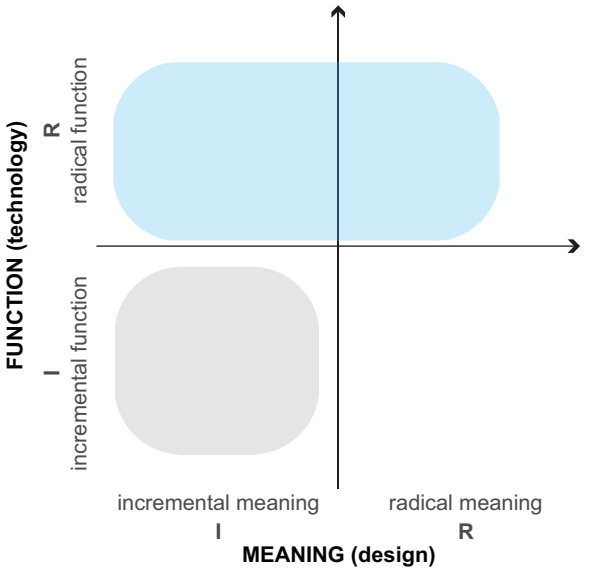

Figure 4.
Distribution of innovation in technology-oriented streams

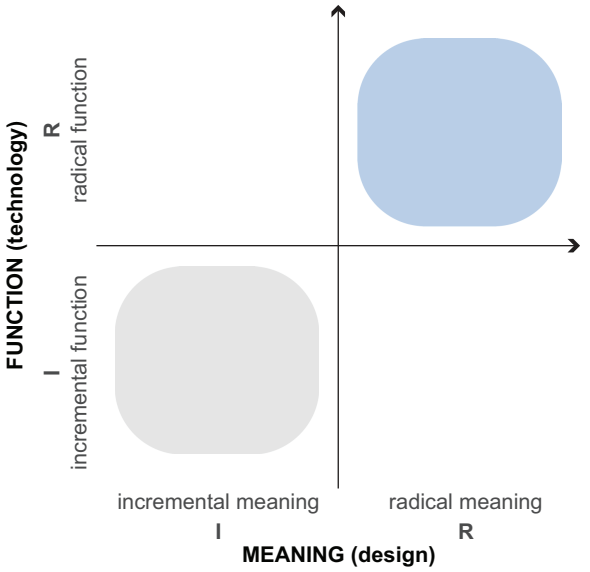

Figure 5.
Distribution of innovation in balanced streams

functional novelties. Innovation streams with a technology epiphany first mover all later result in balanced streams; an example is represented by the "*Conversion into purchases*" innovation stream, which has leveraged both a functional innovation – i.e., adding e-commerce functionalities to social media platforms – and an innovation of meaning – i.e., users visiting social media platforms to shop for specific items – to be created and furtherly imitated by other players in the market. Finally, streams with a technology-push first mover, seem to result in a technology-oriented setting, such as the "*Video content*" innovation stream,

born from the possibility of sharing videos to Facebook, which followed up with continuous and consequent functional innovations into each of the platforms involved.

The analysis draws a clear link between the entry strategy and the overall innovation approach followed by each stream.

Furthermore, the analysis of the dataset reveals even broader information (summarized in Table 5). The sample of 160 innovations sees the participation of eight players in total. However, only four players (with a standard deviation of 1,24), on average, take part in each innovation stream. This value is quite stable across the twelve innovation streams, with a slightly lower number of players in the design-oriented streams (average: 3,67). Moreover, an even smaller portion of the players takes part in the single cycles within the stream: on average 2,49 out of 4,25 for the balanced streams and 2,60 out of 3,67 in the designed-oriented ones. This behavior is also reflected in the technology-oriented stream (on average three out of four), although it is not possible to consider an average behavior.

The number of cycles – calculated as the number of radical innovations introduced after the beginning of the stream – is 4,42, considering a higher difference between the balanced and the design-oriented streams. The number of cycles following the second approach is lower than in the first (3,33 versus 5,13). Interestingly, the number of cycles with just one (radical innovation) – i.e., immediately followed by the start of a new cycle introduced by a new radical innovation – is significantly higher in balanced streams (1,88) than in design-oriented ones (0,69). Nevertheless, the average number of innovations per cycle is slightly lower in balanced streams (3,68 versus 5,00). The same observation is confirmed by the average cycle duration, being shorter for balanced streams (33,19 months) as compared to design-oriented ones (50,27 months), although in both cases, the standard deviations are significantly high.

