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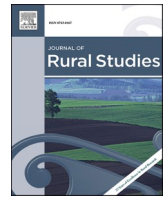
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Modes of spread in social innovation: A social topology case in rural Portugal

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ABSTRACT

The potential of social innovation to address intersecting social and spatial inequalities in regional territories is increasingly recognised. Against this background, the results in this article are based on a qualitative study of constellations of actors in peripheral rural regions engaged in socially innovative approaches to regional development. Empirically, the example of EPAM — a network of new young farmers across Portugal — is investigated using social topology methodology to demonstrate how social innovation spreads through rural regions. Data were collected and analysed across spatial scales to examine how images circulate ecologies of infrastructure —including EPAM — and traverse territorial boundaries. In this way, images as specific material-discursive configurations are shown to be agential in the performative spreading of social innovation.

To conceptualise these observations, the article is based on the assumption that social innovation has dual spatial properties. The first, an empirically legible and bounded object moving *in* space (regional). The second, an trans-scalar relational process in which objects, subjects, and spaces are reciprocally reconfigured (process-relational). This assumption has implications on understanding diffusion dynamics in social innovation, specifically how does social innovation spread in a process-relational mode? Against this background, the primary aim of the article is to examine and elaborate the diffusion dynamics of social innovation in its process-relational mode in the case of EPAM. Applying social topology methodology with agential realist theoretical sensitivity is well suited to theoretically elaborate modes of spread in social innovation according to their spatial properties.

1. Introduction

Rural regions across Europe are heterogenous, displaying a diversity of spatial, cultural, economic and demographic characteristics. Nonetheless, movements of people — especially to and from cities — remains a key factor in uneven social and spatial development across rural areas. For remote rural regions, the migration of young people to cities coupled with an ageing population continues to be a significant factor in decline, lack of development opportunities and chronic depopulation (Copus and Hörnström, 2011; Johansson and Kupiszewski, 2009). The potential of social innovation to introduce novel approaches in rural development and thereby, to an extent, address these disparities and socio-spatial inequalities is increasingly recognised (Bock, 2016; Christmann, 2014; Neumeier, 2017; Ubels et al., 2019). However, knowledge on how social innovation diffuses — especially in rural regions — remains incomplete (Moulaert and Maccallum, 2019; Rabadjieva and Butzin, 2019). For novel approaches, such as EPAM¹ — a network of new young farmers

across Portugal — to have broader societal impact it is recognised social innovations must diffuse (Christmann, 2014; Howaldt and Schwarz, 2010; Tarde, 2000; Westley et al., 2014) and the role of networks in diffusion dynamics (discussed in section 2) is acknowledged (Burt, 1987; Granovetter, 1983; Rogers, 1983; Valente, 1996). However, social innovation is a diverse field with many analytical approaches. These approaches are broadly categorised in two streams which, although they share commonalities, have different characteristics. Simply put, one stream is concerned with well-bounded ‘solutions’ to social problems, the other with transforming social relations through collective processes (cf. Ayob et al., 2016; Moulaert and Maccallum, 2019). While the streams offer different analytical approaches to social innovation, what is overlooked are the differences in spatial dynamics between these types of social innovation. Therefore, this paper begins from the assumption the categories are not only analytical, but that social innovation has differing spatial properties according to these interpretations. The first, an empirically legible and bounded object moving *in* space

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¹ Empreender na fileira das Plantas Aromaticas e Mediciniais em Portugal, (Entrepreneurship in the medicinal and aromatic plants sector in Portugal). Author's translation.

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(regional). The second, a complex trans-scalar reciprocal process in which objects, bodies and spaces are performatively (re)made (process-relational). This assumption has implications for understanding diffusion dynamics in social innovation, whereas the diffusion of innovations as ‘objects’ in space has a long history of research (section 2), significantly less is understood about diffusion dynamics in a complex relational process with outstanding questions still to be answered (Moulaert and Maccallum, 2019; Rabadjieva and Butzin, 2019).

Empirically, the case of EPAM is investigated using social topology methodology (Mol and Law, 1994; Shields, 2012a, 2012b, 2013) with agential realist theoretical sensitivity (Barad, 1996, 2003, 2007) to demonstrate how social innovation spreads through rural regions. Data were collected and analysed across spatial scales to examine how images traverse territorial boundaries through ecologies of infrastructure (Niewöhner, 2015), including: bodies, social networks, online platforms, international supply chains and social media etc. Images, recognised as performative acts (c.f. Bachelard, 1969; Bakewell, 1989; Latour, 2002; Morgan, 2014; Shields, 1992) are understood here with an agential realist approach as ongoing material-discursive configurations in spatial processes. Accordingly, the research is guided by the question **how do material-discursive configurations, in this case images, contribute to the spread of social innovation as a relational-process, and what is this productive of?** To answer this question, the aims of the article are fourfold:

- To briefly conceptualise and introduce the process-relational approach using agential realist theory and social topology.
- To give a short account of diffusion research in social innovation highlighting empirical and theoretical gaps in knowledge.
- To empirically examine in the case of EPAM how social innovation spreads as images transform and traverse infrastructures.
- Finally, to set-out a theoretical approach to modes of spread in social innovation according to differing spatial dynamics.

