Sticky market webs of connection – human and nonhuman market co-codification dynamics across social media

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Abstract

Purpose – Digital markets are increasingly constructed by an interplay between (non)human market actors, i.e. through algorithms, but, simultaneously, fragmented through platformization. This study aims to explore how interactional dynamics between (non)human market actors co-codify markets through expressive and networked content across social media platforms.

Design/methodology/approach – This study applies digital methods as cross-platform analysis to analyze two data sets retrieved from YouTube and Instagram using the keywords "sustainable fashion" and #sustainablefashion, respectively.

Findings – The study shows how interactional dynamics between (non)human market actors, co-codify markets across two social media platforms, i.e. YouTube and Instagram. The authors introduce the notion of sticky market webs of connection, illustrating how these dynamics foster cross-platform market codification through relations of exteriority.

Research limitations/implications – Research implications highlight the necessity to account for all involved entities, including digital infrastructure in digital markets and the methodological potential of cross-platform analyses.

Practical implications – Practical implications highlight considerations managers should take into account when designing market communication for digital markets composed of (non)human market actors.

Social implications – Social implications highlight the possible effects of (non)human market co-codification on markets and consumer culture, and corresponding countermeasures.

Originality/value – This study contributes to an increased understanding of digital market dynamics by illuminating interdependent market co-codification dynamics between (non)human market actors, and how these dynamics (de)territorialize digital market assemblages through relations of exteriority across platforms.

Keywords Digital market dynamics, Digital technology, Market codification, Social media, Algorithm, Assemblage theory, Digital methods

Paper type Research paper

1. Introduction

The digital transition of markets not only reconfigured the compositionality of market actors significantly but also disassembled markets into platformized, appified (Rogers, 2019), and therefore fragmented parts. Compositional reconfiguration of market actors refers to a shift in market authority and communication from traditional market agents, such as high profile brands, designers and magazines, to a more inclusive and complex assemblage of market actors, such as content creators, influencers or regular users (Caliandro and Gandini, 2016; Dolbec and Fischer, 2015). Even regular users' voices, (counter)narratives, (anti)stances, ethical and sustainable concerns accumulate and have a profound impact on a market level (Schöps *et al.*, 2020). However, platformization separates the digital market space into corporate "walled gardens" (Dekker and Wolfsberger, 2009), in which "a handful of tech companies [. . .] define the principles of a market-driven ecosystem" (Van Dijck, 2021, p. 2816), such as Google (YouTube), or Facebook (Instagram), segregating users and their distinct content in enclosed digital market spaces (Rogers, 2019). These enclosed digital market spaces "are fueled by data and governed by algorithms," constituting "platform ecosystems—an assemblage of networked platforms, governed by a particular set of mechanisms" (Van Dijck, 2021, p. 2804). Digital market spaces, therefore, fundamentally alter the foundations of market infrastructure, market actor compositionality and interactional dynamics between market actors, i.e. human, e.g. content creators and regular users, and nonhuman market actors, e.g. algorithms. This paper aims to investigate the role of different market actors in the dynamic formation of digital market assemblages within and across platforms.

Across platforms, user-generated content takes on multiple forms, ranging from forms of entertainment (Gannon and Prothero, 2018), influencer-driven advertorials (Abidin, 2016) and user-generated ads (Muñiz and Schau, 2007), to activist campaigns (Boyd *et al.*, 2016), depending on the distinct social media platform, and its "incentives" for its users. YouTube, for instance, promotes professional content creation by ad and YouTube premium revenue or channel memberships for content creators (Google, 2020), whereas the gates of Instagram are more inclusive toward regular users joining marketplace conversations (Schöps *et al.*, 2020). Despite facing platformized "walled gardens," distinct user groups are able to connect to and communicate with each other across platforms through a shared common interest and market understanding (Humphreys, 2010; Lusch and Watts, 2018) expressed by a shared market language and expressive networked content. Market language refers to the framing of a market-embedded and market-related social issue into platform jargon (Rogers, 2019), which is used to tag expressive networked content. This translatability of shared market language into platform vernacular renders social media market discourse interactive, fluid and plastic across platforms.

However, market agency cannot only be attributed to human market actors but also to digital technology such as machine learning algorithms. Agentic nonhuman entities, for example, co-create consumer experiences (Hoffman and Novak, 2018), shape algorithmic consumer culture (Airoldi and Rokka, 2019) or co-reproduce musical classification (Airoldi, 2021). Similarly, nonhuman entities are co-codifiers of market language, terminology and content; that is, market codification increasingly derives from interactional and interdependent dynamics between (non)human market actors. Nevertheless, research on digital market culture and dynamics mostly leaves this agentic role of digital technology and infrastructure implicit.

As a consequence, scholars recently call for research that offers a more nuanced, agentic view of technology in markets by "zooming in on the infrastructures of market meaning-making" (Nøjgaard and Bajde, 2021, p. 142). Airoldi (2021), for example, argues for "a comparative and more comprehensive understanding of the making and techno-social reproduction of cultural [market] boundaries (. . .) ideally through cross-platform

investigations" to account for "the changeability of algorithms and digital affordances." Accounting for the specificities of cultural market production and formation in and across digital ecosystems, this study applies an assemblage theoretical perspective (DeLanda, 2006, 2016) and digital methods (Rogers, 2019) to investigate how interactional dynamics between (non)human market actors co-codify markets across social media. This paper makes three important contributions. First, this study increases understanding of the enabling and constraining capacities of digital market technology and infrastructure for cross-platform market development. Second, this research illuminates how recursive interactions between (non)human market actors build networks of shared market understandings, connecting the enclosed, platformized parts to an overall market assemblage of networked platforms. Third, this paper advances understanding of user-driven market shaping, demonstrating how both professional and regular users contribute to market codification by collectively assembling, disseminating and circulating cultural market meaning through expressive networked content across social media.

To this end, the article, first, outlines digital markets as socially co-constructed systems of (non)human market actors and the theoretical lens used to describe (non)human market co-codification dynamics across social media, and lays out the research context and procedure. Second, the findings empirically illustrate (non)human market co-codification across social media. Third, a discussion and implications for practice, society and research summarize the main contributions and theoretical advancements of this study.

2. Literature review

Markets can be understood as socially constructed, self-reproducing networks of parts, where repeated exchange takes place under the governance of (in)formal rules and cultural understandings guiding interactions and relations (Fligstein and Calder, 2015; Vargo *et al.*, 2017). As such, markets constitute complex social systems in which "discursive negotiations among and practices of multiple stakeholders including a market-shaping consumer" (Giesler and Fischer, 2017, p. 3) result in a shared market understanding (Lusch and Watts, 2018). Prior research on the constitution of market discourse suggests that market meaning and understanding are dynamically shaped through collective framing of cultural codes and market categories among market actors (Blanchet, 2018; Holt, 2012). Moreover, shifts in semantic categories lead to changes in market meaning that, in turn, influence cultural concepts and consumption practices (Humphreys, 2010). Also, research acknowledges users' influence on the formation and shaping of market understanding (Harrison and Kjellberg, 2016), for instance, when they seek to change market representations and transform market meanings through identity work (Ulver, 2019).

Recent research frames social media as enablers of market interaction by empowering users' role in the marketplace (Lamberton and Stephen, 2016). Yet, only a few studies elaborate on the actual relevance of social media and its users in market shaping. For instance, user innovation research sheds light on the mediating role of social media in the creation and qualification of exchange objects and services (Muninger *et al.*, 2019), whereas user-driven market-shaping studies acknowledge the central role of, for example, fashion bloggers in institutional work, the reinforcement of institutional market logics and the unsettlement of institutionalized market practices (Dolbec and Fischer, 2015; Scaraboto and Fischer, 2012). However, these research streams only grant social media either an enabling or mediating role of user-driven framing and shaping of cultural codes and semantic categories attached to markets but do not account for the increasingly agentic role of digital technology and infrastructure in these market dynamics.

