Article:
Mejia, Cristian, D'Ippolito, Beatrice and Kajikawa, Yuya (2021) Major and recent trends in creativity research:An overview of the field with the aid of computational methods. Creativity and Innovation Management. pp. 475-497. ISSN: 0963-1690

https://doi.org/10.1111/caim.12453

Major and recent trends in creativity research: an overview of the field with the aid of computational methods

Cristian Mejia
Tokyo Institute of Technology
mejia.c.aa@m.titech.ac.jp

Beatrice D'Ippolito
University of York
beatrice.dippolito@york.ac.uk

Yuya Kajikawa
Tokyo Institute of Technology
kajikawa@mot.titech.ac.jp

Abstract
The present article explores 98 years of creativity research [1922-2020] covering more than 38,000 academic articles on the topic. By applying computational methods rooted in network analysis and text mining, we uncover a history of creativity research spread through 12 major topics of inquiry, including, among others, the psychology of creativity, organisational creativity, creative industries, and idea generation. We also unpack recent trends within the growing body of literature, with a particular focus on business and management. These trends, 36 in total, cover a variety of topics, from the discussions of cultural psychology and distributed creativity to the role that virtual worlds play in the generation of creative outputs. Digitalisation, interdisciplinarity, and multiculturalism emerge as transversal topics across the recent developments. Finally, we discuss how computational methods can help develop comprehensive snapshots of large research fields such as that of creativity and draw subsequent policy implications.

Keywords: creativity; organisational creativity; network analysis; citation networks, business and management

1.- Introduction

Research on creativity gained momentum in the 1950s with J. P. Guilford addressing the American Psychological Association in his presidential speech over the lack of research on, or closely related to, creativity (Rhodes, 1961). Since then, the landscape of creativity research has changed dramatically. As of 2020, a simple search of the term creativity in any bibliographic database will reveal thousands of records, with the greatest concentrations of published articles located in the past recent years, highlighting that the field is transiting over its most productive period. This comes with no surprise, as creativity has spread beyond psychology to the context of business and innovation, where the interest is to understand, measure, and nurture creativity not only at the individual level, but also at the level of the organisation and the wider society (Castillo-Vergara, Alvarez-Marin & Placencio-Hidalgo, 2018). Policies promoting innovation have helped boost this trend as creativity is associated with innovation and, as a result, economic growth (Audretsch & Link, 2012; Teece, 1986). The breadth of creativity research is astounding. It involves a large number of academics and research institutions, each focusing on a granular aspect of the topic. Therefore, summarising the research that has been conducted remains a rather challenging task.

When attempting to overview such a broad and complex concept as creativity, the first obstacle is identifying relevant criteria for classifying it. In social sciences, this problem is more acute as there is no thesaurus or consensual classification schemes. Although some contributions may classify the research according to categories such as those provided by Web of Science (WOS), these are not granular enough to capture the plurality of sub-topics that characterises creativity research. An alternative is the use of semi-automated approaches derived from network analysis and text mining. These methods exploit the underlying patterns that tie together different but related corpora of knowledge and are able to surface detailed taxonomies of a given research field. For instance, these methods have been applied to large

research fields such as robotics (Mejia & Kajikawa, 2017) and sustainability science (Kajikawa et al., 2007).

In this article we study the structure of creativity research by addressing the following questions:

1. What are the major publication trends in creativity research?
2. How can we best classify the research on creativity via sub-topics that can be relevant to business and management scholars?
3. How do recent trends in creativity research inform ongoing debates within business and management literature?

We answer these questions by comprehensively navigating all available literature in a bibliographic database, by means of network analysis and text mining, with the aim of revealing large and fine-grained topical clusters. Our dataset covers more than 38,000 academic articles published between 1 January 1922 and 31 December 2020.

The article is structured as follows. In the next section, we illustrate how creativity has been defined and discuss how previous literature has applied semi-automated tools for exploring creativity research, positioning the present article accordingly. We describe our methodology in Section 3 and illustrate the main results, including most recent trends in the literature in Section 4. Next, we discuss the methodological and theoretical implications deriving from the findings (Section 5) and conclude with a summary of the research (Section 6).

2.- Previous literature

2.1.- Defining creativity

One of the earliest definitions of creativity, given by Ellis Paul Torrance, states that creativity is "the process of sensing gaps or disturbing, missing elements; forming ideas or hypotheses

concerning them; testing these hypotheses; and communicating the results, possibly modifying and retesting the hypotheses" (Torrance, 1962). Torrance later would take into consideration elements of that definition to develop what is known today as the Torrance Test of Creative Thinking (Torrance, 1966). Originally, the test evaluated verbal and non-verbal activities related to the four factors of creative thinking: fluency, flexibility, originality, and elaboration.

Those four factors were borrowed from Guildford's ideas of divergent thinking (Guilford, 1967), in a first attempt to separate creativity from intelligence, or convergence thinking, which was measured with traditional intelligence tests. Guildford became the evangelist of creative research, and his seminal works would eventually lead to a massive field that is creativity research today.

As the field grows, more definitions of creativity have been provided. Runco and Jaeger (2012), after summarising the most commonly cited definitions in the literature, have commented that originality and effectiveness are the two main components of creativity, with surprise being a potential third (Simonton, 2018). Other definitions also link creativity to discovery (Martin & Wilson, 2017).

2.2.- Targets of the research on creativity to date

Not only the components of creativity have been subject of study, but also the target to whom the creativity is measured. While early studies of creativity centred on the individual, later the field also started focusing on the organisations, given that their competitive advantage depends on the creativity of the individuals who belong to them (Amabile et al., 1996). A large corpus of literature deals with the measurement and enhancement of creativity of team members under a competitive environment and unpredictable conditions, pointing to a generic form of organisational creativity. More recently, a branch of creativity research deals with larger creativity ecosystems like the creative industries and creative cities (Scott, 2006). In this

research, factors contributing to both a stimulating infrastructure and city mindset, like approaches towards flexibility, inclusion, interaction among others, play a central role (Florida, 2002).

2.3.- Efforts in overviewing creativity research

In the history of creativity research, we can find examples of reviews that seek to capture different dynamics of this evolving field. One of the earliest contributions is the work of Mel Rhodes, who by 1961 noticed that research on creativity, based on the definitions applied by scholars of the time, could be allocated into four strands, namely: persons, or research on the traits, habits, and personality of the individuals; process, covering the motivations, thinking, and communication during the creative process; press, pertaining to environmental factors influencing creativity; and products or studies on the ideas and generated outputs (Rhodes, 1961). However, as the volume of publications increased, expert-based updates covering the directions of the whole field seem to be inexistent.