These aims are structured according to the following sections: Section 1.1 provides a short contextual background and introduction to EPAM. Section 2 lays out the conceptual framework through which the case is analysed, where section 2.1 introduces the process-relational approach in agential realism in combination with social topological methodology. In section 2.2 I introduce social innovation and give a short review on diffusion and networks within the broader field. Section 3 sets-out in detail the research design elaborating the suitability of social topological methodology to analyse the spatial and temporal dynamics of complex mobilities and transformations; events across multiple scales; processes, relations and connectivity; reciprocal emergences and spatialisation. Structured according to scale, section 4 presents the research findings examining how social innovation was diffused in the circulation of images traversing interconnected infrastructures, and how subjectivities, infrastructures, and regional spaces were reconfigured in the process. The main results are summarised, discussed, and a heuristic diagram of modes of spread is presented in section 5.

1.1. Background

Alentejo is a peripheral rural region occupying about 30% of the total area of mainland Portugal with about 7% of the national population (Instituto Nacional de Estatística Statistics Portugal, 2021). In the 1960’s the region’s rural population reduced by half due to emigration and industrialisation and continues to decrease (Varela, 2019). Consisting of a particularly hot and arid agricultural landscape supplying about 75% of the country’s wheat, Alentejo is characterised by its rolling plains and cork orchards on the one hand, and a decreasing number of agricultural holdings (Gabinete de Planamento e Políticas e Administração Geral, 2017), a lack of economic dynamism and ageing population on the other (André and Abreu, 2009; Fonseca, 2008).

However, existing quantitative research on the emerging medicinal and aromatic herb (PAM) farming sector indicates a small but legible counter-pattern emerging. Over the last 15 years the number of new, often young farmers entering the PAM sector increased (Gabinete de Planamento, Políticas e Administração Geral, 2013). This rate of growth rose after the 2008 financial crisis as evidenced by the successful funding applications for new young farmers to establish themselves in the sector — part of the Rural Development Programme, ProDer. Between 2008 and 2013 there were 138 new projects started by young farmers (Gabinete de Planamento e Políticas e Administração Geral, 2013). A 2018 survey of PAM farmers for the municipality of Almodôvar in Alentejo reported 75% of respondents had higher education qualifications, three-quarters of which were not related to agriculture (ADC-Moura, 2018). Supported by the empirical research in this paper, these findings show young farmers were new to the agricultural sector. Together, these data indicate a small and focused migration of young ex-urban professionals to the Portuguese countryside, including Alentejo to start family farms in the new PAM sector.

Against this background, a local development association based in Alentejo recognised that the influx of young people into the region, the growth of a new farming sector and the circulation of knowledge, resources and social capital could contribute towards local rural development. Subsequently, the project EPAM was founded to support new farmers and the emerging sector. EPAM is an infrastructure consisting of a digital platform and face-to-face events fostering collaboration between farmers and actors in other sectors. By disseminating and supporting the co-production of knowledge on the sector, EPAM aims to animate and strengthen networks and support new social relations. It is recognised in both scientific and practice discourses as a social innovation in rural development in Alentejo (e.g., Ferreira et al., 2018; Rogowski and Sita, 2020).

2. Conceptual framework

2.1. Social topology with agential realist sensitivity

Corresponding with a process-relational approach, agential realism (Barad, 1996, 2003, 2007) foregrounds the primacy of relations over relata, that is, over the things anticipated to be whole and pre-determined prior to entering relations. In this way, agential realism focuses on the performativity of practices through which space, time and matter materialise. Practices are the unit of analysis and are material (matter) and discursive (meaning) configurations. Accordingly, matter and meaning are mutually constituted in ‘intra-actions’, where matter, ‘is not a fixed essence or property of things’, rather it is ‘generated and generative’ (Barad, 2007, p. 137). Following Foucault, discursive practices are ‘the material conditions that define what counts as meaningful statements’ (2007, p. 64). Together, material-discursive practices in a posthumanist sense ‘are material reconfigurings of the world’ through which ‘boundaries, properties and meanings are differentially enacted’ (151).

Against this theoretical background, topological methodology (Shields, 2012a; 2012b, 2013) combined with agential realist theoretical sensitivity was selected and applied to the empirical object of images. Discussed in detail in section 3, topological methodology is well suited to map nonlinear and performative circulations of material-discursive configurations agential in spatial processes, in this case exemplified by images (c.f. Bachelard, 1969; Bakewell, 1989; Latour, 2002; Morgan, 2014; Shields, 1992).

2.2. Social innovation, diffusion and networks

Early research linking the diffusion of innovations to networks tends to be quantitative and actor-centric measuring the innovativeness of individuals (time of adoption) and influence on the rate of adoption of others (opinion leaders) e.g., how many times an individual was

mentioned as part of a network (Rogers, 1983). Here, innovations tend to be well-bounded objects (e.g., technologies, ideas or behaviours) and diffusion refers to the process of their adoption through a social system describing, for example, adopter categories ranging from ‘early adopters’ to ‘laggards’ (Rogers, 1983; Ryan and Gross, 1943).

From the 1980s onwards focus shifts to examining the role of social networks in the diffusion process. Here, networks tend to be understood as a ‘pattern of friendship, advice, communication or support which exists among the members of a social system’ (Valente, 1996). Valente shows the diffusion of an innovation can be relative not only to the entire social system but also to an individual’s social network. Through this dual approach Valente highlights the role of interpersonal influence in adoption behaviour. This approach is used to predict patterns of innovation and identify opinion leaders in social networks in order to affect the rate of adoption.