Social media and other digital entities are not just enablers and mediators of socioeconomic, cultural and political interactions that impact markets but, in fact, active organizers and drivers of both interactional and communicational infrastructure and market actor composition (Nieborg and Poell, 2018). Nonhuman market actors increasingly receive scholarly attention as agentic entities. Hoffman and Novak (2018) theorize smart objects as nonhuman actors that actively impact individual consumption behavior and experiences. Likewise, algorithms constitute an active nonhuman workforce, shaping shared understandings of the world (Kitchin, 2017) by controlling the visibility of culture as curators and gatekeepers, and can therefore be considered as key authorities in taste- and preference-making (Beer, 2013; Roberge and Seyfert, 2016; Wu et al., 2019).

Nevertheless, nonhuman and human activities are inherently intertwined. On the one hand, content recommendation algorithms apply machine learning based on aggregated behavioral patterns of social media users (Airoldi et al., 2016; Covington et al., 2016). On the other hand, content creators theorize how algorithms work and adopt a promotional mindset to optimally cater their content to algorithms (Carah and Brodmerkel, 2020; Cotter, 2019; Wu et al., 2019). For example, by using specific hashtag vernacular, content creators not only join affordance-mediated conversations but also redesign their expressive networked content to be better recognized and distributed by algorithms. These entangled (non)human activities eventually result in "a recursive loop between the calculations of the algorithm and the "calculations" of people" (Gillespie, 2014, p. 183), forming bubbles and algorithmic consumer cultures (Airoldi and Rokka, 2019; Carah and Brodmerkel, 2020) produced by iterative cycles of user and machine actions and corresponding responses. Algorithmic cultures manifest in vast clouds of expressive and networked cultural codes that echo with people, digital technology and infrastructure on a market level.

The present study aims to investigate these clouds of expressive and networked cultural codes as digital manifestations of market meaning and understanding across social media by drawing on an assemblage perspective. In doing so, this study focuses on how interactional dynamics between heterogeneous arrangements of (non)human market actors co-codify markets across social media.

3. An assemblage perspective on market codification on social media

Assemblages are heterogeneous arrangements or groupings of entities, consisting of emergent properties and capacities (DeLanda, 2016). As such, assemblages evolve from continuous interactions between their parts, that is, "people and the material and expressive goods people exchange" (DeLanda, 2006, p. 17). These interactions can either territorialize or deterritorialize the identity of an assemblage (DeLanda, 2006). Digital market assemblages are particularly interesting, as these assemblages do not only derive from human-human interaction but also increasingly from recursive human-nonhuman interaction (Hoffman and Novak, 2018). Assemblage theory reemphasizes sociomateriality, that is, the co-constitution of human and nonhuman actors as "humans are always in composition with nonhumanity, never outside of a sticky web of connections or an ecology" (Bennett, 2004, p. 365). In particular, a flat ontology perspective (DeLanda, 2016) helps to identify different modes of organization involved in co-codifying digital market assemblages whereby (non)human market actors both "mod(e)ify" and are modified by the other" (Bennett, 2010, p. 22). Flat ontology grounds all involved entities on the same ontological level – only differentiating their "spatio-temporal scale" (DeLanda, 2002, p. 51). Accordingly, any given arrangement (original text: (fr.) agencement) of human, i.e. content creators, or regular users, and nonhuman market actors, i.e. algorithms, or hashtags, creates agency (DeLanda, 2016) as "agency always depends on the collaboration, cooperation, or interactive interference"

(Bennett, 2010, p. 21) of multiple entities. In the context of this study, assemblage theory helps to account for the agentic nature of digital market assemblages, where "different actors, agencies, materialities, and relations" (Bode and Kjeldgaard, 2017, p. 253) come to interact and interfere with each other.

Furthermore, assemblages are defined along two axes – the material and expressive capacities of components axis and the territorialization and deterritorialization axis (DeLanda, 2006, 2016). The first axis refers not only to concrete material entities, such as physical products or consumers but also to the material capacity of social media platforms to support market actors in their effort to seek market change (Parmentier and Fischer, 2014; Scaraboto and Fischer, 2012). Expressive capacities refer to human market actors' content consisting of textual and visual narratives, and networked contextualization and categorization of content, e.g. via hashtags (Caliandro and Gandini, 2016). The second axis specifies the "determination of the spatial boundaries of the whole" (DeLanda, 2016, p. 22) or the extent of homogenization of the assemblage parts. In other words, the identity of an assemblage is more territorialized, the higher the density of an assemblage; and more deterritorialized, the higher the heterogeneity of an assemblage as a whole (DeLanda, 2016). For example, market deterritorialization occurs when market actors challenge "dominant market forms, ideologies, and/or practices" (Nenonen *et al.*, 2014, p. 9) through constant interaction, negotiation and exchange of shared understandings (Geiger *et al.*, 2012; Lusch and Watts, 2018). Deterritorialization renders boundaries between parts of the market assemblage more fluid and plastic (Nenonen *et al.*, 2014). Assemblages exhibit relations of exteriority, implying that parts of the whole are autonomous and "can be detached from one whole and plugged into another one, entering into new interactions" (DeLanda, 2016, p. 10). These (de)territorialization dynamics are not only induced by human market actors but also mediated by nonhuman actors, i.e. algorithms, or hashtags (Schöps *et al.*, 2020). Finally, the identity of an assemblage is determined by degrees of coding and decoding (DeLanda, 2016).

(De)coding refers to the openness of an assemblage to change, or, put differently, to "specialized expressive components" (DeLanda, 2016, p. 24) that fix an assemblage's identity by (de)legitimizing rituals, regulations, rules, norms or standard procedures. In this study, (de)coding involves the demarcation of markets by (non)human market actors via associative or dissociative market language and networked content generation (Wood, 2020).

Consequently, assemblage theory enables not only to investigate the composition of markets (Canniford and Bajde, 2016) but also the interplay between all entities within a market assemblage. By navigating along these theoretical cornerstones, we illuminate market codification dynamics across social media, induced by interactions between (non) human market actors – content creators, influencers, regular users, algorithms and hashtags. As a research context, we chose to analyze transformative (non)human co-codification dynamics in the fashion market, manifested in expressive clouds of market language and networked content across social media, and how these codifications enable and constrain the market as a whole.

4. Empirical study
4.1 Research context
The fashion industry has experienced tremendous growth in the past 20 years, mainly pushed by business practices subsumed under the label "fast fashion," i.e. continuous trend-spotting, and subsequent quick implementation of trendy designs, short production and distribution lead times and extensive demand creation and marketing efforts (Cachon and Swinney, 2011). Many market actors have followed pioneers, such as Zara or H&M, that

established fast fashion as the dominant business model in the market (Kim *et al.*, 2013). However, these practices are increasingly scrutinized due to fast fashion's exploitation of people and the environment, which, in turn, fuels public discourse, raises awareness among critical consumers and opens the market to sustainable alternatives (Ertekin and Atik, 2015).

As a consequence, the fashion market is experiencing radical rethinking, manifesting in environmental, prosocial, slow fashion, reuse, recycling, cruelty-free and anti-consumption and anti-production practices (Mukendi *et al.*, 2020). One key driver that spreads and fosters rethinking and subversion of dominant market practices is digital technology (Schöps *et al.*, 2020). Recent research emphasizes the centrality of social media in the transformation of the fashion market towards a more sustainable form (Han *et al.*, 2017; Strähle and Gräff, 2017), suggesting that exposure to sustainable fashion content and related consumer engagement on social media platforms drives consumers' attitudes and values. Shifting attitudes and values, in turn, not only affects consumption behavior but also market norms (McKeown and Shearer, 2019).

Adding to these findings, the present study uses the digital transformation of the fashion market as a context to investigate interactional market co-codification dynamics between (non)human market actors across the two most relevant social media platforms for fashion – YouTube and Instagram (Gannon and Prothero, 2018; Sokolova and Kefi, 2020). On the human side, content creation on YouTube constitutes professional labor, premising expertise in video production, storytelling, postproduction as well as the use of costly hard- and software, and high-end video equipment. On the nonhuman side, algorithms drive more than 70% of the time users spend watching content on YouTube (Solsman, 2018). Applying deep neural networks technology (Covington *et al.*, 2016), the main data input for machine learning algorithms comprises both individual and collective user behavior.