To overcome the information overload, researchers have opted for computer-assisted methods that could enable them to perform comprehensive navigation of the field. Still, these assisted overviews are not abundant and are usually focused on narrow sets of information, from where general trends are inferred. Table 1 summarises these researches. In chronological order, we have the work by Wehner, Csikszentmihalyi, and Magyari-Beck (1991), who analyse dissertations linking creativity with innovation and entrepreneurship and develop a typology of creativity research for the fields of education, business, economics, history, and political science. A similar work, updating the contribution by Wehner and colleagues, has focused on dissertations and brought back to surface the interest on psychology and science and engineering, not observed in the former (Kahl, Da Fonseca & Witte, 2009). Then, we have the first review based on academic articles, which centres on publications within a leading

academic outlet in creativity research, the Journal of Creative Behavior, exploring 23 years of publications since their first issue; the review draws attention to increasing interest towards topics such as creativity enhancement, education, problem-solving, social influences, and personalities of the creative individual (Feist & Runco, 1993). The review articles that followed did not specifically aim at finding topical trends, rather bringing overviews on authors and citation patterns. Beghetto et al. (2001) and Kumar et al. (2013) also targeted publications in the Journal of Creative Behavior to bring insights on author collaborations and citation impact, respectively. A more comprehensive approach was followed by Long et al. (2014), who included contributions to creativity research published in four leading journals (i.e., Journal of Creative Behaviour, Gifted Child Quarterly, Creativity Research Journal, and Psychology of Aesthetics, Creativity, and the Arts.) and assessed the journal's productivity by the number of publications and the journal's performance by citations received. They found an increase of scholarly interest in creativity research, which translated in an improvement over time of the impact factor of those journals along with an increase in the yearly number of publications.

Finally, the publications after 2015 adopt a broader search strategy: instead of focusing on a single journal, the authors focus on any article covering a variety of creativity-related topics; they also apply more sophisticated methodologies like keywords and network analysis. Zhang et al. (2015) have explored 20 years of creativity research aiming to clarify the "spatial structure" of creativity, that is, the core topics investigated during that time frame. Their methods helped distil 163 keywords that could be grouped into any of five topical trends: practice applications of creativity pathology, and physiology of creativity; individual-level creativity; organisational-level creativity; and the basic theories and methodologies of creativity (Zhang et al., 2015). William et al. (2016) have also undertaken a keyword-based analysis of the research on creativity over a 25-year timespan. Their analysis of 1,472 articles led to capture three main trends: innovation in the workplace, the role of personality and

intelligence in divergent thinking, and creative performance with a focus on idea generation. One of the major contributions of their article is the discussion of central articles within each topic (Williams, Runco & Berlow, 2016). The last and most recent review focuses on creativity in business and economics. It spans over 43 years of research covering 5,710 articles, and uncovers varied topics such as, among the most recent trends, innovation, cities, behaviour, communities, strategy, impact, culture, science, careers, and teams. Their work has revealed that two main issues should be addressed in the future: first, the study of creativity in terms of training professionals, which has shown to impact organisations meaningfully; second, a focus on creativity evaluation and performance systems that go beyond the individual level and encompass management indicators (Castillo-Vergara, Alvarez-Marin & Placencio-Hidalgo, 2018).

Two articles have applied bibliometric methods to study conceptualisations of creativity rather than topical distributions within creativity research. Slavich and Svejenova's (2016) study of the definition of creativity used in 400 articles found that creativity is associated with four core processes: synthesis, engagement, interactions, and creations focusing on individuals and organisations. The concept is also studied as an outcome and as an impact. Puryear and Lamb (2020) reviewed 600 articles with the aim of analysing how the definition of creativity differs across the domains of business, education, and psychology; the authors suggested that problem-solving is emphasised by scholars in education and business, while psychometric definitions, expectedly, are the core defining creativity by psychology scholars. In general, novelty and usefulness are reported as common traits across all definitions.

Progress in data accessibility and computing power has enabled covering larger periods of time. More data bring insights on topical trends and key players of creativity research. This is revealed as a progression from small samples of dissertation abstracts to comprehensive coverage of academic literature. These computer-assisted methods bring additional benefits,

that is, they prevent the overlooking of nascent but relevant topics thanks to the ample coverage, as well as the occurrence of biases when experts try to fit an academic landscape into predefined frameworks or mindsets. However, despite the application of computational methods, previous literature identifying topical classifications or taxonomies have focused on larger levels of aggregation. For instance, Wehner et al. (1991) have classified creativity research within the domains of Education, Business, History, and Political Science (see Table 1). While those large categories are informative, higher levels of granularity that would capture the organic growth of creativity as a research field are missing. Additionally, no article has yet brought a comprehensive picture of creativity research as a whole across all scientific disciplines.

This manuscript has the objective of filling this gap. By implementing a comprehensive search strategy, we cover the largest timeframe available for creativity research. We integrate and add to extant literature in that we not only aim at identifying major trends, which expectedly may partially overlap with those found in previous articles, but we leverage on technologies of data mining for research-front detection to reveal granular yet impactful topics within the larger trends. This approach enables us to explore and discuss the role of leading journals in bringing the field forward and identify, if any, important topics that have been overlooked by prominent research outlets. Therefore, we expect to contribute to bringing the most complete snapshot of the state-of-the-art in creativity research, while discussing the potential directions of the field and its relevance for business and management scholarship.

3.- Data and Methods

In analysing the research on creativity, we have dealt with two challenges: finding the literature pertaining to creativity research and identifying the topics in which it could be classified. To handle the first challenge, we used a broad search strategy that pulled the largest number of articles related to creativity from the bibliographic database. We retrieved any article

containing the keyword "creativ*" in either the title, abstract, or keywords. The asterisk is a wild card, allowing one to extract articles having words starting with "creativ" like "creativity", "creative", "creativeness", etc. Articles were obtained from the Web of Science Core Collection, which is the standard database for bibliographic analysis given its readiness for text and citation mining. More importantly, leading journals on creativity research like the Journal of Creative Behavior, Creativity Research Journal, Creativity and Innovation Management, Psychology of Aesthetics, Creativity, and the Arts, among others, are indexed within the Collection. Although there exist various bibliographic databases like Scopus, the majority of bibliometric and meta-analysis studies rely on Web of Science (Zhu & Liu, 2020), which emerges as encompassing a better structure content, from the categorisation of journals to the inclusion of formatted and complete citation linkages (Birkle et al., 2020). We searched for any article written in English published until 31December 2020 for a total of 133,073 records by the date of data retrieval on 20 February 2021.