Overall, it is interesting to observe how, on average, four companies are involved in all the streams (representing half of the considered sample), relying on approximately 4,5 radical innovations each (thus, cycles), making each cycle particularly brief in terms of number of incremental innovations (approximately four) and lasting on average three years.

Discussion

Our results explore the innovation dynamics where a meaning dimension of innovation exists, along with the technological dimension, and is relevant in defining a model for the observation of innovation. First, the results highlight aspects that challenge existing models. Moving from a purely technological perspective to a mixed perspective that encompasses both meanings and functionalities urges the need to update the traditional functional innovation models (e.g., Christensen and Bower, 1996; Tushman *et al.*, 1997) that represent new technologies as transient paradigms, constantly undergoing replacement by new generations entering the market. Second, the observation of two different dimensions of innovation at the same time underlines significant differences from previous models. The starting point of the analysis consisted in the identification of 12 different innovation streams within the same product: social media platforms. This, on the one hand, is inherent in the selected industry and product type: digital platforms give companies the possibility to leverage on their basic architecture to foster innovation in multiple, coexisting directions (Gawer and Cusumano, 2014). On the other hand, given the co-creational nature of the service experience (Ramaswamy and Ozcan, 2018), users may take part to the innovation of the service itself by customizing the way they experience it and autonomously introducing innovations according to their needs (Oliveira and von Hippel, 2011). As product and service meanings are proposals made by companies to their customers that leverage emerging socio-cultural trends (Verganti and Öberg, 2013), this autonomous way of experiencing services and user participation in their innovation process may be of particular relevance when dealing with service meanings leveraging a co-creational logic (Artusi and Bellini, 2020a).

These relevant differences hint for the need to update the existing models on innovation dynamics. As opposed to traditional models (Tushman *et al.*, 1997) that only observe one dimension of innovation and iteratively build on previous work, the opportunity to leverage on two dimensions of innovation lets different innovation streams co-exist and simultaneously evolve in the market (Figure 6). This is consistent with the interpretation of product meanings as proposals that companies make to users (Verganti and Öberg, 2013). Users may or may not accept them, pushing the market players to work on different levels (Trabucchi *et al.*, 2017) building modular designs that allow tailoring the product to each user's needs. To this extent, the chance to leverage a digital infrastructure– as in the case of the social media industry – enables the co-existence of different types of features within the same service, working as a platform (Gawer and Cusumano, 2014) where, various meanings can be created relying on scope economies, exploiting the value of different innovation streams for the same set of customers.

This section considers two main perspectives: (1) the triggers to new innovation streams as compared to traditional dynamic models and (2) the dynamics taking place within a single innovation stream as compared to traditional models, now considering the interplay between functionalities and meanings.

A first difference from the cyclical model presented by Tushman *et al.* (1997) consists of the triggers to the generation of new innovation streams. Existing models in innovation dynamics consider technological discontinuities or breakthroughs as the starting point of every new cycle. A remarkable observation resulting from our analysis of the social media industry is how the innovation of meaning can play a relevant role in the industry's dynamics. These triggers, alone or combined with a technological change, can foster innovation within the single stream, promote the beginning of new cycles or even give rise to new innovation streams. As a result, the observation of innovation dynamics within each innovation stream displays the coexistence of both functionality-based innovations and innovations based purely on a shift in meaning. This finding is consistent with previous research, confirming the existence of three different forms of innovation – i.e., technology push (Dosi, 1982), design-driven (Verganti, 2011), and market pull (Von Hippel, 1976), involving different aspects driving the introduction of an innovation.

Furthermore, it appears that, in design-oriented streams, the kind of innovation that gives rise to a new stream guides the innovation approach of the entire stream. In contrast, those streams started through a technology epiphany evolve in different directions – relying on both incremental innovations in functions and/or in meanings – resulting in an overall balanced strategy.