Contrary to YouTube, entry barriers for content creation on Instagram are rather low (i.e. easy-to-use, built-in image editing tools) enabling regular (nonprofessional) users to conveniently join marketplace conversations (Schöps *et al.*, 2020). However, Instagram does not generate internal income streams for users. Users who aspire to generate income streams on Instagram have to push their attentional capital to generate external income streams through collaborative, influencer-esque advertorials for brands. Similar to YouTube, algorithms on Instagram curate user feeds but only by assembling posts of followed accounts in a nonchronological order, based on content engagement and personal preferences. Nonfollowed, algorithm-curated content is only recommended to users in the explore feed to which users have to deliberately switch.

4.2 Research procedure
As an analytical framework, this study applies digital methods in the form of a cross-platform analysis (Rogers, 2019) to investigate how (non)human market actors co-codify sustainable fashion through interactive interference across social media (Figure 1). "Digital methods" is "an umbrella term for tool-based methods used in the digital humanities and e-social sciences" (Rogers, 2019, p. 203). These tool-based methods allow to analyze natively digital objects and content that frame market dynamics in digital market assemblages (Schöps *et al.*, 2020). Digital methods follow a mixed-method approach, that is, a "quanti-quali approach" (Venturini *et al.*, 2014) in which an initial computational analysis is subsequently followed by "a qualitative close reading of the data" (Niederer, 2016, p. 111). Digital methods propose a "search as research" paradigm. Therefore, the first step is to identify keywords – so-called issue language – that is, "the terms employed by the actors" (Niederer, 2016, p. 36) to express a social issue in platform vernacular. In the context of this study, issue language takes on the form of market language, i.e. a distinct language that

Figure 1.
Research procedure
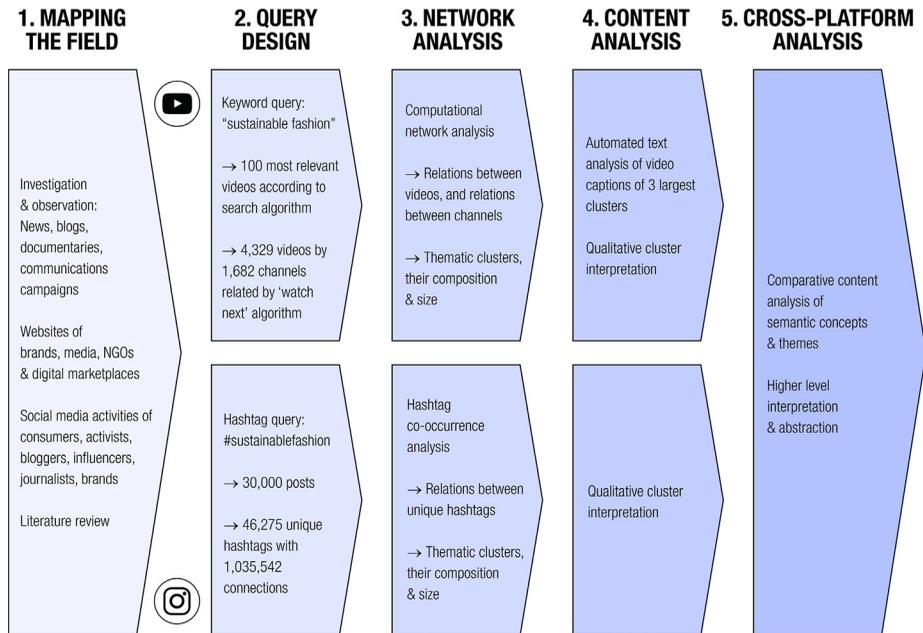
allows market actors to express practices and issues in the form of semantic concepts and themes that are either tied to fast or sustainable fashion. The identification of the most dominant keyword in this language informs the subsequent query design (Rogers, 2019).

In the first step, we observed and investigated all relevant media, ranging from news, blogs, websites and documentaries to social media to become familiar with sustainable fashion market language and determine the most dominant keyword in this market language (Figure 1). To substantiate dominant keyword identification, we conducted an extensive literature review. Literature on sustainable fashion is widely distributed across management research and renders sustainable fashion approaches under labels such as ethical fashion, eco fashion, slow fashion or green fashion. However, we identified the term "sustainable fashion" as the most dominant umbrella term, keyword, respectively. A systematic literature review on sustainable fashion including 465 research papers by Mukendi *et al.* (2020) confirmed the keyword analysis.

The second step of a digital methods approach is then to set up a query design, using the identified keyword(s) for data collection. For this study, we conducted a cross-platform analysis, consisting of two query designs, and, correspondingly, collected two "natively digital" data sets from YouTube and Instagram. We investigate YouTube as a network of content producing and diffusing market actors, that is, algorithms and professional content creators that produce (nonhuman-made) recursive loops of (human-made) content for consumption, and Instagram as a network of regular users (Caliandro and Gandini, 2016) that mirrors the extent of how (non) human-induced market co-codifications – in this study market codification of sustainable fashion – are internalized by and resonate with this user group.

4.3 Query design data set 1
We collected the YouTube data set using YouTube Data Tools (Rieder, 2015) in February 2020. First, we explored videos that are presented to users by YouTube search engine, which

is "[. . .] a socioalgorithmic process involved in the construction of relevance and knowledge around a large number of issues" (Rieder *et al.*, 2018, p. 52), where users define their search with specific keywords, and ranking and recommendation algorithms define the search results (Rieder *et al.*, 2018).

In doing so, we performed a single keyword query with the keyword "sustainable fashion" to generate a list of the top 100 YouTube videos based on their "relevance" according to the YouTube search algorithm. To disclose as little individual information as possible to algorithms, we used a research browser, i.e. a separate instance of a browser (in our case Firefox), allowing to clean cookies, and ensuring disentanglement from Google (Rogers, 2019). Therefore, the results are predominantly based on aggregated viewing behavior and user engagement data which determines the visibility of content and its creators. Subsequently, YouTube Data Tools helped to identify those videos that are related by recommendations created by the YouTube "watch next" algorithm. Data collection on YouTube resulted in a final sample of 4,329 videos published by 1,682 channels (content creators). The videos have an average view count of 2,062,381 and an average number of likes of 20,147, illustrating that the content is produced by professional content creators.

4.4 Analysis data set 1

Data analysis encompassed a networked content analysis (Niederer, 2016). First, we used the open-source software Gephi (Bastian *et al.*, 2009) to perform computational network analysis of the YouTube data. Computational network analysis investigates relations between videos and relations between channels. Specifically, we calculated network statistics and visualizations for both networks. In the video network, we used the modularity class algorithm (no edge weight, resolution 1.0) (Brandes *et al.*, 2008) to visualize thematic clusters of densely connected nodes (videos). To highlight the most visible videos, node size was adjusted according to in-degree level – a centrality measure based on the number of links directed toward a node (Yang *et al.*, 2016). To enhance readability, we filtered out nodes with less than 50 links. The final video network graph comprises the 327 most visible videos (node visibility: 6.64%). In the channel network visualization, we adjusted node size according to network centrality – the bigger the node size, the more connections, and, therefore, the more centrality in the network – and defined a degree cutoff level of 20, resulting in 16.94% node visibility, i.e. 285 nodes.

Second, we ran an automated text analysis (Humphreys and Wang, 2018) on the video captions of the three largest content clusters to identify market codification in the form of recurring semantic concepts and themes. Furthermore, we manually categorized videos and meta data to grasp the essence of semantic concepts and themes within the clusters (Niederer, 2016). In the content creator network, we manually coded channel categories, i.e. types of content creators, and used colors to visually separate them. To ensure trustworthiness, the authors formed an interpretive group, where each author coded the data independently. Subsequently, constant comparison, both individual and within the interpretive group, eliminated inconsistencies and established consent (Spiggle, 1994).

4.5 Query design data set 2

We collected the Instagram data set by running the InstaCrawlR scripts in RStudio (Schröder, 2018). On Instagram, the keyword takes on the form of the hashtag. Therefore, we translated the initial keyword into Instagram platform vernacular, that is, hashtag vernacular (Rogers, 2019). We then performed a single hashtag query for #sustainablefashion and downloaded a meta data set of 30,000 postings in April 2020 to capture the "effects" of professional YouTube content on regular users on Instagram,

manifesting in hashtagged co-codifications. The meta data set contained post ID, URL, number of likes, post owner ID, caption and the date of the post. In contrast to professional YouTube content, the content of the Instagram data set is mostly created by regular users (Caliandro and Gandini, 2016, p. 142), illustrated by a likes mean of 73, a median of 23, respectively.