Although our search strategy was comprehensive enough to pull articles related to "creative thinking", "creative destruction", "creative industries" and so on, it also brought several articles that, despite mentioning keywords such as "creative" and "creativity", were unrelated to creativity research. To overcome this obstacle, we applied two exclusion criteria. First, we cleaned the dataset from any article where the only match to our query was the term "creative" within the "creative commons" license statement. It is not unusual for some journals to include the copyright statement as the last sentence in the abstract. As a result of this filtering process, we were left with 103,071 articles for further analysis. Second, we aimed at clearing out other incidental mentions, which are harder to identify when using a text search. For instance, an engineering article may describe "a creative mechanism of gears" or state "this creative design…". As there is not a fixed pattern for such keywords, we instead took advantage of the properties of citation networks. Creativity research does not exist in isolation. Therefore,

an article focusing on creativity as a topic of inquiry will necessarily reference another prior work also within the scope of creativity research. Then, we built a citation network representing each article as a node and connecting it to any other article in their list of references that is present in our dataset. Connections are made by matching the document object identifier (DOI) in the list of reference of each article to the DOI of the article in the dataset. When the DOI is not available, we matched the author, publication year, journal, volume, and page number of each reference, to those of the papers in the dataset. Citation networks created with this approach are known as direct citation or inter-citation networks. They are more appropriate to identify research fronts (Shibata et al., 2008) and generate knowledge taxonomies or landscapes (Klavans & Boyack, 2017) in comparison to other methods like bibliographic coupling (Kessler, 1963) or co-citation (Small, 1973). In such a network, the largest connected component is the one covering the topic of creativity research. On the other hand, disconnected nodes, which do not cite or are cited by any article in the largest component are neglected. After this filtering, we retained 38,290 articles, which have become the object of study of this paper. The disconnected components were also inspected in search of small groups of disconnected creativity research; however, this led to no further inclusion. The full list of article IDs retrieved from the database along with an indication of the inclusion in the present research is offered as supplementary material. Figure 1 summarises the procedure followed.

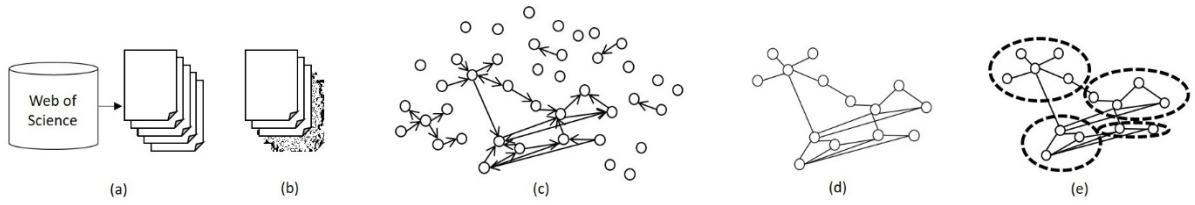

Figure 1. *Data collection and methodology described in this article. (a) Obtain articles from the database (b) Remove unrelated articles based on text search. (c) A citation network is created based on the references of the articles. (d) The largest connected component is extracted. (e) Clusters are obtained from the network.*

The final step of the filtering process was designed to overcome the challenge of identifying the sub-topics within creativity research. We identified groups of densely connected articles within the largest component of the network by applying the Louvain algorithm (Blondel et al., 2008), which is based on the maximisation of a network property called modularity. Modularity is an indicator of connectivity strength among nodes in a cluster. The higher the value the denser the connections. Modularity is computed by applying Equation 1 (Clauset, Moore & Newman, 2008):

$$Q = \sum_{s=1}^{N} \left[\frac{l_s}{l} - \left(\frac{d_s}{2l} \right)^2 \right] \quad 1)$$

where N is the number of clusters and l_s and d_s represent number of links and sum of the degrees of nodes within cluster s, respectively. The optimal number of clusters is obtained automatically when the iterations reach the maximum modularity.

Each cluster was labelled based on the contents of their most cited articles. A first run of the algorithm would lead to relatively big clusters; given the relatively large number of articles within each of them, one could argue that these clusters cover major trends in creativity research. We then extracted the average year of publication, average citations, top researchers, and top journals of each cluster. Finally, we analysed the evolution of each cluster over the years by looking at their number of articles throughout different windows of time.

Semantic relatedness among clusters was also computed by text mining the contents of each cluster. We aggregated the title, abstract, and keywords of the articles in the clusters; we extracted vectors of keywords by using a bag of words model, whereby each keyword in the cluster is scored with their term frequency-inverse document frequency score, a well-known weighting schema in text mining (Shibata, Kajikawa & Sakata, 2011). With these keyword vectors, we plotted a map of semantic relationships based on multidimensional scaling of the

principal components (see Sievert and Shirley (2014) for details of the computation of this type of semantic map). We repeated the procedure recursively with the aim of finding detailed sub-topics, which were assessed in terms of the number of articles, average citations received, and average publication year of their articles.

We also wanted to investigate the role of reputable journals and impactful research within the management and business field in defining creativity research. To do so, we proceeded with the identification of top research by using as reference the Academic Journal Guide (AJG) maintained by the Chartered Association of Business Schools (CABS, 2018). The guide consists of a peer-reviewed list of academic journals where business and management scholars publish their works. The list is split into four levels, with Level 4 including journals who publishes research of the highest quality and with a high impact factor. There is a Level 4* category above Level 4, which encompasses those journals that are "recognised as world-wide exemplars of excellence" (CABS, 2018). We choose the AJG over other journal ranking systems due to its hybrid nature (based on judgements of experts and citation indicators). Hybrid ranking systems tend to have higher correlations with other rankings (Vogel, Hattke & Petersen, 2017), expectedly leading to consistent results. Also, the AJG gained rapid adoption among management scholars (Walker et al., 2019). This ranking does not escape from criticism (Walker et al., 2019). Thus, to minimise bias introduced by the ranking we have selected three inclusion criteria to find relevant management research even when a journal is scored in the lower levels of the AJG. We used the 2018 version of the guide, as the most updated at the time this study was conducted. A subset of 5,111 articles was obtained that satisfy any of these criteria:

1. articles published in journals ranked at Level 4 and 4*;
2. articles published in journals ranked at Level 3, where these have either been cited more than 100 times or the journal has more than five articles on the topic;

3. articles published in journals ranked at Level 2, where these have been cited more than 100 times.