Greenhalgh and colleagues’ (2004) comprehensive review of innovation literature across fields shows the spread of innovation to be on a spectrum between unplanned diffusion and intentional dissemination. Here, social networks are regarded as the dominant mechanism of unplanned diffusion where ‘emergence’ and ‘adaption’ are metaphors for spread. This contrasts with ‘dissemination’ and ‘engineered’, metaphors at the planned end of the spectrum. The review highlights innovations are objects or processes and that most studies of the spread of innovation have addressed well-bounded and proactively disseminated innovations (e.g., technologies or products). It reports less studies on complex processes of emergent and unplanned diffusion. The authors claim that this division has received little attention in the literature (2004, p. 604). It is worth pointing out, the review does not include social innovation. At the time of publication, the contemporary field of social innovation was in its infancy with few empirical studies on diffusion and spread, as is still the case.

Understandings of networks were being advanced in other fields in which complexity theory provided background. Actor-network theory (ANT) for example, famously examines the effects of non-human actors in networks. Furthermore, ANT shows how networks are topological spaces differing from Euclidean regional space (Mol and Law, 1994). Here, networks do not exist as social ties between (human) actor categories in regionally bound space between here and there. Instead, networks are shown to be both objects and spaces where topologies describe the non-Euclidian relations constituting and connecting them.

Further advances were made in the role of networks in social movements specifically turning towards their materiality and historicity. MacFarlane’s emphasis on a process-relational approach, or ‘relational topology’ as he refers to it, calls for a shift in terminology from network to assemblage to foreground stabilisation, emergence and co-causality through processes of territorialising and deterritorialising (Mcfarlane, 2009). In this turn to materiality networks are theorised as infrastructures with weak boundaries through which agency is distributed (Shields, 2013), a position akin to Barad’s agential realist analysis of material-discursive apparatus.

The observations above regarding the dual spatial character of networks (as object and space) is applicable to social innovation where it is seen as both a solution-oriented object, referring to ‘the development and implementation of new ideas (products, services and models) to meet social needs’ (Mulgan et al., 2007), and as a collective process in which relations are transformed (MacCallum et al., 2009). Other interpretations bring together social innovation as a solution-orientated object and process for example, Zapf defines social innovations as ‘new ways of achieving goals, particularly new ways of organizing, new regulations, new ways of life, that will alter the direction of social change, will solve problems better than earlier practices, and are thus worth the effort of being imitated and institutionalised’ (Zapf, 1989). To distinguish from other processes of social change and innovation, Howaldt and Schwarz (2010) add that social innovations are ‘goal orientated’ and ‘the result of intentional and targeted action’ (Howaldt and Schwarz, 2010, p. 64).

The diffusion of social innovation has roots in early diffusion and innovation theory (Rogers, 1983; Tarde, 1903) discussed above. With reference to Rogers, Howaldt and Schwarz describe diffusion as the spread of ideas and inventions through existing communication channels. Channels include technological infrastructures and web-based social networking (2010, p. 36). Others add to this list the market (Moulaert and Nussbaumer, 2005), and organisations (Mulgan et al., 2007) as diffusion channels. Howaldt and Schwarz point out that, as social innovations are special forms of social practice, bodies and artefacts can be carriers (2015b, p. 36) thereby providing infrastructure for diffusion. Their definition of social innovations follows closely Reckwitz’s understanding of practices, whereby the social is sought in the ‘collectivity of behaviour patterns ... held together by a specific practicality’ (Reckwitz, 2002, p. 289). For Reckwitz, materiality is an essential component of social practices and in this way is a site of the social (Reckwitz, 2002). As Law observes, materials are durable and hold their shape well over time serving to stabilise networks, but material configurations are the effects of relations and therefore are not permanent (Law, 2007). Coupling social innovations to social practices marks a shift away from actor-centric approaches, although social innovations still tend to be coherent bundles of practices operationalised to meet specific local needs in a regional topology.

In contrast, Tarde’s microsociology spells out an early processual approach to diffusion of social innovation, where a social *invention* must be repeated to become a social *innovation*. During this repetition it encounters forces of *opposition* in the shape of other competing inventions, potentially hindering its spread, and thus negating it from becoming a social innovation (Tarde, 2000). Together, with a third force of *adaption*, Tarde’s Laws of Imitation account for the ongoing micropolitical struggle within social processes towards the formation of wider societies. Tarde elaborates this as a process of growth which occurs in two ways. First, intrinsically, which he describes as a ‘growth in comprehension by a series of logical combinations’ (Tarde, 2000, p. 80). Second, extrinsically, which he formulates as ‘growth in extension by imitative diffusion’ (2000, p.80).

Tarde’s early process-relational approach, which informed Deleuze’s philosophy of immanence (upon which the topological methodology presented in the next section is partially built) and Latour’s early ANT, was less influential than the positivist inclination of Rogers’ diffusion research. Tarde’s approach provides an early attempt to dethrone the central role of human actors in innovation processes; account for micropolitical power relations in the struggle between repetitional and oppositional forces; consider relational processes as generative (adaption), thereby placing spread prior to emergence and rendering the process of diffusion productive of innovation. This last move undermines the idea that coherent pre-determined entities are spread through space and opens the door for an agential realist account for the reciprocal imbrication of bodies, spaces and objects in the spreading of trans-scalar processes of social and spatial change, as I propose and illustrate in section 4.