4.6 Analysis data set 2

Similar to analysis of data set 1, we performed a networked content analysis. First, we conducted computational analysis in the form of a hashtag co-occurrence analysis on the Instagram data (Marres and Gerlitz, 2016). A hashtag co-occurrence analysis "allows for the characterization of hashtags in terms of how they are networked associatively with other hashtags" (Niederer, 2016, p. 106). In doing so, we extracted the co-occurring hashtags, e.g. #slowfashion #ethicalfashion, from the meta data set by using a Python script. Using Gephi, we calculated network statistics, encompassing average degree (frequency of hashtags), modularity class algorithm (no edge weight, resolution 1.0) (Brandes *et al.*, 2008) and eigenvector centrality algorithm (100 iterations) (Benson, 2019). We used the modularity class algorithm for color partition, and eigenvector centrality for node and label size – the bigger the node and label size, the more important the hashtag in the network. To enhance legibility, we filtered the network by setting the degree cutoff level to 115, resulting in 5.08% node visibility, i.e. 2,352 nodes.

Second, we manually categorized the clusters from computational analysis to grasp the essence of semantic concepts and themes within the clusters. Trustworthiness measures were identical to the analysis of data set 1.

4.7 Cross-platform analysis

After having categorized semantic concepts and themes from both data sets, we performed a comparative content analysis (Niederer, 2016; Rössler, 2012). Comparison of the semantic concepts and themes from the automated text analysis of the YouTube data set and the hashtag co-occurrence analysis of the Instagram data set unveiled cross-platform codification dynamics. We identified recurring word combinations and stems as semantic concepts and themes and compared them between both data sets. As such, cross-platform analysis involved higher level interpretation and abstraction to grasp the essence and core of cross-platform codification dynamics (Spiggle, 1994).

5. Findings

The findings of this study uncover how the enabling and constraining capacities of digital technology and infrastructure not only facilitate platform-specific (non)human market co-codification dynamics but also rhizomatous spread (Deleuze and Guattari, 1980) of these market codifications across platforms, gluing together the constituent parts of the market through sticky market webs of connection (Bennett, 2004). Consequently, (non)human market co-codification dynamics render the corporate "walled gardens" (Dekker and Wolfsberger, 2009) of digital market spaces fluid, and thus contribute to a homogenization of the fashion market assemblage as a whole (DeLanda, 2016). Table 1 summarizes how these capacities enable and constrain each (non)human market co-codification dynamic.

In the following, we illustrate these (non)human market co-codification dynamics in detail. First, we present interactional network dynamics between content creators and recommender algorithms on YouTube. Second, we present interactional network dynamics between regular users and hashtags on Instagram. Third, we outline the interrelations between market codifications on both platforms, i.e. how (non)human market

Dynamics	Enabling	Constraining
Curating and gatekeeping	Algorithms enable thematic clustering of trending content and topics, increasing visibility by recommending this content to users whose content preferences match these themes	Algorithms constrain creative freedom by limiting recommendations to trending types of content, creating market bubbles that entrap users in closed loops of homogenous content
Catering	Algorithms enable increased reach and relations for users who follow the content codex of algorithms	Algorithms constrain content creation by "demanding" to obey the content codex
Lexical codex creating	Algorithms enable human market actors to create and diffuse a homogeneous lexical codex containing semantic concepts and themes	Algorithms constrain content creators to stick to established entries of the lexical codex
Contextualizing	Hashtags enable the definition of the context of content, users to interact with a certain social context and meta-communication	Hashtags constrain the uniqueness of content as users are required to tag content with dominant hashtags related to specific contexts
Self-categorizing	Hashtags enable users to define the semantic concepts and themes attached and related to their content, framing a discursive market space	Algorithmic hashtag recommendation constrains users in defining semantic concepts and themes by providing predefined, prevalent concepts
Unifying	Hashtags enable user unification through their function as participatory objects, i.e. umbrella terms under which regular users can gather and contribute content	Hashtags constrain user unification to a small amount of or even a single hashtag. Users that do not use these hashtags are virtually excluded from participation
Archiving	Hashtags enable linking of content to corresponding archival hashtag feeds which gather and store all content tagged with a specific hashtag, are browsable and followable	Hashtags constrain linkage of content only to those hashtag feeds that function as content catalysts in terms of visibility
Scaling	Algorithms enable scaling of content by leveraging trending hashtags, leading to increased visibility. Algorithms enable recommendation of trending hashtags to users posting with related hashtags	Algorithms constrain scaling only to trending hashtags, i.e. hashtags frequently used. Hashtags of small interest groups remain obscure

co-codifications, digital technologies and infrastructure create sticky market webs of connection through shared market language and expressive networked content across the trenches of platformized social media.

5.1 Market co-codification dynamics on YouTube

5.1.1 Curating, gatekeeping and catering. Our study finds two interrelated market co-codification dynamics in (non)human market actors' interactions on YouTube, affecting visibility of content and agency of content creators – *curating and gatekeeping,* and *catering*. By acting as curators and gatekeepers, algorithms, first, decide what kind of content is seen by viewers and, second, only put the limelight on selected content creators who follow trending types

of content. This dynamic becomes apparent in the analysis of the most recommended videos. Analysis reveals that most recommended videos are dominated by two content creator groups – influencers and media outlets – promoting only a few influential genres. Figure 2 exhibits the most relevant content creators.

Influencers make up the largest share of visibility (68.14%), underlining their dominant voice (Rogers, 2019) in the sustainable fashion market assemblage on YouTube. Media outlets are in second position with a 17.98% share of visibility. Other clusters are of minor relevance, encompassing brands (3.47%), Non-Governmental organizations (NGOs) (2.52%), education (2.21%), business service providers (1.58%), celebrities (1.89%), retailers (1.26%) and events (0.95%). Interestingly, brands only play a subordinate role in the network despite sustainability playing an increasingly important role in brand positioning and communication (Han et al., 2017; Strähle and Gräff, 2017). Figure 2 also indicates a strong in-group interrelation among influencers with only a few out-group relations, such as linkages to media, models, celebrities or events. However, media outlets are more interconnected, being related to almost all other creator groups in the network. These relations suggest different behavioral patterns of users; for instance, some users primarily watch influencer content while users watching media content are more open to a wider range of video content. Moreover, the centrality and dominance of influencers in the network point to their know-how of the content creation that appeals to both their target audience as well as algorithms (Berman and Katona, 2020; Carah and Brodmerkel, 2020; Wu et al., 2019).

Figure 2.
Network of most relevant content creators on YouTube

As such, nonhuman *curating and gatekeeping* triggers a related market co-codification dynamic – *catering*. *Catering* necessitates human market actors to subscribe to a "content codex," containing content templates assembled of algorithm-pleasing genres, styles, formats and factors (Cotter, 2019). These algorithmic content templates enable increased content visibility, however, at the cost of creative freedom. Figure 3, in which the numbers refer to distinct modularity clusters, visualizes the network of most successful and, consequently, most visible videos, i.e. content templates, which the YouTube recommendation system presents to users exploring sustainable fashion content.