We compared the larger set of creativity research and the subset composed of top creativity research in management in terms of average publication years, citation, and volume of publications.

Data processing and computational methods applied in this article were implemented with the R programming language version 3.6.3 (R Core Team, 2019) for Windows. Additionally, for the steps involving network building and clustering, we used the R package igraph version 1.2.5 (Csardi & Nepusz, 2006). The network visualisation was made using the Large Graph Layout, an algorithm and free software designed to plot large networks (Adai et al., 2004). We set the size of nodes to zero to display only the edges. These were given different colours to represent the clusters.

4.- Results

We found 38,290 articles related to creativity research. With the two earliest articles in our dataset dating back to 1922, covering creative imagination (Simpson, 1922) and creative synthesis (Titchener, 1922), both published by the American Journal of Psychology. Since then, the field has grown to reach a rate of around 3,000 publications per year over the past 4 years, with 2019 and 2020 reaching a maximum of 3,290 and 3,250 papers respectively. Articles come from 8,418 different journals with the ten largest being the Creativity Research Journal, Journal of Creative Behavior, Thinking Skills and Creativity, Frontiers in Psychology, Psychology of Aesthetics Creativity and the Arts, Sustainability, Psychological Reports, Arts in Psychotherapy, Personality and Individual Differences, and Creativity and Innovation Management.

4.1 Major trends

By means of citation networks, we could identify 11 major trends covering 90% of the publications. The residual 10% covers a plurality of minor topics that we aggregate as "others", for a total of 12 distinctive clusters. Figure 2 shows the citation network and a sample of the largest clusters. For ease of visualisation, only the edges (and not also the nodes) are displayed, resulting in a hairball-like figure. Citation networks plotted in this way help uncover underlying relationships among the clusters. In this case, we observe a cohesive corpus of knowledge, with the clusters highly overlapped. This signals that, although each cluster refers to particular topics, they tend to share citations across them. Table 2 summarises the contents of each cluster. Clusters were named by inspecting the keywords most frequently mentioned by their articles and by reading the contents of their most cited works. They are sorted from the one having the most publications.

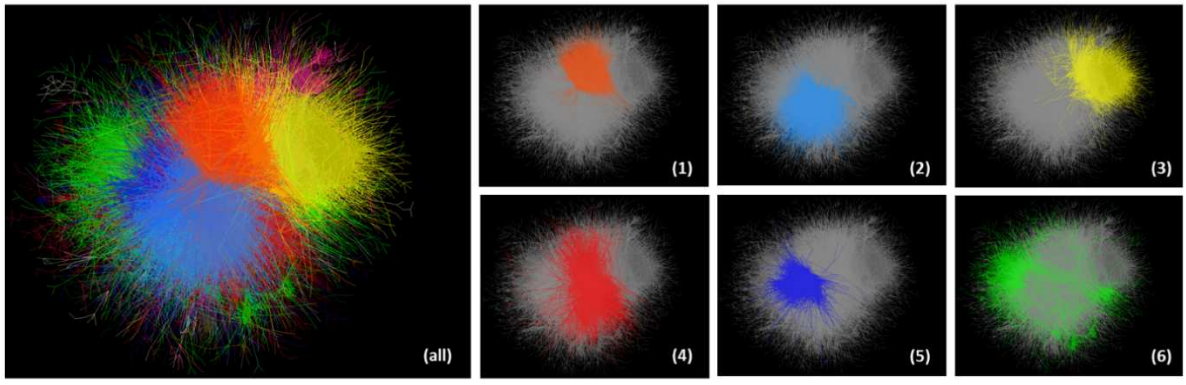

Figure 2. *Citation network of creativity research on articles published in the Web of Science until 2020. We found 12 major topical trends or clusters, all highly intertwined. Clusters are represented with different colours in the network. The position of the largest 6 is shown separately.*

The largest cluster is also the one having the highest average citations: organisational creativity and team creativity. This covers research on factors affecting creativity and innovation in the workplace (Amabile et al., 1996; Oldham & Cummings, 1996). The second-largest cluster, focusing on the social psychology of creativity, is largely dealing with factors affecting the creativity of individuals, theoretical works, and the measure of creativity. It can

be said to be a foundational topic for creativity research where most of the notable authors on the field are located. Fundamental concepts in creativity like intrinsic motivation (Amabile et al., 1994), or the role of incentives and constraints in affecting individual creativity, are also found in this cluster. The third-largest cluster is on average the youngest covering the creative industries and creative cities. This cluster is largely influenced by the work of Richard Florida on the creative class (Florida, 2002). Research in this cluster focuses on issues related to the effect of policies and urban design in the lives and creative capacities of individuals (Peck, 2005; Scott, 2006). Next, we have a cluster on idea generation. A plurality of research investigating how ideas come to be, with special attention to idea generation in groups, for instance through brainstorming (Paulus & Yang, 2000) or open innovation (Enkel, Gassmann & Chesbrough, 2009). This cluster also covers design science (Hevner et al., 2004).

The fifth cluster looks at creativity through the lenses of neuroscience, investigating how the brain works during the creative process (Dietrich & Kanso, 2010; Mednick, 1962). Cluster 6, covers creativity as a means of healing, including art therapy and the connection between art and public health (Perruzza & Kinsella, 2010; Stuckey & Nobel, 2010). On the contrary, cluster 7 covers research on how mental illnesses, including schizophrenia, depression, alcoholism, suicide rates, and others, relate to the extent to which individuals are considered to be creative; in these studies, the targets are usually writers and artists (Andreasen, 1987;Post, 1994; Felix Post, 1996).

Expertise and productivity constitutes the next cluster. Research within this cluster discusses the role of age, career paths, and landmarks in relation to the creative outputs of individuals in the organisation. (Simonton, 1997). Among others, it also covers how the surroundings affect the creative process (Chen, Chandler & Venkatesh, 2020). Cluster 9 is about research on enhancing creativity. Pertains to the training of creativity, and strategies for improving creative thinking within organisations (Scott, Leritz, & Mumford, 2004; Torrance,

1972). This cluster is also the oldest one. Next is the cluster of identity and multiculturalism. This cluster aggregates studies on how the exposition to multiple cultures enhances the creativity of individuals (Leung et al., 2008), for instance by increasing their collaboration networks including people from different backgrounds during team assembly (Uzzi & Spiro, 2005), or just by having the experience of living abroad (Maddux & Galinsky, 2009). The final cluster explores the concept of creative destruction collecting research from the point of view of economic innovation. This cluster covers theoretical research on how innovation affects established systems of production and marketing (Abernathy & Clark, 1985), and discussions on new models of economic growth (Aghion & Howitt, 1992), along with case studies on specific industries (Trabucchi et al., 2017).