Traditional models on innovation dynamics (e.g., Abernathy and Utterback, 1978; Tushman *et al.*, 1997) portray the existence of a series of distinct phases: an era of ferment triggered by a discontinuity, followed by an incremental phase triggered by the emergence of a dominant design. The proposed analysis of the 12 innovation streams can contribute to innovation theory by enriching the models mentioned above: extending them on the one hand, while challenging some of their underlying assumptions on the other.

Every innovation stream contains, on average, four cycles, regardless of the stream's nature or whether the radical improvement involves functionalities or meanings. Previous studies were able to propose a clear distinction between the era of ferment and the era of incremental reworks. This phenomenon is hardly observable in this case as cycles are significantly shorter (including four innovations on average), leading them to be too short and without enough time to allow the emergence of a dominant design. This finding challenges previous studies that focused only on the technological domain (e.g., Abernathy and Utterback, 1978; Anderson and Tushman, 1990; Tushman and Anderson, 1986; Tushman *et al.*, 1997).

The main difference is related to the clear distinction between the era of ferment and the era of incremental change, as previous models (Anderson and Tushman, 1990; Tushman *et al.*, 1997) considered the two eras as separated by the emergence of a dominant design.

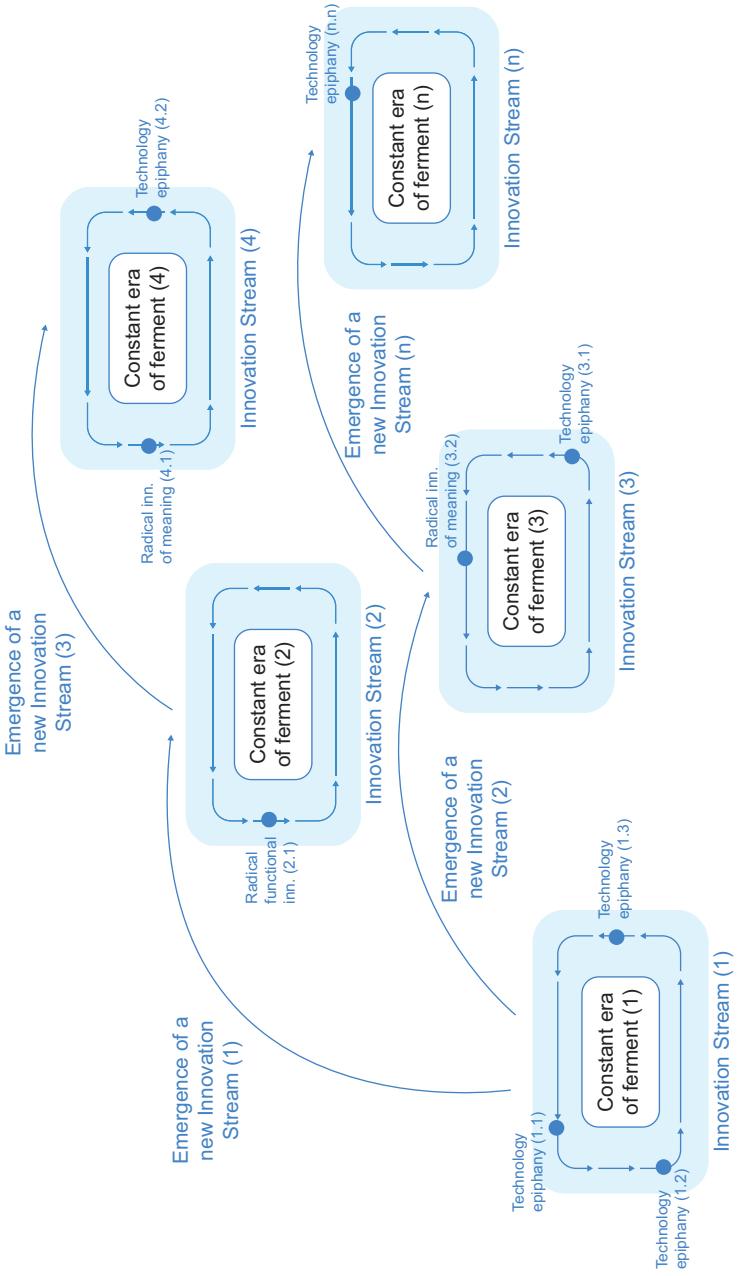

Figure 6.
A conceptual model for innovation dynamics

This observation may both mean that the dominant design has not been reached yet, leaving each stream in a constant era of ferment, or that the dominant design does not exist as none of the designs has been able to establish itself in the market. Considering the analyses performed on the innovation matrices, it is possible to observe how 11 innovation streams out of 12 show the highest incidence of interventions in the incremental-incremental area of the matrix. This finding indicates how, for both functional and meaning dimensions, the market players leverage on meanings and functions that were previously introduced in the market by other players or by themselves. At the same time, these incremental reworks are often followed by other radical innovations, creating a fast and continuous interplay between radical and incremental interventions along both dimensions. These findings contribute to blurring the concept of "dominant design", challenging what had previously been found in other industries (Cappetta *et al.*, 2006). There seem to be too many overlapping cycles to let a dominant design emerge, both at the industry level and at the single stream's level.

If traditional views on innovation dynamics describe how companies were used to fight against one another to establish their dominant design (e.g., Tripsas, 1997), companies can now focus on specific streams within the industry, possibly taking part in some of the innovation cycles.