The largest cluster (16.19%; nr. 18) is predominantly composed of influencers, presenting styling tips and latest fashion trends. Only 1 out of the top 10 videos was created by a different market actor – a retailer – yet, format-wise in an influencer-esque manner. The second-largest cluster (15.15%; nr. 2) consists of editorial content, raising awareness for fast fashion-related issues (e.g. production and consumption) as well as innovative ideas to overcome them. The third-largest cluster (9.47%; nr. 23) is also composed of influencer content, mostly featuring sustainable lifestyle how-tos. These main clusters are strongly related within but also among each other, suggesting that user groups predominantly stay within a genre, whereas others are switching. The fourth largest cluster (7.84%; nr. 6) solely contains technology, entertainment, design (TED) Talks. This cluster is isolated from most clusters in the network. A considerable number of ties only exists with cluster nr. 2 (awareness-raising editorials). Furthermore, the network also
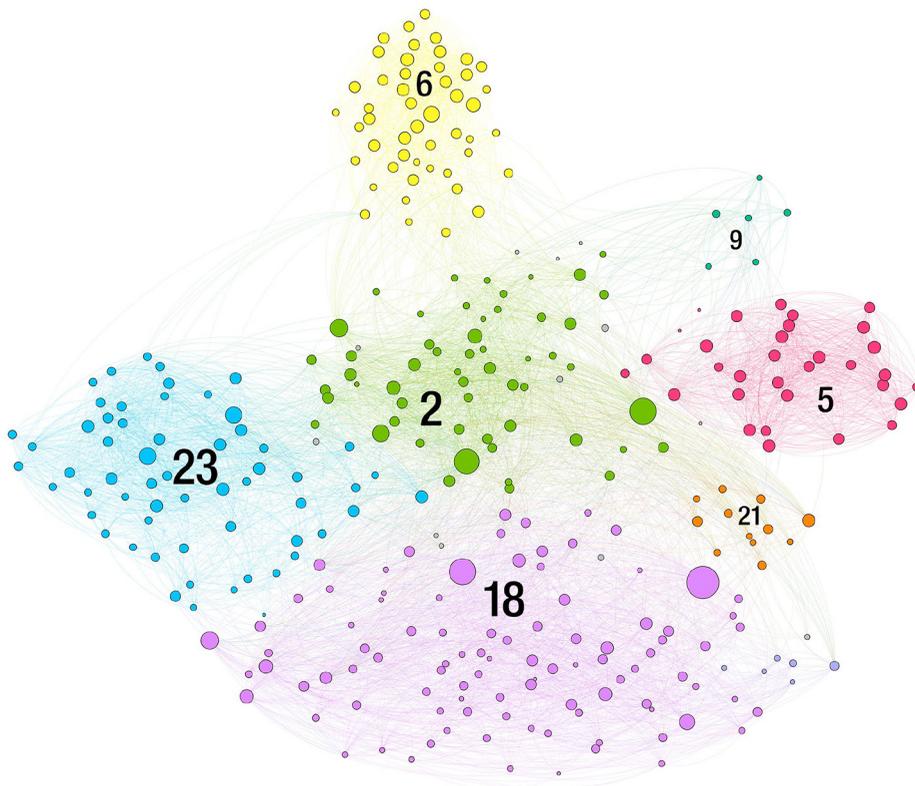

Figure 3.
Network of most
visible videos on
YouTube

contains promotional clips of fashion models (7.8%; nr. 21), fashion industry reports (4.63%; nr. 9) and fashion shows (2.52%; nr. 5).

A holistic view of Figures 2 and 3 illuminates the interrelatedness and recursivity of *curating and gatekeeping*, and *catering*. That is, both figures are the result of a recursive interplay between content creators who excel in *catering* their content to the taste of algorithms, algorithms which *curate and gatekeep* specific types of content and users, who view and engage with curated content, providing behavioral data (e.g. view count and duration or skipping behavior) as input for algorithmic calculation. For example, the isolated position of cluster nr. 6 in Figure 3 indicates that users watching a TED Talk are likely to be recommended to watch another TED Talk. In contrast, findings demonstrate a higher interrelation between the influencer-dominated clusters nr. 18 and 23, creating cross-cluster cyclical loops of influencer-driven advertorials, or editorials (Abidin, 2016).

Eventually, these interwoven, recursive market co-codification dynamics result in homogenization and territorialization (DeLanda, 2016) of the sustainable fashion assemblage on YouTube, constraining both the variety of content and cultural codes presented to users. In other words, YouTube's algorithmic workforce plugs related content creators and their content into clouds of inherently homogeneous thematic parts that not only relate to and connect with other parts of the market assemblage but, ultimately, also form the market assemblage as a whole (DeLanda, 2016). Thus, algorithms constitute key agents in this homogenization and territorialization of market assemblages, possibly resulting in filter bubbles (Berman and Katona, 2020), or, in the present case, "market bubbles" which entrap users (Seaver, 2019) in closed, cyclical loops of homogenous, market territorializing content.

5.1.2 Lexical codex creation. Zooming into the actual content elicits another market co-codification dynamic, affecting creation, diffusion and establishment of market language – *lexical codex creation.* That is, human market actors create a codex, containing lexical entries and semantic concepts and themes, to frame a universal sustainable fashion market language. Figure 4 shows the most commonly used lexical semantic concepts and themes in the largest cluster (nr. 18) of the network of most visible videos.

We identify two opposing narratives in this cluster, both dealing with a core concept of fashion at first sight – dressing and styling tips. One narrative is framed by culturally coded

Figure 4.
Word cloud of most frequent video title phrases in Cluster 18

rituals of fast fashion, promoting seasonal trends (e.g. "fashion trends" or "2020 fashion") or excessive consumption (e.g. "clothing haul" or "Zara haul"). The other narrative draws on a semantic counter-concept, postulating deconsumption without sacrificing creative mix-and-match outfit assembly – the "capsule wardrobe." The capsule wardrobe is a small, well-curated wardrobe, consisting of versatile, high-quality fashion pieces. As such, the semantic concept of the "capsule wardrobe" decodes the fast fashion narrative at its core, deterritorializing the identity of the fast fashion market assemblage while simultaneously recodifying the market assemblage more sustainably. However, both narratives are located within the influencer-dominated content cluster, causing not only an in-group deterritorialization among influencers but also rendering the fashion market, which is dominated by influencer-driven advertorials (Abidin, 2016), more fluid and open to change dynamics.

Similar to cluster nr. 18, the third biggest cluster (nr. 23) is mainly composed of influencer-generated content but, in contrast to cluster nr. 18, solely contains lexical entries and semantic concepts and themes that aim to decode and recodify the market, i.e. raising concerns about fast fashion consumption practices while suggesting sustainable alternatives. The word cloud in Figure 5 represents the most commonly used lexical semantic concepts and themes in cluster nr. 23.

The videos in cluster nr. 23 promote sustainable forms of consumption by adding dissociative semantic concepts and themes (Wood, 2020) to the lexical codex, such as "low waste" or "anti haul," demarcating sustainable from fast fashion. Further semantic concepts, e.g. "DITL" (day in the life) or instructive how-tos (e.g. "10 things") guide users toward a sustainable lifestyle and help them to resolve the dissonance between adhering to sustainable principles while still gaining personal value through fashion consumption. These codifications homogenize the sustainable consumption codex, territorializing the identity of the sustainable fashion market assemblage. Yet, these codifications also constrain consumer behavior by establishing a clear code of conduct for sustainable consumption. Influencers, for instance, not only establish visibility for a specific market discourse but also foster the "downward causal influence that wholes, once constituted, can exert on their parts" (DeLanda, 2016, p. 18).

In contrast to the lifestyle- and consumption-oriented content of influencers in clusters nr. 18 and 23, cluster nr. 2 is mainly dominated by media (Figure 6). We find that media also

Figure 5.
Word cloud of most
frequent video title
phrases in Cluster 23

contribute to *lexical codex creation* through investigative journalism that directly addresses and dismantles environmentally damaging and unethical business practices of fast fashion and campaigns for change.

Thereby, media partake in demarcating parts of the fashion market assemblage, territorializing the identity of the sustainable fashion market assemblage while simultaneously deterritorializing the identity of the fast fashion market assemblage. As such, *lexical codex creation* not only homogenizes the sustainable fashion vernacular and grammar (Gibbs *et al.*, 2015) but also guides sustainable consumer behavior. However, this homogenization simultaneously constrains content creators to well-established entries of the lexical codex.

5.2 Market co-codification dynamics on Instagram
5.2.1 Self-categorizing and contextualizing. Analysis of (non)human market actors' interactions on Instagram exhibits two interrelated market co-codification dynamics, affecting framing and delimitation of discursive market space – *self-categorizing* and *contextualizing*. Human market actors partake in market codification (DeLanda, 2016) through *self-categorization* of their expressive content via hashtags as classification devices (Caliandro and Gandini, 2016). Self-categorizing necessitates human market actors to translate the lexical codex into hashtag vernacular (Gibbs *et al.*, 2015), creating a platform-specific lexical hashtag market codex that provides users with specific semantic contexts and concepts for sustainable consumption. Figure 7 displays this hashtag market vernacular, i.e. the network of hashtags co-occurring with #sustainablefashion, framing the market assemblage on Instagram.