The above-described classification along with the quantitative summary included in Table 2 reveals the current snapshot of creativity research. The influence of management scholars in bringing this field forward becomes apparent with the first four largest clusters, which explore the underlying structure of creativity, the ingredients of the creative mind, motivations and constraints of the creative process, at the levels of individuals, teams, companies, and societies. Those four clusters share similarities to other classifications and explorations of creativity conducted in the past in the contexts of business, management, and innovation (Castillo-Vergara, Alvarez-Marin & Placencio-Hidalgo, 2018; Sternberg, 1999). The remaining clusters explore other facets of creativity research as studied in medicine, biology, economics, arts, and humanities.

Overall, creativity research is increasing with more articles published every year. However, each trend has followed its own path. Figure 3 shows the yearly trends of publications for each cluster since 2010. Although the number of publications in cluster 3 sharply increased since 2015, it decreased in the past year. Cluster 1 continues increasing. The

first seven clusters have dominated over the past years, while the remaining clusters have remained stable or slightly rising. No cluster seems to be entirely "dying".

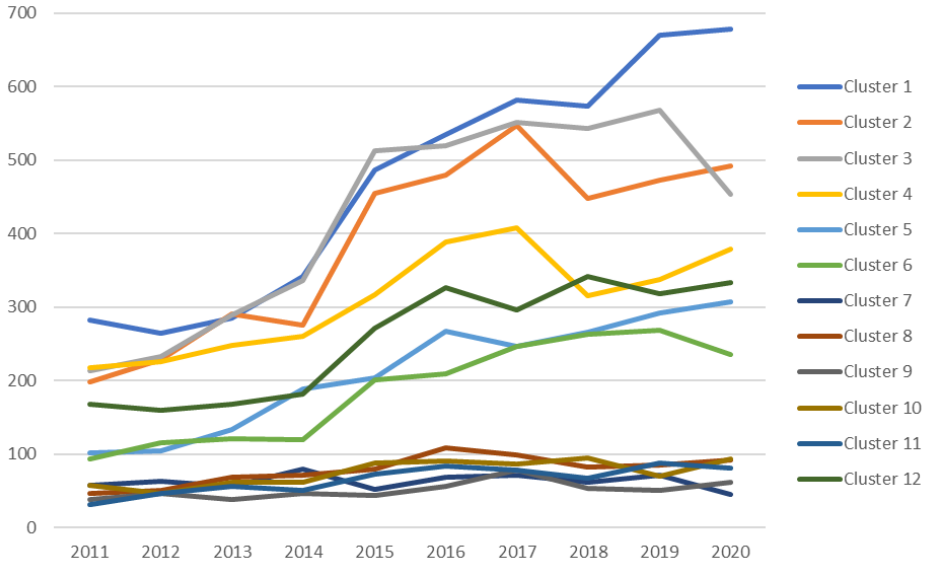

Figure 3. *Documents per year since 2010 for the major trends of creativity research.*

Another way of looking at the history of creativity research is to study how the proportion of articles in each cluster has changed over time. Figure 4 depicts the evolutionary trend by splitting the publications into five-year windows. Research undertaken before the 1990s was largely focused on the socio-psychological aspects of creativity. Followed by neuroscience studies, research linking creativity to mental illness, and the enhancement and training of creativity. In the early 1990s, research on organisational and team creativity along with studies on idea generation starting to take off. Most of the research pertaining to creative industries and creative cities comes from the 2000s. Proportionally, the research topics that have experienced the largest dwarfing are the one of mental illness and the studies of enhancement and training of creativity. Finally, the neuroscience of creativity has been a consistent topic, covering from 8 to 10% of the creativity research published at any given time.

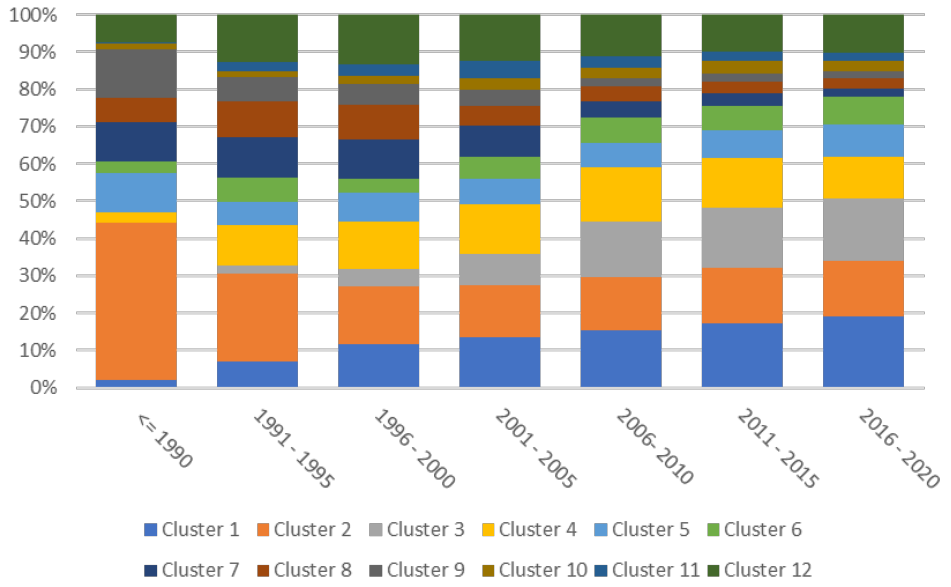

Figure 4. *Evolution of creativity research. The x-axis represents the proportion of articles per cluster. The y-axis is different windows of time.*

We also investigated semantic relationships among them by mining their text contents. This is done by creating a topic distance map based on the most relevant keywords within each cluster. Figure 5 describes the semantic relationship of the clusters. Clusters that are close to each other are interpreted to have a larger shared vocabulary. The employed methodology makes the dimensions of the axes to be irrelevant, and the map just serves as an approximated representation on how the topics are distant to each other. We interpreted the coordinates based on how the clusters were located. For instance, clusters 5 and 7 covering neuroscience and mental illness are in the left, while creative industries and cities on the right. Revealing a topical gradient over the x-axis from studies covering the individual (from the very biological factors) to societies. Cluster on organisational creativity and others covering innovation are situated in the bottom, and those clusters related to art and humanities at the top. Cluster 12 which is an aggregate of all other research, appears near the centre, which confirms its expected plurality.