The merit of Tarde’s microsociology and process-oriented approach for contemporary social innovation theory is recognised by Howaldt and colleagues in their project SI Drive (Howaldt et al., 2015a; 2015b, 2017). Here, Tarde’s emphasis on micro phenomena, events, inventions etc. is combined with practice theoretical approaches providing a methodology to ‘meticulously trace social inventions and innovations as well as the associated social practices of their imitation’. (Howaldt et al., 2015b, p. 28). In this way, relational structures at the micro level and the intentional dissemination of practice elements reaching a meso or macro level is examined as a process of social change. Developing a practice orientated approach, Rabadjeva and Butzin (2019) focus on traveling elements (of practices) including materials, competences and meanings in the diffusion of social innovation. Here, traveling elements are facilitated in practice fields which are bundles of social innovations doing the same thing appearing in different locales. This approach provides an analytical procedure to account for trans-local connectivity between

places through an emerging practice field, however, how spaces, bodies and meanings are co-produced ‘on the ground’ through practices is less in view. The emergence of a social innovation precedes spread, although by means of diffusion a broader practice field emerges. In this way, spread partially takes on generative characteristics.

Using the multi-level perspective approach Westley et al. (2014) provide a typology describing how and why organisation shift their focus from ‘scaling-out’ (disseminating innovations to other communities) to ‘scaling-up’ (to affect system-level transformation). Using complexity perspectives, the typology provides 5 main approaches to scaling. The focus here is on an organisation’s selection of pathways to affect change at higher institutional levels towards system change. Arguably, the insistence on scaling-up over scaling-out reproduces a hierarchical spatial structuring and cuts against empirical insights on the significance of horizontal networks in diffusion of social innovation, as discussed next.

Similar to early diffusion of innovation research outlined above, networks are valorised in their ability to spread social innovation (e.g. André and Abreu, 2009) by overcoming material, social and spatial boundaries connecting across spatial scales, levels of governance and institutions. For example, supra-local networks connect agents across scales providing means of communication and coordination through regions improving the quality of social relations (Moulaert and Nussbaumer, 2005). Networks span both horizontally and vertically (Hillmann, 2009) connecting levels of governance, institutions and actors in other locations (Moulaert and Mehmood, 2011). Territorial networks tend to be place specific due to the particular tacit relationships in each (Abramo, 2009). They have the possibility to form new, more equitable relations of power (Hillier, 2013).

This review highlights different approaches to diffusion in social innovation revealing common and conflicting characteristics often according to how social innovation is perceived. What tends to be agreed is that social innovation is distributed with the help of social and material infrastructure consisting of networks, supply chains, bodies, artefacts etc. For some, intentional action is significant to distinguish social innovation from other types of change, whereas for others micro-processes, event and relations precede and are productive of human agents and other entities. Furthermore, approaches to scale, distance and levels vary, where for some networks cast horizontally in space are significant, for others incremental steps from micro to macro explain social change in social innovation processes.

3. Methodology: social topology

As pointed out by Christmann, ‘an analysis of innovation processes must also consider the socio-spatial environmental conditions’ (2014, p. 46). To research complex spatio-temporal processes of exchange between environment and object topological methodology (Bachelard, 1969; Barad, 2007; DeLanda, 2002, 2016; Deleuze, 2019; Deleuze and Guattari, 1987; Mol and Law, 1994; Shields, 2012a, 2012b, 2013) was selected, and in combination with agential realist theoretical sensitivity applied to the empirical object of images.

Topology is a spatial framework to examine how spaces, bodies and objects are produced through the combination of mobilities, transformations, trans-scalar events and relational emergences. Topologies map complex mobilities and translations (Shields, 2012a) and are therefore well suited to map images understood as performative material-discursive configurations agential in spaital processes. Bachelard uses topoanalysis to track and analyse the spread and transformation of poetic images as they reverberate through human memory and imagination into texts and spaces of the home showing how subjects extend themselves into space, and how spaces affect subjectivity. Here, imaginations, domestic spaces and texts are understood as infrastructures with weak boundaries through, and between which, images circulate.

Grounded in the observation that sites are made in a relation of difference to each other, ‘cast — or spatialised — as certain types of

place: romantic, harsh, warm etc.’ (Shields, 2013, p. 31), Shields develops the methodology further (Shields 2012a; 2012b, 2013) to bring-to-the-fore and examine topological and mutually productive relations between images, matter and space. Spatialisation enrolls a relational network of many other interconnected sites constructed on a cultural foundation of events, histories, memory and myth. It is ‘a process and horizon of meaning’, over which there is an ‘intense struggle’ (2013, p.31) where places vie with each other for their unique capacities and identity. Instrumental in this struggle for meaning are images, which ‘over-write’ (32), or rather enfold into sites. Shields elaborates topology to show how images as visual and textual representations and intersubjective cultural imaginaries are cast into sites (34). By collecting diverse multi-scalar data the approach affords analysis of the circulation of images across scales.

According to the theoretical assumption that social innovation has dual spatial properties (object and process-relational) outlined in section 2, social topology is used to analyse messy objects, where messy objects are ethnographic complex objects appearing to have shifting ontological properties (Law and Singleton, 2005, p. 11), applicable to material-discursive configurations of images in the case.