The purple cluster, which makes up the largest share of the network with 16.97%, is framed by dissociative semantic concepts and themes (Wood, 2020) that oppose fast fashion. The most important hashtag in this cluster as well as in the whole network is #slowfashion (eigenvector centrality [evc] = 1.0), followed by #ethicalfashion (evc = 0.77), #sustainable (evc = 0.69), #sustainability (evc = 0.69) and #ecofriendly (evc = 0.60). The second largest cluster (green; 14.52%) is related to influencers, and dominant fashion content hashtags, such as #fashion (evc = 0.88), #style (evc = 0.55), #stayhome (evc = 0.46), #fashionblogger (evc = 0.42) and #love (0.39). Hashtags in this cluster illustrate so-called attention-seeking
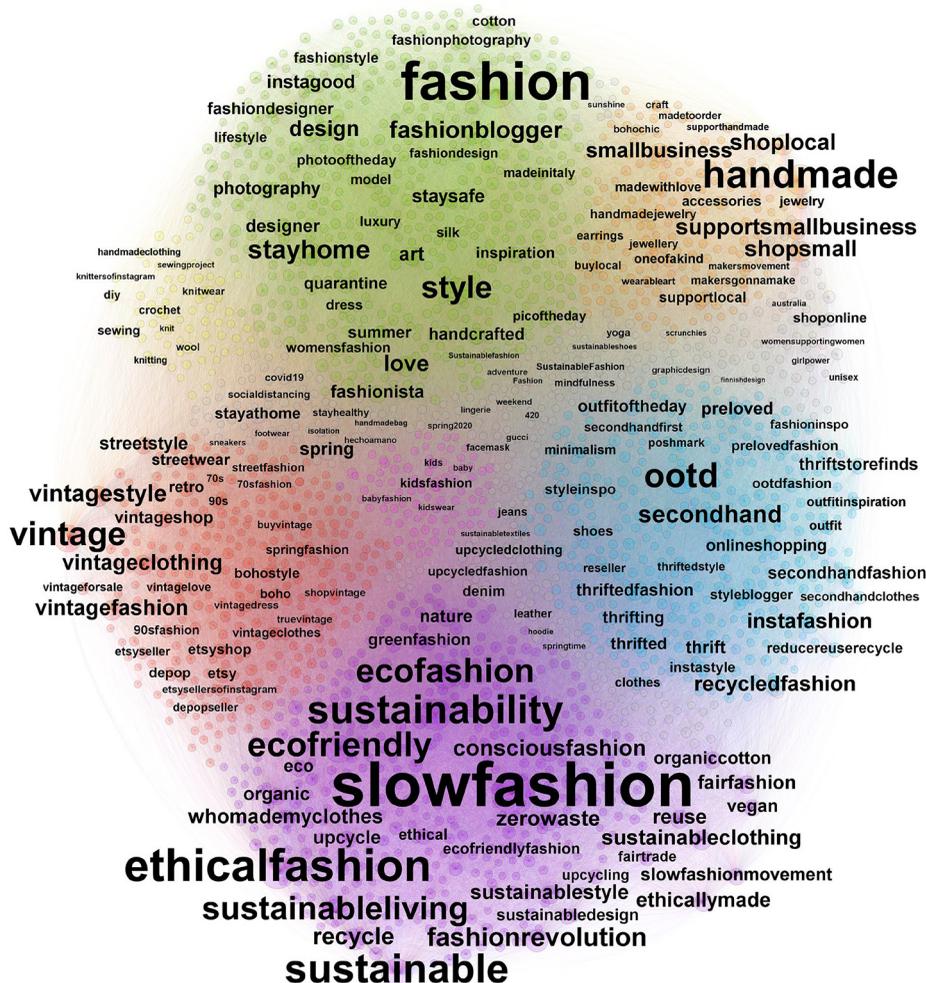
hashtags (Schöps *et al.*, 2020) such as #love – the most often used hashtag (1.835 billion) and #fashion – the third most common hashtag (812.7 million) on Instagram (Top-Hashtags. com, 2021). The light blue cluster (11.67%) encompasses hashtags related to second-hand clothing and thrift shopping styling tips, such as #ootd (evc = 0.60), #secondhand (evc = 0.42), #instafashion (evc = 0.36), #recycledfashion (evc = 0.35) and #thrift (evc = 0.29). Closely related is the red cluster (10.72%), featuring vintage fashion hashtags, like #vintage (evc = 0.58), #vintagestyle (evc = 0.41), #vintagefashion (evc = 0.38), #vintageclothing (evc = 0.37) and #streetstyle (evc = 0.30). The orange cluster (7.65%) is about locally produced, #handmade (evc = 0.67), #accessoires (evc = 0.20) such as #jewelry (evc = 0.18) by small businesses (#smallbusiness; evc = 0.39). Sustainable fashion discourse further includes #kidsfashion (evc = 0.19) (pink; 4.62%), as well as #diy (evc = 0.16), #sewing (evc = 0.17) of #knitwear (evc =0.15) (yellow; 4.19%). The network also contains pop-up

clusters (grey), for instance, a COVID-19-related cluster (#stayathome, #socialdistancing), a seasonal cluster (#spring2020, #420) and a location-based cluster (#australia).

As such, Figure 7 illustrates how *self-categorizing* and *contextualizing* relate to each other. First, sustainability-conscious users *categorize* their sustainable fashion content as such by using purpose-led and agenda-setting hashtags, for instance, #slowfashion or #sustainability.

Purpose-led and agenda-setting hashtags function as accumulation, coordination and distribution devices of specific information, debates or discourse (Rambukkana, 2015); in other words, as market codification devices. The hashtag #slowfashion, for instance, serves as a powerful umbrella hashtag for content that addresses environmental consumption issues related to fast fashion, codifying sustainable fashion as a more ethical, considerate and decelerated consumption approach to fashion.

Second, hashtags as nonhuman market actors *contextualize* content by functioning as "markers through which both human and nonhuman actors categorize digital content produced by themselves or by others" (Caliandro and Gandini, 2016, p. 22). Consequently, hashtags enable market *categorization* and *contextualization*, framing "a hashtag-mediated public sphere" (Rambukkana, 2015, p. 4) in the process. In our case, the hashtag public is based on a common cause, agenda and vernacular and grammar (Gibbs *et al.*, 2015) for sustainable fashion. However, users who seek to contribute to the hashtag public are constrained to predefined, prevalent semantic concepts.

5.2.2 Unifying, archiving and scaling. Meta-communication via hashtags unfolds further market (re)codification dynamics, affecting reach and spread of networked content – *unifying*, *archiving* and *scaling*. That is, purpose-led and agenda-setting hashtags *unify* users in their quest for a more sustainable fashion market. As such, hashtags function as "participatory objects" (Marres, 2012, p. 9), co-codification tools, respectively, for regular users who seek to contribute expressive content to the sustainable fashion market assemblage. However, hashtags not only drive user engagement but also actively codify the sustainable fashion market assemblage through their affordance of *archiving* and *scaling* content. Hashtags constitute archival devices, linking all posts that are tagged with a specific hashtag to the respective hashtag feed in which all these posts are *archived*. The more entries in the respective archive, the higher the *scaling* of the respective hashtag and, consequently, the more visible. These dynamics illustrate folksonomic market co-codification (Rambukkana, 2015) that territorializes the identity of the sustainable fashion market assemblage on Instagram (Figure 7).

Similar to YouTube, digital technology and infrastructure on Instagram enables and constrains (non)human market co-codification dynamics. On the one hand, users, who seek to join networked marketplace conversations around #sustainablefashion, have to identify the hashtag(s) under which users gather, archive their posts and leverage content visibility. On the other hand, nonhuman actors can only catalyze visibility for trending user sociality and content *categorization*. Thus, findings show that a hashtag is not only a mere communicative, participatory marker in marketplace conversations but also "has a material tangibility in itself as a distinctive contributor to an assemblage of human and nonhuman agents that constitute the conversation" (Rambukkana, 2015, p. 55). Consequently, only conjoined human-nonhuman interactions *scale* to and penetrate the market level.