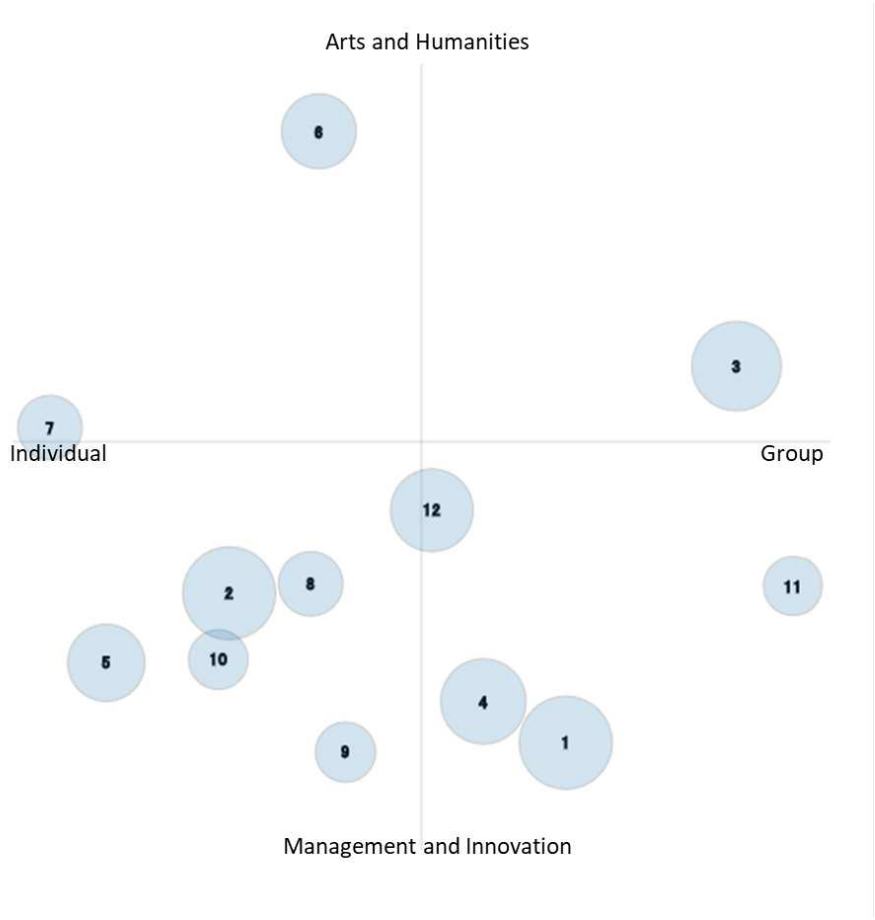

Figure 5*. Cluster distance map via multidimensional scaling of keyword vectors. Keywords were extracted from the title, abstracts, and author keywords fields. Axis labels were inferred a-posteriori by inspecting the cluster contents. The size of the cluster is relative to its number of articles.*

4.2.- Recent trends

We identified fine-grained sup-topics by recursively clustering the citation networks corresponding to each major cluster. We found 141 sup-topics from where we computed their average publication year and citations received. Figure 6 shows a boxplot of the average publication year of the sub-topics. We define as falling under 'recent trend' those sub-topics being the youngest with a publication year after the third quartile (i.e., after 2014.2); we obtained 36 sub-topics, with more than 50 articles in each of them. We labelled them in a way that captures their relationship with their major clusters; for instance, sub-topic "1-a" refers to the largest of the recent sub-topics from cluster 1, "2-a" refers to the largest of the recent sub-

topics from cluster 2, and so forth. Figure 7 illustrates the relationship between publication year and citations received per each recent sub-topic. Also, while in the remainder of the article we focus on the 36 most recent trends, the full list is presented as supplementary material, including their average publication years, citation, article counts, representative papers, and keywords.

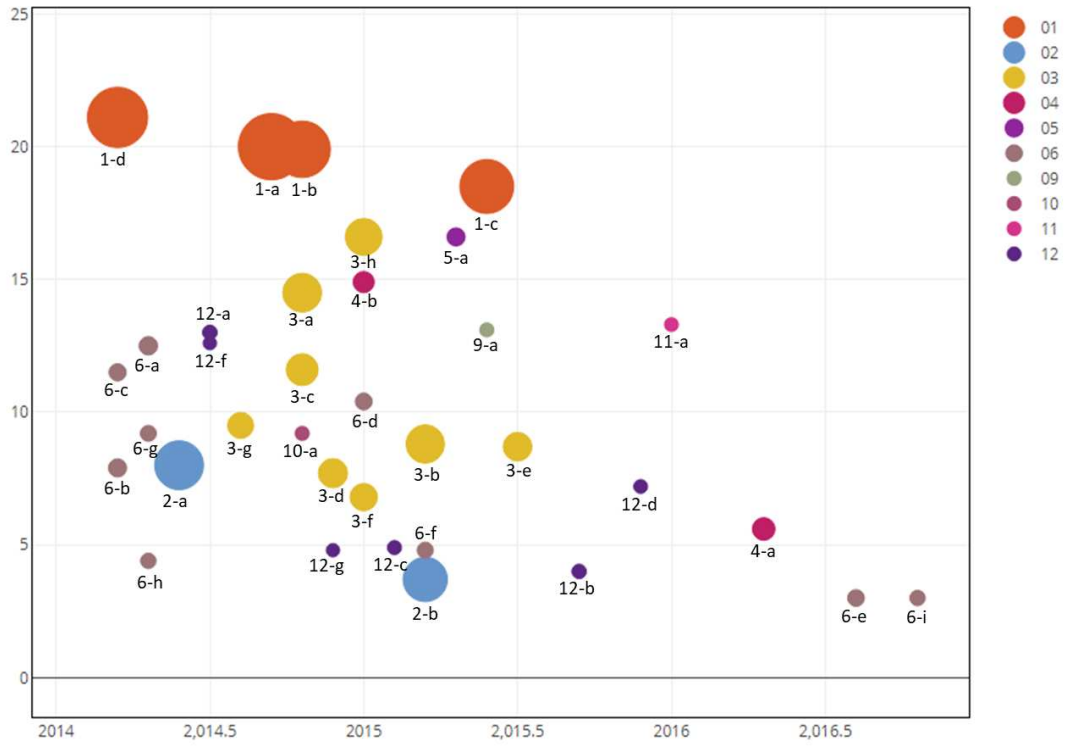

Figure 7. *36 recent sub-topics derived from the major clusters. Colours represent the colour of their major cluster and the size is relative to their number of articles.*

Recent sub-topics related to creativity in teams and organisations have received the greatest attention by the number of citations received and the number of articles published. The sub-topic with most citations is 12-e on socio-ecological system innovation. The newest of the sub-topics correspond to 6-i on digital art therapy, and 6-e on creativity in counselling. A brief explanation of the content of selected recent sub-topics follows.