To address the second aspect of the research question, the method attends to emergences. This provided a lens to examine what was (re) made and performed as images de/re-materialised in circulation. The aim here was to consider the productive role of images in the spatialisation of rural peripheral space in Portugal, thereby contributing to a process of social innovation, understood as a relational trans-scalar process of socio-spatial change.

Topologies provide diagrams of networks, assemblages and the forces within (Deleuze and Guattari, 1987; Shields, 2012a; DeLanda, 2002). Diagrams follow two directions: intensive and extensive (DeLanda, 2016, p. 110), reminiscent of Tarde’s intrinsic and extrinsic process of growth in innovation, as discussed in section 2. Extensive mappings capture features of the world extended *in* space within boundaries and regions using metrics such as length, volume, area etc. between here and there. In contrast, intensive mappings capture the ‘differences in the intensity of qualities’ within a spatial assemblage, such as gradients of temperature, pressure or speed (Ibid.). Intensive and extensive properties are linked, where the diversity of perceived phenomena bounded in extension are the product of processes governed by gradients of intensity (Deleuze and Guattari, 1987 cited in: DeLanda, 2002). In this way, intensive forces are the autopoietic enfolding of spaces, objects and bodies in intra-active material-discursive practices.

By applying the topological method with agential realist theoretical sensitivity outlined here, the research in this paper diagrams the intensive and more-than-human forces at work in the spatial dynamics of diffusion in social innovation in a process-relational mode, to analyse:

- circulations and transformation of material-discursive configurations of images
- relations and connectivity through scales (trans-scalar);
- the reciprocal production and performativity of bodies, objects and spaces (e.g. farmers, infrastructures and peripheral space).

Following Shields (2012b), social topology is combined with ethnographic fieldwork to collect diverse primary data supplemented with secondary data analytically divided along two spatial scales (zoomed-in and zoomed-out), as follows:

- i. For zoomed-in analysis, primary data were collected through semi-structured interviews (+22 h) and conversations with PAM farmers, local and regional development experts, social entrepreneurs, local civil servants, residents and participant observations, including a work placement in a local development association (2 months), farm stays and multiple farm/agricultural production site visits (12 no.) in Spring (2019). Fieldwork conducted across the country was documented with extensive notes

- (15,849 words and 4 no. notebooks), photographs and drawings (+65 no.). Data were coded using an inductive approach in grounded theory (Strauss and Corbin, 1998). This approach was applied to map and diagram drawing (iii) (Baxter, forthcoming b). MaxQDA and ATLAS.ti software was used.
- ii. For zoomed-out analysis secondary data were collected through desktop research including documents (policy documents, research reports, statistical reports, scientific papers). In the paper, **visual images including, photographs and illustrations collected from social media and websites and herb packaging** were analysed in relation to primary interview data and observations.
 - iii. For analysis across scales and to reveal relations between data maps, spatial drawings and animations were made (6 no.).

4. Findings

The following section topologically charts the de/re-materialisation and circulation of images in the infrastructures connected to and including the infrastructure of EPAM.² The topology reveals how images transformed between different infrastructures adapting to the modalities of each, and how in reciprocal processes subjectivities, infrastructures and peripheral rural space were together reconfigured. Accordingly, it is shown how social innovation as reciprocal trans-scalar process of socio-spatial change involving more-than-human relations intensively spreads. In this topology, the spread of social innovation is shown to be in an unintentional mode. Analytically, findings are presented according to three circulations which cross scales, from zoomed-in to zoomed-out. Each circulation examines a different infrastructure, and between circulations the de/re-materialisation of images is described as images transfer across scales and infrastructures.

4.1. Circulation 1: nature-images/self-images

As discussed in section 1, EPAM was designed to support new young farmers entering the herb farming sector who had recently migrated from urban centres towards the rural interior. Herb farming was attractive as it can be done organically, on small family farms, supported by specific technologies to ease the intensive labour required for organic production, and with relatively little pre-existing farming knowledge. Funding was available through a national rural development programme to support new young entrants into the agricultural sector. Interviewees (EPAM co-founders and new farmers) reported that the information received as part of the funding application process was to some extent inaccurate, to the point of being detrimental to the economic viability of some farms. The farmers reported not having training in organic methods at point of entry. It was said that the inaccurate information and lack of specific training contributed to unrealistic expectations regarding anticipated crop yield and financial gain, size and amount of land required, labour intensity, timeframes, technological and equipment requirements. The information was widely circulated, this was likely due to the repetition of applications by an agency employed (by applicants) to support the application process. Compounding this, many new young farmers had unrealistic, romantic images towards country life, organic farming and nature more broadly. Images configured in the city and cast onto rural Alentejo.

“because we like nature we’d like to live in the countryside we decided to start this project of aromatic plants.” (PAM farmer)

“really to bring information that would be real, realistic and try to tell people that there will not be any romanticism in the sector.” (EPAM co-founder)

² For an in-depth analysis of social innovation infrastructure in this case, see Author (forthcoming a).

Apart from providing support for new young farmers, interviewees reported that the EPAM project aimed to disseminate ‘real’ and accurate information about the sector, including counteracting the romantic images of nature and country life regarded by more experienced actors as unrealistic and detrimental to the development of the sector and survival of the new farms. Similar to the competing micropolitical innovation process described by Tarde (section 2), EPAM emerged as an infrastructure in a micropolitical process of repetition and opposition (section 2), consisting of a network of new farmers and associated actors, a web-platform and through a host of events including local and regional meetups, training sessions, expos and conferences.