5.3 Sticky market webs of connection
To metaphorically illustrate how these conjoined human-nonhuman interactions not only penetrate the market level but also the corporate "walled gardens" (Dekker and Wolfsberger, 2009) of digital market spaces, this study introduces the notion of sticky market webs of

connection. Sticky market webs of connection imply that interactional dynamics between (non)human market actors weave a rhizomatous network (Deleuze and Guattari, 1980) of homogenized market codifications across platforms, rendering the concrete walls of corporate "walled gardens" fluid and plastic. The findings of this study empirically show how sticky market webs are spun by the influence of wholes on their parts through relations of exteriority (DeLanda, 2016). Comparative analysis of YouTube and Instagram content illuminates otherwise hidden sticky market webs of connections. Findings unveil how regular user-generated content on Instagram mirrors the *lexical codex* created by professional content creators on YouTube, manifesting in thematically consistent codifications in terms of word combinations and stems.

The purple cluster of Figure 7 echoes the market codifications of clusters nr. 2 and 23 of Figure 3 in hashtag vernacular and grammar (Gibbs *et al.*, 2015), for instance, #slowfashion, #sustainableliving or #ethicalfashion (cf. Figures 5, 6 and 7). In terms of content, these codifications take form in awareness-raising editorials on YouTube, suggesting a consumption codex to regular users on Instagram (Figure 7). Users appropriate and internalize this suggested sustainable fashion codex through iterative content consumption within closed, cyclical market loops. Consequently, (non)human market co-codification results in an algorithmic market culture (Airoldi and Rokka, 2019) of homogenous, territorialized codes, semantic concepts, themes, types of content and consumption practices – a sticky market web of shared market language and expressive networked content, weaving rhizomatous threads (Deleuze and Guattari, 1980) across the trenches of platformized social media. For example, the light blue cluster in Figure 7 and the purple cluster (nr. 18) in Figure 3 illustrates a connective silk thread between YouTube and Instagram, both following the sustainable consumption codex of creative outfit assembly through thrifted, second-hand clothes as well as a minimalistic, well-curated collection of clothes – the capsule wardrobe. Accordingly, findings not only suggest that the YouTube assemblage is "plugged into" (DeLanda, 2016, p. 10) the Instagram assemblage but also that sticky market webs of connection protrude over the realms of YouTube and Instagram through relations of exteriority to other digital marketplaces, illustrated by hashtags in the red cluster of Figure 7 that link to second-hand clothing marketplaces, e.g. #depop or #etsy.

As such, sticky market webs constitute invisible, yet indissoluble connections between (non)human market actors within digital ecologies. Human market actors cannot disentangle themselves from these sticky webs but have to act in compliance with the content codex of nonhuman market actors as well as the *lexical codex* of professional content creators when seeking to partake in market codification. The translatability of the *lexical codex* into platform-specific vernacular, for example, hashtags on Instagram, enables the propagation of the cultural market codex of sustainable fashion across market actors and platforms.

6. Discussion

This study illustrates how interactional dynamics between (non)human market actors co-codify digital market assemblages, eventually spinning sticky market webs of connections across social media platforms. The contribution of this study is threefold. First, this study advances understanding of the enabling and constraining capacities of technology by outlining the agentic role of digital technology and infrastructure in digital markets. Second, this research offers empirical evidence of algorithmic market culture by exemplifying how the interplay and interrelatedness of (non)human market actors weave sticky market webs of connection across social media platforms. Third, this research offers an increased understanding of user-driven market codification dynamics by illustrating

how human market actors, both professional content creators and regular users, jam markets by diffusing a recodified consumption codex across social media feeds, containing semantic concepts, themes, agendas, topics and practices tied to markets.

The empirical study of the fashion market across two social media platforms illustrates the agentic role of digital technology and infrastructure, enabling and constraining market codification. In times when "powerful and unknowable information technologies [...] 'produce' everyday life" (Beer, 2009, p. 988), markets are not exempt from this production. Digital media enable users to diffuse their expressive networked content into social media feeds, and thereby leverage visibility of market codifying content (Cotter, 2019), potentially changing markets. However, nonhuman market actors only enable increased content visibility if "pleased" by content. Yet, viewers may benefit from algorithmic content curation as personalized content recommendations aim to enhance their consumption experience (Berman and Katona, 2020). As such, nonhuman actors not only shape markets but also human market actors by producing "hierarchization and modulation of visibility," i.e. so-called "ranking cultures" (Rieder *et al.*, 2018, p. 52). However, these dynamics also illustrate the constraining capacities of digital technology and infrastructure. Algorithmic curating and gatekeeping can create so-called filter bubbles (Berman and Katona, 2020), narrowing content width and homogenizing content recommendations. Analysis of YouTube data illustrates how viewers are entrapped in closed, cyclical loops of homogeneous content – market bubbles. Moreover, this study empirically demonstrates how algorithms actively lock the door for certain content creators, content, semantic concepts, themes and topics. This is due to YouTube's curation algorithm being a collaborative filter that is based on collective user viewing behavior. Collaborative filter algorithms appear to create filter bubbles more frequently (Hosanagar *et al.*, 2014). Correspondingly, algorithmic curating and gatekeeping may also constrain both content creators and viewers – algorithms raise the filter bar for content creators while keeping viewers in content bubbles. These content bubbles are mirrored in regular user-generated content that is thematically aligned with the consumption codex put forth by (non)human market actors. These dynamics may close markets to change, territorializing the market assemblage. Moreover, the present study suggests that nonhuman actors are at least as powerful, if not more powerful, than human actors and, therefore, act as an authoritative instance in terms of enabling and constraining content visibility in digital markets.

This study further provides empirical evidence of an algorithmic market culture, offering insights into synergistic (non)human market co-codification dynamics across social media. Algorithmic market dynamics are inevitable when human market actors engage with social media affordances, such as algorithms or hashtags. Social media potentially democratize markets due to their egalitarian, inclusive and empowering nature (Schöps *et al.*, 2020). However, the "power of the algorithm" (Beer, 2013) forces users to master "playing the visibility game" (Cotter, 2019) when seeking to be successful with their content. In other words, users need to form a symbiotic relationship with technology, and excel in understanding platform-specific algorithmic characteristics as well as catering content to algorithms to increase their connectivity in the network (Berman and Katona, 2020). In doing so, human market actors, moving on algorithmic territory (Rieder *et al.*, 2018), need to stick to the vernacular of the lexical market codex to maximize content visibility. Users, in turn, find themselves, though mostly unconsciously, in "recursive relationships" (Airoldi and Rokka, 2019, p. 3) with nonhuman actors, relying on algorithm-suggested "watch next" videos. Eventually, these market dynamics result in an algorithmic market culture – closed, cyclical market loops in which human market actors' output becomes the input for nonhuman market formation (Hallinan and Striphas, 2016). However, algorithmic market

culture is not platform-bound but fluid and plastic in nature, forming relations of exteriority (DeLanda, 2016) in the form of sticky market webs of connection across the corporate "walled gardens" (Dekker and Wolfsberger, 2009) of social media platforms. In this study, these webs are spun from YouTube to Instagram, resulting in a hashtag public of #sustainablefashion. The #sustainablefashion public on Instagram constitutes a shared market public in which interactions among human market actors are unified, archived and scaled through nonhuman market interference, and participation is termed by co-codifications of shared market language and expressive networked content. In contrast to brand publics (Arvidsson and Caliandro, 2016), market actors in this study do not use hashtags as a mere means to express their individual and personal perspectives on sustainable fashion. Instead, market actors rather employ hashtags as unification devices, enabling not only collaborative sustainable fashion market codification under the umbrella of purpose-led and agenda-setting hashtags but also providing a universal market language for cross-platform marketplace conversations. These dynamics illustrate how algorithmic market culture manifests in cross-platform relations of exteriority in the form of sticky market webs of connection that weave rhizomatous threads between the constituent platformized parts of the social media fashion market assemblage as a whole (DeLanda, 2016; Deleuze and Guattari, 1980).