1-a Transformational leadership. Within the main cluster of organisational and team creativity, we found four emerging trends. The first current trend is the research of

transformational leadership. Referring to the active engagement of team leaders or managers in understanding and supporting the intrinsic motivations of the followers or employees for achieving common goals (Shin & Zhou, 2003). Although transformational leadership research has been around since the early 2000s, the topic has received attention in the past couple of years (Hughes et al., 2018). This recent sub-topic is also the second in order with the highest average citations received among the hot topics identified.

1-b Drivers of innovative work behaviour. Recent research explores the actual implementation of ideas in the shop floor, where group relationships and proactive behaviour from part of the employee are central (Pan, Liu, Ma, & Qu, 2018;Scott & Bruce, 1994). It also covers research on the issues of transitioning from a top-down leadership towards employee-centred styles of leadership (Cai et al., 2018).

1-c Empowering creative self-efficacy. Research in this sub-topic explores current trends on how leaders could empower followers in their belief of being capable of creative outputs. Explored methods include improving access to resources and information (Zhang, Ke, Frank Wang, & Liu, 2018), support from managers (Tierney & Farmer, 2002), or even inducing employees to a challenging situation due to workload (Shao, Nijstad & Täuber, 2019).

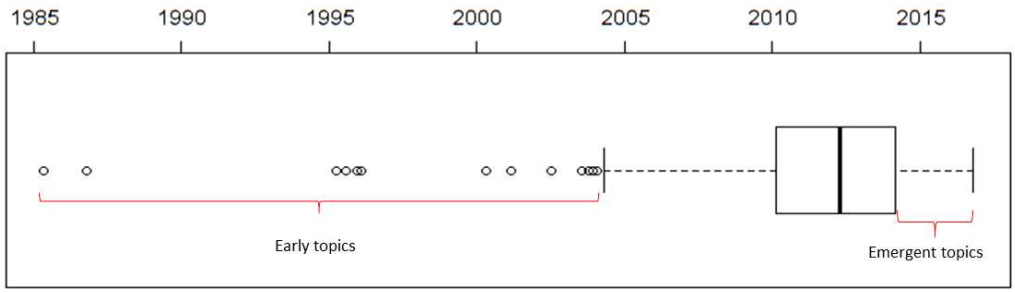

Figure 6. *Boxplot representing the dispersion of the average publication year of 141 sub-topics of creativity research. 13 sub-topics have an outlier early publication year. We considered as emergent those young sub-topics beyond the third quartile.*

1-d Creativity management. This sub-topic contains research on the benefit of training on creativity management. For instance, better creative performance is observed in managers

who have taken creativity training and such performance correlates to the time invested in such training (Epstein et al., 2013). Worthy of note is also the research on time management strategies for innovative performance (Brem & Utikal, 2019) and on management of intrinsic and extrinsic factors from an entrepreneurial perspective (Dayan, Zacca & Di Benedetto, 2013) that fall within this sub-topic.

2-a Cultural psychology and distributed creativity. Most of the research in cluster 2 attributes creativity as a trait of the individual. Even when external factors, environmental or social, are present, it is ultimately the individual who is considered to be the source of creativity. However, the research represented by this sub-topic deals with the idea that creativity can be distributed among members of a community. As such, the creative process is shared and not bounded to individuals; in addition, the symbolic representations embedded in objects and places are also said to play a significant role in the creative outputs (Glăveanu, 2014). The theory behind this research is grounded in cultural psychology, defined as "cultural traditions and social practices that regulate, express, and transform the human psyche" (Shweder, 1991). Under this paradigm, Glăveanu (2010) develops a framework to explain the creative act based on four elements: the self, the community, new, and existing artefacts. Not only is creativity conditioned by social factors, but it cannot exist outside cultural resources, its value is given in a social dialogue. As a result, the act of creation and the value attributed to it are given as a community.

2-b Problem-based learning and creative thinking. This sub-topic collects case-studies on the effect of a variety of student-centred teaching methodologies and their impact on the creative thinking of students. The target of analysis is high-school students and junior undergrads (Ersoy & Başer, 2014; Gregory et al., 2013). Discussions on the improvement of divergent thinking through mathematical problems (Kwon, Park & Park, 2006) are also present

along with case studies on the enhancement of creative mathematical thinking (Kandemir et al., 2019).

3-a Creative cities. This set covers literature on how economically diversified cities provide a fertile environment for the discovery and development of new technological combinations (Desrochers & Leppälä, 2011), including a debate around the type of indicators that can be used to measure the creative performance of cities (Rodrigues & Franco, 2019).

3-b Labour precarity in the creative industries. The flourishing of the creative industries has spawned an ever-growing community of independent or autonomous workers for which the sense of freedom and detachment from traditional corporate hierarchies is the main incentive. However, freedom comes with a price. Recent trends in creative industries research point to the understanding of those issues and the offering of potential solutions (Gill & Pratt, 2000; Hesmondhalgh & Baker, 2010). Low-payments, lack of stability, and lack of validation are among the many issues being studied (Butler & Stoyanova Russell, 2018; Wright, Marsh & Mc Ardle, 2019).

3-c Urban policies. Research in this sub-topic discuss policy interventions and strategies for the expansion or concentration of the creative class in urban areas. (Evans, 2009; Peck, 2005).

3-d Clusters of creative industries. This recent trend explores the characteristics of clusters of creative industries. Creative industries have a preference for urban areas, but there are differences in how they cluster together within these areas depending on whether they belong to traditional cultural creative industries like publishing or technology-related creative industries like advertising (Lazzeretti, Boix & Capone, 2008). Also, creative clusters, different from traditional industries, are observed in a compact neighbourhood within the cities priming accessibility and networking opportunities (Coll-Martínez, Moreno-Monroy & Arauzo-Carod,

2019; Granpayehvaghei et al., 2019). Research in this sub-topic explores such differences in a variety of cities and industry types.