Fieldwork, including interviews and observations suggested that the self-image of farmers had been, and were still being constructed in relation to changing imaginaries of nature, organic farming and country life. For example, in one interview nature was repeatedly figured as vulnerable and requiring protection. It was regarded that in his new role as an organic farmer part of his responsibility was to protect nature. Imagining nature in relation to self in this way contributed to the reconfiguring of the ex-urban professional’s identity, part of the process of becoming an organic herb farmer/custodian of nature in Alentejo.

Interviewees described the reason for leaving the city not only as a negative effect of the financial crisis on their urban livelihoods, but as an opportunity to work with and learn from nature, some described how bees, insects, plants and farmers cooperated in the production of herbs. This value laden image of nature is supported by statements on farmers websites. Farmers rehearsed and performed their emerging identities in relation to nature in practices of organic farming, including the layout of farms to encourage the interplay between species in the production of herbs, discussed below. This material and symbolic relation between images of nature and self-image continued to be discursively performed and spread as farmers spoke about their new roles and circulated knowledge, photographs and illustrations (discussed below) using the EPAM infrastructure. The flow of images of self in relation to nature co-constructed shared meanings between farmers. Social relations were stabilised and a new cultural imaginary specific to New Rurals working in peripheral rural space in Portugal gradually emerged.

Performing nature, self and collective identities through organic herb farming practices and the EPAM infrastructure had specific ethical components which led some interviewees to set themselves apart from other traditional farmers. Interviewees reported such farmers were seen to be polluting the soil by using chemical fertilizers. These boundary making practices stabilise and give further definition to an emerging subjectivity. A quality of contingency and experiment was perceptible as the farmers rehearsed their ethical positions in the interview. These ethical, aesthetic and practical considerations lead to specific material configurations of farms (discussed in section 4.4) and the curation and circulation of self-images, which I discuss next.

As pointed out in section 2, it is recognised that the diffusion of innovation requires an infrastructure which in this case consists of networks of actors, bodies, artefacts, supply chains etc. In the following subsection I analyse herb package images to consider how the emerging material-discursive configurations of nature, self and collective translated into herb packaging circulated a wider ecology of infrastructures. I refer to this translation as a process of *de/re-materialising* so as to foreground how images adapt to and lend materiality of other infrastructures.

4.2. De/re-materialisation 1: herb packaging

As discussed in the introduction (section 1.1), the young professionals who moved from metropolitan areas on the Portuguese coast to the rural interior, brought with them specific practices cultivated in their professional lives in the city. For example, graphic designers-cum-farmers capitalised on their capacities to produce attractive brands to market herbal products (such as, teas and oils). The branding and images varied between producers, but typically consisted of illustrations of

herbs, leaves or part of the plants in combination with typography on paper, card or glass packaging.

In one example, the tea packaging consists of a white vertically proportioned cylindrical box made from card with a black plastic lid. Text above and below frames a decorative and highly abstract illustration of an herb plant. Visual analysis of the images deconstructed the relations between components (e.g., text, fonts, illustration, proximity, contrast, colour, tone, proportion etc.) to show how the specific material configuration of box, text and illustration performs particular values, ideas and aspirations regarding nature. In the example, the configuration does not indicate place, climate, weather nor is there any reference to utility e.g., drinking tea, or cooking etc. In order to enhance their ornamental and decorative quality, images were abstracted from a specific socio-spatial setting. The products are marketed as gourmet and appear in boutique shops online and across Europe.

In a further example, brown, unbleached paper bags are used to package herbs. A label applied to the bag contains a small logo, minimal text and a strong decorative geometric background pattern. Images are rendered in one pastel colour set against white background and the brown bag. Again, there is no visual reference to what the herbs are used for. But, in this example, the logo consists of three parallel undulating lines with two small tree shapes. According to the designer, this is an abstraction of the Alentejo landscape. Further reference to the region is made through the geometrical background pattern that, according to the designer, references patterns found on traditional rugs from the region. The products are marketed at a medium-high price point.

Both these examples, which are not isolated, are highly aesthetic and ornamental configurations and construct nature in specific ways. In the first example, the extensive abstraction of the herbs, relation between text, illustration and white space, and the contrastive colour range suggests a highly abstract and decorative rendition of nature. In the second, the unbleached brown bag is suggestive of being natural and authentic. These images enact nature in a romantic and idealised ways and coincide with the construction of nature reported in interviews and on websites (see section 4.1).

Recalling the conceptual framework in section 2, I have described how images perform nature in relation to self and translate between modalities (e.g., from urban imaginations of rural life to herb packaging). Through this de/re-materialisation and adaption to other modalities, images are able to translate between and connect infrastructures. Next, I shall examine how the herb packaging images circulate through national and international supply chains. I argue that nature in relation to rural Alentejo and the emerging cultural identity of the new herb farmers is discursively performed in other locations as images continue to spread through interconnected infrastructures. In this way, images of rural Alentejo-nature-herb farmers enter into a trans-scalar process of socio-spatial change *in relation to* other socio-spatial systems.