These continuous reworks on both the technological and meaning dimensions are consistent with previous studies. They reflect how innovations previously introduced by competitors represent the basis for further innovations both in the technological domain (Tripsas, 1997) and in the meaning domain (Norman and Verganti, 2014). At the industry level, this rapid evolution and continuous improvement are extremely coherent with the shift from rigid to flexible product development models (Cooper and Sommer, 2016) and, more generally, to the agile methods and innovation approaches enabled by digital technologies (Downes and Nunes, 2014).

Figure 6 provides a conceptual model based on the findings of this study, taking inspiration from the original model of Tushman *et al.* (1997), while updating it by integrating the dynamics taking place on the *functional* dimension of innovation with a perspective on the *meaning* dimension. The model represents the industry, where multiple innovations streams (represented by the rectangles denominated "Innovation Stream") co-exist and evolve while, within each of the streams, an era of constant ferment takes place (as represented by the label) as multiple innovations unfold within the stream (represented the arrows and circles within each innovation stream). Different kinds of radical innovations take place in the different streams (represented by the circles and their denominations) relying on either innovation of meaning, function or both – i.e., technology epiphanies. These radical innovations are immersed in the constant era of ferment established within the innovation stream, where they are thus preceded and followed by several incremental innovations (represented by the continuous cycle of arrows). As the analysis is centered upon the innovation stream rather than the firms taking part to the industry, each cycle may involve multiple players from the industry as well as cover just one or both dimensions of innovation (meaning and/or functionalities). Nevertheless, as a new stream of innovation starts, with the introduction of a completely new functionality or meaning by one of the players, a new innovation stream emerges (as represented by the arrow "Emergence of a new Innovation Stream") without substituting the previous and extant ones but rather co-existing with them. Adopting this perspective, the original model (Tushman *et al.*, 1997) can be updated to better capture the complexity of the scrutinized industry and the innovation dynamics relying on the two different dimensions of innovation (Verganti, 2009, 2011). Our model also illustrates the way multiple meanings can co-exist in the same industry (Trabucchi *et al.*, 2017) and how the overall complexity and competition forces, leading to fast and continuous changes in the market (e.g., Downes and Nunes, 2014), hamper the emergence of a clear dominant design (Cappetta *et al.*, 2006).

Implications, limitations and future research

The present study sheds light on how innovation dynamics take place when also innovation in product and service meaning is involved. To do so, we gained insights from a field where both technological (e.g., Tushman *et al.*, 1997) and meaning (e.g., Verganti, 2009) dimensions play a crucial role in determining the product's adoption and evolution: the social media industry.