Finally, this research adds to prior research on user-driven market shaping (Dolbec and Fischer, 2015; Scaraboto and Fischer, 2012; Schöps *et al.*, 2020), illustrating how expressive networked content (de)codes and transforms markets across social media. Content creators, influencers and regular users collectively partake in this folksonomic market co-codification (Rambukkana, 2015). In the case of sustainable fashion, influencers renegotiate their role as intermediaries between the market and consumers, using their visibility to reposition themselves as persona brands, and producing expressive networked content that documents their liberation from excessive and unsustainable consumption behavior as well as the dominant fashion market codex. Simultaneously, influencers claim new territory for their renegotiated market role as educators and agenda-setters of sustainable fashion. As educative intermediaries, they not only challenge the dominant market codex but also their followers by providing clear codes of conduct, comprising a lexical codex of semantic concepts and themes, for instance, "10 things I don't buy anymore." Such codes of conduct disseminate the sustainable fashion agenda while playfully engaging users in the co-codification of sustainable fashion via agenda-setting and purpose-led hashtags across social media. This dissemination of the lexical codex of sustainable fashion into digital fashion networks constitutes a form of culture jamming (Carducci, 2006; Wood, 2020) – in the present study, market culture jamming. Following the content codex, and unified by nonhuman market actors, i.e. hashtags, content creators, influencers and regular users collectively engage in market culture jamming, leveraging the enabling capacities of digital technology and infrastructure to disrupt and dismantle dominant semantic concepts and themes of fast fashion while diffusing new, more sustainable semantic concepts and themes across social media. However, influencers not only co-codify the market with downright practical sustainable fashion consumption how-tos for regular users but also monetize their visibility by creating new business models for themselves – (re)territorializing business models that possibly make them independent from brands.

6.1 Practical implications
This study illustrates the importance of not only listening to and understanding human but also nonhuman market actors, i.e. algorithms. Listening to and understanding these nonhuman market actors enables managers to leverage the visibility of their

communication. Adhering to the content codex, i.e. frequency, timing, caption and description of publications and acquiring market vernacular is crucial for joining digital marketplace conversations to maximize visibility. Content is only leveraged in terms of diffusion and relevance when picked up by nonhuman market actors. Thus, this study emphasizes the practical relevance of chiming content in the platform-specific meta-discourse of markets.

The methodological approach of this research further offers an updated approach to what is called "social listening" in practice, blending traditional social listening with a novel form, namely, algorithmic listening. Social listening is defined as "an active process of attending to, observing, interpreting and responding to a variety of stimuli through mediated, electronic, and social channels" (Stewart and Arnold, 2018, p. 86). In times when marketplace conversations increasingly take place in digital environments, social listening constitutes a crucial endeavor for marketing managers, substantially improving their understanding of consumers, clients and other crucial stakeholders. However, social listening is mostly neglected in favor of social media analytics, i.e. tracking and improving KPIs, such as reach, engagement and leads, in practice. We propose that these approaches are by no means mutually exclusive but instead mutually beneficial. Social listening should be the first step in designing market communication that aligns with audience sentiments. The measurement of communication performance then is a matter of social media analytics. In doing so, managers can create powerful closed feedback loops, assessing if they listened attentively and correctly and, subsequently, adjust their communication. These closed feedback loops consisting of a combination of qualitative and quantitative approaches provide marketing managers with social intelligence for informed, considered decision-making.

This study also illustrates the relevance of content creators and influencers on market discourse. Criteria for market relevance should not solely focus on metrics, such as number of followers or likes, but rather on the ability of market actors to occupy a discursive space with an impactful market voice across platforms. Accordingly, managers can cooperate and learn from content creators who actively partake in market codification by their expressive networked content across social media. Collaborating with these market actors both nonhuman and human may help managers not only to understand changing and emerging digital market culture but also to successfully act in markets. Marketing managers can profit from an increased understanding of digital market culture dynamics in two ways. First, they can draw on digital methods to install a "trend spotting radar," enabling them to detect changing and emerging market understandings, and determine the degree to which shifts in consumer behavior that are exemplified by content creators, resonate with the "broad mass" across platforms. Second, they can seed lexical codes that address these understandings and shifts in digital markets by themselves. Nurturing these seeded lexical codes potentially enables marketing managers to occupy a discursive digital market space, eventually generating leads.

6.2 Societal implications

This research illuminates two potential downsides of markets embedded in digital technology and infrastructure. First, algorithms are prone to errors, potentially causing reproduction of societal bias (Noble, 2018), polarization (Courtois *et al.*, 2018) and social fragmentation (Möller *et al.*, 2018). Second, algorithms' actual mechanisms remain in obscurity. Yet, algorithms exert a form of posthegemonic power (Beer, 2009), co-constructing reality. A technology of such ambivalent nature should face scrutiny on

both an individual and a societal level. However, scholars question if a will to scrutinize these mechanisms even exists (Deighton, 2019).

The societal issues caused by algorithms are foremost filter bubbles, limiting access to information by narrowing and homogenizing content. As such, filter bubbles manipulate social media users' information infrastructure, entrapping them in sticky webs of homogenous content, leading to one-sided perspectives and distorting societal opinion-, taste- and preference-making (Roberge and Seyfert, 2016). Recent phenomena such as fake news illustrate this pitfall of recommender systems. Using content relevance as a metric, a recommender system might label an article as relevant due to its virality. However, the actual content of that article – false/harmful or not – does not influence its circulation.

Social media users can enact countermeasures to escape filter bubbles. First, users can use browsers that have built-in privacy tools, i.e. anti-trackers, or install equivalent browser extensions, e.g. TrackMeNot (Howe and Nissenbaum, 2009). Anti-trackers minimize the amount and transmission of digital traces to third parties and, subsequently, input data for algorithmic bubble formation. Second, users should deliberately step outside their comfort zone in their filter bubble, take the risk to their personalized content feed, set foot on the soil of other platforms, put the algorithm-induced blinkers aside, and, consequently, open their eyes to different angles on a certain issue (Amrollahi and McBride, 2019).

On the corporate side, companies could offer the option to disable algorithmic services, or, at least, render the algorithmic services transparent by integrating affordance that displays the reason on which a recommendation has been generated for a specific user, e.g. due to the content's controversiality, or virality. To give impetus to social media companies, legal regulations could be enforced, necessitating companies to disclose algorithmic mechanisms, i.e. the coding. This would constitute a logical next step following the obligation to mark sponsored content and ads as such.

6.3 Research implications

This study highlights the importance for research investigating digital markets and dynamics to account not only for all relevant market actors, both human and nonhuman, in the formation and shaping of markets but also digital infrastructure. Digital technology renders markets as open-ended communicative processes constituted by the interplay of (non)human market actors, constantly updating market meanings and practices mediated by its affordances. Future research could therefore account for dynamics related to other constitutive nonhuman market actors in the formation of markets, such as follow or subscription dynamics, recommendation dynamics and ranking cultures (Rieder *et al.*, 2018), as well as dynamics related to automated nonhuman market agents, e.g. bots.

Moreover, this study stresses the necessity of cross-/multi-platform studies for future research. Cross-platform analyses allow to eliminate the bias brought forth by single-platform, API-led studies, i.e. to overcome being led by platform-specific "content organizing elements" (Rogers, 2019, p. 209). As such, cross-platform analyses constitute a crucial approach to minimize platform effects, i.e. "how the platform affects the content, be it its presence or absence as well as its orderings" (Rogers, 2019, p. 220). Platform effects also hint at a common issue in contemporary social media research – viewing social media as a "collapsed category," and thereby neglecting "important differences in the affordances of different tools" (Costanza-Chock, 2014, p. 65).

Cross-platform analyses using digital methods allow to account for these differences. More specifically, the networked content analysis of this study as a form of cross-platform analysis enables scholars to account for both "how the platforms network content, and how

content is 'inter-linked, inter-liked and inter-hashtagged'" (Niederer, 2016, p. 125) across platforms.

As such, cross-platform analyses bear immense methodological potential for future research, enabling data triangulation, visualization of mechanisms that work on an individual level in accumulated form – on a macrolevel – as well as content dissemination/circulation dynamics. This study empirically demonstrates how concepts and themes circulate across platforms. Likewise, research is needed across platforms, "following the medium" (Rogers, 2019) to acquire a holistic understanding of the phenomenon under investigation. With ever-increasing complexity in digital technology, new and creative methodologies will help in the future to fully account for the role of nonhuman entities and digital infrastructure in markets, requiring close collaborations between marketing and information technology (IT) departments – IT being a field marketing is increasingly dependent on. Moreover, the dubious developments of increasing data access restrictions by closing application programming interface (API) endpoints due to recent data breaches, e.g. the Cambridge Analytica scandal, as well as opaqueness and unpredictability of digital technology leave researchers as one of the last moral and responsible instances to shine light unto the dark corners of corporate "walled gardens" through critical investigative research.

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