4.3. Circulation 2: illustrations and infrastructures

The herbs and their packaging were sold in shops in Lisbon, Porto and in the Alentejo, mainly catering to tourists. Additionally, herbs were exported to other European capital cities, circulating a *wider ecology of infrastructure* (e.g., supply chains, transport logistics, recreation travel etc.) and online market places (pointed out in section 4.2). Effectively, the images circulated vast territories through interconnected infrastructures.

In addition to spreading through cities and social media (examined in section 4.5), images circulated shops in the Alentejo. During extended fieldwork in the region (section 3), I met a shop owner and his partner selling herb products. They were proud of the boutique selection lining the shelves of their exquisitely choreographed shop. Products were few but each had a strong aesthetic materiality and were carefully arranged in the shop. The owners enjoyed recounting the stories attached to each object (e.g., boxes of herbs, tins of sardines, bottles of olive oil etc.), the

producers, and where in Alentejo they lived. These performances in which images, products, shop, owner and customers interact reproduced and spread imaginaries about herb farming in Alentejo, and as products were bought their images and stories recirculated further afield. Meanwhile in reciprocal relation, the images and their entangled stories co-constitute the shop by lending it materiality. This illustrates how material-discursive configurations spread through, cross between, connect and perform infrastructures, and how human actors are enrolled in these practices.

Infrastructure here is not the same as the EPAM infrastructure described above which was intentionally designed to disseminate information, knowledge and meaning between farmers. Nonetheless, as the case depicts, this wider ecology of infrastructure is agential in the diffusion of social innovation through circulation of images, where social innovation is a trans-scalar relational process of socio-spatial change which EPAM infrastructure is weaved into. In line with the theoretical insights outlined in section 2, this suggests that there is an unintentional dimension to the spread of social innovation which must be accounted for when considering diffusion dynamics.

These empirical findings support the notion that infrastructure is at once an object without clear boundaries and a set of relations (Larkin, 2013) inscribing a topological space (Niewöhner, 2015) materialised in the interweaving of ecologies of infrastructures. I suggest a characteristic of infrastructures, such as EPAM, is their ability to piggyback on other established infrastructures, such as supply chains and logistics thereby amplifying spatial reach and effectiveness (Baxter, forthcoming a).

4.4. De/re-materialisation 2: spatial arrangements and photos

Images of nature, self, rural life and farming were re-materialised in the spatial arrangement of farms, where farms offered a novel way of living in contrast to the separation between work and home individuals had been accustomed to in the city. Observations showed workspaces and domestic spaces overlapped and interconnected on farms. For example, in the proximity of herb gardens and production areas to kitchens and external terraces, or how onsite utility infrastructures such as solar panels, water catch, filtration and sewage systems supported domestic and work spaces. The spatial proximities of work and domestic life were reported in interviews as being advantageous and a special characteristic of farming that facilitated novel relations within the family. Observations and fieldwork showed farms to be carefully curated where plants were arranged to attract specific insects to manage others which farmers described in interviews as an example of working with nature (section 4.1). In one example where a farmer had previously worked as a landscape architect (this was not unique and it was reported to me that architecture and landscape architecture had been hard hit in Portugal during the 2008 financial recession), the organisation of the fields, structure of the warehouse and production area had been carefully crafted and detailed. For example, the general layout of internal spaces had been artfully arranged, materials carefully selected for tonal and colour consistency. The spaces had clearly been carefully designed and choreographed beyond the technical requirements of a working space. Although this was unusual, it was not isolated.

Furthermore, as in the example of the shop earlier, boxes waiting to be packed with herbs lined walls of production areas. Fieldwork showed farms often had visitors including volunteers and other farmers in the network who would be exposed to the images and packaging, the architectural quality of warehouses and storerooms and the spatial arrangements of farms and the wider site. These observations were supported in interviews where farmers reported to have volunteered on other farms prior to starting their own.

Like packaging images described above, photographs of these material and spatial arrangements circulated the on internet e.g. Facebook, Instagram, web-shops, regional marketing campaigns and tourist information, graphic-design portfolios, photographers' homepages etc.

thereby translating between and piggybacking on other infrastructures.

4.5. Circulation 3: photos and social media

Marketing products on social media relies less on placing an advert and instead on integrating products into sets and sequences of visual images promoting a sense of “authenticity” with the user’s lifestyle. In this way, images depicting a particular lifestyle are used to promote products. In this case, farmers circulated photographs of herbs, gardens, fields, with domestic life in the countryside, family and pets against the backdrop of trees, fields, sunsets, farming equipment etc. to promote their businesses. As a side point, the digital fluency of the new young farmers was specifically remarked upon in interviews with regional development agencies, further setting them apart from traditional farmers in Alentejo.

Images were collected from new farmer’s Instagram and Facebook accounts and visually analysed. They were split into two main categories: ‘Packaging and products’ (1) and ‘Spatial arrangements’ (2). The second category was subdivided into three further subcategories, including:

- Farming practices (e.g., removing plastic sheeting, tending to herbs etc.);
- landscape (e.g., static, often sweeping shots of landscape carefully composed and contrasting natural elements with human practices e.g. large skies and clumps of trees with tractors or rigid lines of planting etc.);
- close-ups (e.g., shots of objects suggesting domestic life in the countryside such as toys next to carefully arranged flowers in proximity to a window overlooking the garden).