From a theoretical perspective, this research offers a contribution to the strong and grounded literature on innovation dynamics in the technological domain (e.g., Abernathy and Utterback, 1978; Tushman *et al.*, 1997), by integrating it with the growing literature on the innovation of meaning (e.g., Verganti, 2011). In particular, following insights from previous researches (e.g., Cappetta *et al.*, 2006; Trabucchi *et al.*, 2017), this article provides an updated model. It shows how different innovation approaches can co-exist in the same field, where different companies work in multiple innovation directions. Then, it shows how the speed, complexity and overlap of the industry dynamics make the emergence of a clear dominant design almost impossible, driven by the fast and continuous emergence of new cycles triggered by radical innovations. Hence, we propose that dominant designs and innovation cycles take place in "innovation streams", i.e., subsystems of innovation that concern comparable features of a given product or service, rather than at the product level. Within these streams, the introduction of different innovation approaches – i.e., technology-oriented, design-oriented or balanced between the two – causes the following incremental adaptation of different players in the market, until a company starts a new cycle.

As a conclusion, we propose a reflection on the generalizability of the results presented. The social media industry served the aim of this research by providing a paradigmatic empirical setting where the underlying service meaning has significantly evolved within a limited timeframe. Our results suggest that dominant designs do not emerge in such setting, due to the fast cycles of innovation characterizing the industry. Notwithstanding this, it is important to define the boundaries of contribution for these findings. As suggested by the literature on emerging technologies (Rotolo *et al.*, 2015), the nature of digital technologies, and in particular their pace of growth, may be held accountable for failure of the emergence of a dominant design. Still, this finding is in contrast with the original model on technological innovation (Tushman *et al.*, 1997) due to the high number of innovations introduced within a very limited timeframe. Nevertheless, the occurrence of this phenomenon – such as the impossibility to converge to a dominant design due to the co-existence and fast evolution of multiple, interconnected innovation streams – may provide valuable insights also beyond the social media industry. Indeed, our findings may be extended to all industries characterized by emerging technologies (Magistretti and Dell'Era, 2019; Rotolo *et al.*, 2015), sharing the same crucial features of this empirical setting. Furthermore, as previously mentioned, social media services act as platforms where providers can simultaneously deliver multiple services to several sets of customers while leveraging the same digital platform, leading to the creation of multi-sided platforms (Gawer and Cusumano, 2014). Multi-sided platforms may act as a catalyst for embedding multiple and co-existing meanings within a service (Dell'Era *et al.*, 2020).

More broadly, these considerations can serve as valuable for service industries that aim to propose multiple levels of experience (Artusi *et al.*, 2020) especially those that include a digital component in the service experience. In other words, the implications of this research may serve industries that are well beyond the social media industry, especially for platform-based industries, and industries characterized by emerging technology, that may undergo similar innovation dynamics, involving the rapid emergence and evolution of multiple co-existing meanings and innovation streams.

From a managerial perspective, this research can aid innovators connect two fundamental innovation approaches: technology push and design-driven. Indeed, managers should be aware of the chance to rely on both dimensions when attempting to generate an industry shift, being

conscious of its fast and relentless evolution. At the same time, this paper offers significant implications regarding strategic decisions on innovation. Given the lack of evidence on the emergence of dominant designs, managers may decide to focus on specific innovation streams and eventually sub-cycles within the stream. They know that they can leverage more than one stream at a time while not risking the chance to miss catching the wave of a new dominant design. Building on the previous reflections, managers in platform-based environments may benefit from the results of this research considering the co-existence of multiple meaning a relevant dimension to foster innovation, adding new sides, new value-added services and eventually embedding functions and meanings presented by other platforms in related value chains.

This research is not free from limitations. This represents a first attempt to update a consolidated model taking into consideration the complex and fast-changing environment of digital industries and two main dimensions of innovation. Therefore, the generalizability of the model is low, and future studies should dig into other empirical fields to test the discussed findings of this paper. Furthermore, no measures for performance are considered in this research, making it impossible to clarify whether the different approaches have different impacts on the cycles. As a consequence, future researches may consider this aspect, along with the relative relevance of the different innovation streams within an industry. In the end, although this research only analyzes eight companies, its focus is on the entire industry, rather than every single player's behavior. Another possible dimension of analysis for future research may consider the specific behavior of the different players involved.

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Annex

The Annex is available online for this article

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