Common to these sets of images are the compositional relationships between nature and social practices intensified for aesthetic effect. For example, filters increased light and dark and saturation levels, or the application of blue tints to cool down highlights and shadows, effectively exaggerating contrast between mid-tones and skin hues. These visual manipulations aim to evoke a sense of nostalgia by softening the focus and bleeding out highlights. These visual data support the reports in interviews (see section 4.1) that many new young farmers brought with them romantic and unrealistic images of nature and rural life to herb farming in the Alentejo and present a similar refined aesthetic as the packaging images (section 4.2).

A quick online image search for “herb farming Alentejo” yields a large amount of highly aestheticized images in line with what is described above. Coupled with the circulation of images regionally across the EPAM network, and those distributed along supply chains reaching customers and shops in other European cities (see section 4.3) a distinctive visual discourse on life, work, and herb farming in relation to nature in rural Alentejo is evident. These material-discursive practices extend beyond herb farming and can be seen in other sectors such as artisanal production of traditional Aquarente de Medronho (strawberry tree brandy), mushroom collecting, and eco-tourism (e.g., Brul, 2012).

5. Conclusion: modes of spread in social innovation – a process relational approach

The aim of this article was to analyse how circulations of material-discursive configurations, in this case images, contribute to spreading social innovation as a relational trans-scalar process, and to examine what was produced therein. This objective was met by applying social topology with agential realist theoretical sensitivity in order to foreground performativity, material-discursive configurations, and more-than-human practices. Together, this approach showed that the circulation of material-discursive configurations spreads social innovation. This type of spread did not follow an extensive linear process, or an

intentional dissemination strategy, instead the approach yielded results which can be summarised as follows:

- i. Images are material-discursive configurations produced through reciprocal relations (e.g. topologically between urban and rural sites, or self and nature).
- ii. Images circulated through an ecology of infrastructures, including EPAM.
- iii. EPAM can be said to be a socially innovative infrastructure connecting into other infrastructures including, supply chains, shops, farms and farmers, social media.
- iv. Images and infrastructures were shown to adapt to the each other in a process of re/de-materialisation. This resulted in images transgressing infrastructures which had the effect of connecting and reconfiguring spatial systems trans-locally.
- v. Circulations of images were performative of emerging subjective and collective identities.

To answer the question how images contribute to the spread of social innovation, a cascade of images (Latour, 2002) circulating an ecology of infrastructures weaving a discursive web as they go, can be imagined. In an act of reciprocal inherence, images lend infrastructures their materiality and, as they enfold, they establish new topological relations and spread a process of socio-spatial change. A process in which subjectivities, objects, and spaces are together reconfigured and which shows spread to be generative and precede emergence.

To elaborate this idea, I offer a topological diagram of the spatial dynamics of spread in social innovation. This diagram consists of four poles on two axes, the first connects/holds apart intensive and extensive forces (referencing Tarde and DeLanda’s theoretical observations, as laid out in section 2.2 and 3), the perpendicular axis separates intentional and unintentional forces (referring to Greenhalgh et al.’s observations discussed in section 2.2).

5.1. Extensive/intentional

As discussed in section 2, social innovation may be understood as both an object and a relational process. When understood as a pre-determined object (e.g., a bundle of novel social practices or solutions) spread or diffusion *in* space maybe mapped extensively tracing its movement against contained regional space. These properties of social innovation as a solution-orientated object diffused across networks in regional space is well elaborated (see section 2.2). The aim is to intentionally scale-out or scale-up a social innovation object to increase uptake or impact, either horizontally across a network or vertically through institutional or systemic levels.

5.2. Intensive/unintentional

However, where social innovation is understood as a relational process according to the conceptual framework laid out above, the extensive diffusion of objects *in* space does not hold. Therefore, as I have argued in this paper, a different understanding of spread and methods for analysing it was required. Spread in this mode is the result of the internal reordering of relations and boundaries reminiscent of — but not identical to — Tarde’s overlooked intrinsic growth (section 2.2). The agential realist approach presented here adds to Tarde’s observations by sharpening the focus on the internal reconfiguring of relations and boundaries in posthumanist performative practices. Following DeLanda, I refer to this mode as *intensive* (see section 3).

In contrast to practices of scaling-up or -out in, in an unintentional mode social innovation is spread by the circulation of material-discursive configurations, in this case images. The spread of social innovation by the circulation of images was not intentionally planned. Indeed, as the results show, human subjectivity was, at least partially, produced through the circulation and performativity of images. In this

way the pole of intentionality and unintentionality serves to foreground more-than-human agencies at work in relational processes.

By distinguishing these modes of spread according to the diagram the article i) foregrounds a process-relational interpretation of social innovation and spatial spread, ii) contributes knowledge to a less prevailing discourse on diffusion in social innovation, iii) by doing so, it brings to the fore spatial assumptions underpinning the dominant interpretations of social innovation.

It is intended that this diagram may provide a useful heuristic for further diffusion studies in social innovation research and analysis. A number of question arises from this article, for example how do images behave differently to circulations of other material-discursive configurations in relational processes of social innovation and spatial spread?

I have argued in this paper for a process-relational approach to social innovation and spatial spread to be distinguished from social innovation's as predetermined objects and regional diffusion dynamics. I use the approach to describe, map and analyse connectivity across scales through which things, subjectivities and spaces are reciprocally reconfigured in processes of social innovation.

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