3-e Creative tourism. Creative tourism refers to practices and strategies for tourism development that deviates from mass cultural tourism, aiming for flexible, new, and authentic experiences between host and tourists (Richards, 2011). This sub-topic includes research on co-creation of tourism experiences, creativity in tourism, and cultural tourism and events. (Galvagno & Giaccone, 2019). Specific elements within tourism are also studied, for instance creativity in haute cuisine (Stierand, Dörfler & MacBryde, 2014).

3-d Creative industries in China. This sub-topic collects research discussing the interest of China in transitioning from the label of "made in China" to "designed" or "created in China" (Ren & Sun, 2012). Shanghai is recurrently studied as an example of success for the creative industries (O'Connor & Gu, 2014; Zheng, 2011). Other cities discussed by their active creative clusters are Nanjing (He, Huang & Xi, 2018) and Guangzhou (Li & Liu, 2019). The specific focus on China of this specific sub-topic is perhaps a reflection of the surge of academic interest on such a dynamic and diverse empirical setting (Keane, 2009).

3-g Development of human capital and the creative city. The role of higher education institutions in the training of creative human capital within creative cities is an expanding area of policy interest. Research in this sub-topic covers the study of collaboration between stakeholders from the different sectors, involved in teaching, curriculum and policy development, research and knowledge exchange (Gilmore & Comunian, 2016). It also draws attention to the challenges professionals and institutions face as new actors in the regional creative economies. Their role in relation to regional and urban creative economic development has been mostly overlooked, with the exception of the contribution by Comunian et al. (2014).

3-h Gentrification and coworking spaces. This sub-topic covers research on how individuals in the creative industries, especially independent workers or freelancers tend to

select their places for living and working. Independent workers in the creative industries tend to prefer affordable cost of living, amenities, bohemian environments, or places where their creative networks flourish (Markusen & Schrock, 2006). Accompanied by the economic growth of the creative industries, the way freelancers and independent workers cluster together helps in the gentrification of some urban spaces (Ley, 2003), or the development of rural areas (Balfour, W-P Fortunato & Alter, 2018). Research also includes issues in the labour market for this type of worker and the role of co-working spaces in fulfilling their needs (Merkel, 2019).

4-a Design thinking and gamification. Design thinking has a long history of research. It refers to user-centric practical processes for problem solving and design (Johansson-Sköldberg, Woodilla & Çetinkaya, 2013). In this sub-topic, design thinking is paired to gamification techniques, like role-playing games to support the process of idea generation (Agogué, Levillain & Hooge, 2015); games may involve the creation of visualisations, physical models, or storytelling (Schulz et al., 2015).

4-b Design thinking for new service development. Recent trends in idea generation focus on design thinking for new service development. The two concepts have to date received attention by two, quite distinct academic communities. New service development has borrowed ideas and strategies from new product development, and more recently relied on the integration of user-centric approaches. Intersecting the framework of design thinking to new service development is a rather novel approach. It has been argued that this mix helps facilitate value co-creation and aligning system actors to support the value to the user (Yu & Sangiorgi, 2018). Benefits include improving the creative process of service design, strengthening the fit between service offering and user needs, and providing an organisational boost towards innovation (Steen, Manschot & de Koning, 2011).

6-e *Creativity in counselling.* This sub-topic encompasses research on the study of how creative teaching techniques can raise counselees' feeling awareness (Warren & Nash, 2019)

or how arts can be embedded in the teaching of counselling practices (Ziff, Ivers & Hutton, 2017).

6-f *Writing therapy.* In this sub-topic, we find research on the benefits that creative writing may engender across a variety of contexts, such as when individuals have to (re)define their career goals (Lengelle et al., 2013) or as a support therapy when suffering a mental illness (Chiang, Reid-Varley & Fan, 2019). Some articles also explore the effectiveness of different creative writing techniques (Nicholls, 2009).

6-g *Collaborative and social network methods.* The concept of 'small-world' refers to networks in which, despite not all the nodes are connected to each other, they are reachable in a few steps between any given pair. This short-path property remains relatively stable as the network grows. In creativity research, this mathematical construct is used to analyse collaborative networks, of individuals or organisations – see for instance the study of the network of artists by Uzzi and Spiro (2005). However, they are broadly used in the context of business and management, where the presence of this type of network has been demonstrated to enhance innovation (Fleming, King & Juda, 2007; Fleming & Marx, 2006).

6-i Art therapy and new technologies. Refers to research intersecting classic approaches of art therapy with the digital world. For instance, benefits of empowerment and creativity enhancement of homeless and mentally ill individual through photo digital photography (Padgett et al., 2013), or the art, dance and move therapy in telemedicine (Spooner et al., 2019).

10-a Malevolent creativity. Also referred to as negative creativity, malevolent creativity encompasses research on the study of creative behaviour of those individuals who deliberately attempt to harm others (Cropley, Kaufman & Cropley, 2008) as well as research that explores negative traits of highly creative individuals. Research in this sub-topic has found that some individuals with high scores in divergent thinking tests tend to be prone to unethical behaviour,

and have greater ability to justify dishonest behaviour (Gino & Ariely, 2012). Environmental and individual predictors of malevolent creativity are also studied (Jia, Wang & Lin, 2020).

11-a Creative destruction and policy mixes. The cluster of creative destruction has a recent trend focused on the study of policy mixes for system transition. A policy mix can be defined as the combination of monetary and fiscal policies that stimulate socio-technological change towards the desired direction. This sub-topic deals with the inclusion of ideas of creative destruction in those policy mixes, such as the shift from old established systems like fossil fuels towards new ones like green energy (David, 2017). These mixes actively stimulate the destruction of the old system while motivating the creation of new ones (Kivimaa & Kern, 2016).

12-b STEAM: Art integration in STEM education. This sub-topic aggregates case-studies with supportive evidence of the value of the arts in the creative outputs of the engineers and other technical professions. It covers several approaches, like adopting pedagogy styles commonly seen in the liberal arts (Connor, Karmokar & Whittington, 2015), the improvement of engineering creativity after conducting art-related tasks like writing poems or video making (Pollard & Olizko, 2019), and a focus on artistic sensibility as a predictor of the number of patents or entrepreneurial drive (Root-Bernstein, 2015).

12-c Video games and creativity. It collects research investigating the role of video games in enhancing the creativity of the players. Research within this sub-topic has explored the development of custom video games to be tested with students in the classroom (Hsiao et al., 2014) or the testing of students' creativity while playing popular video games like Minecraft (Blanco-Herrera, Gentile & Rokkum, 2019). Some research also investigates video games themselves as creative outputs (Hall et al., 2019).

12-d Virtual Worlds. This sub-topic cover research on virtual communities, in particular, the study of young people engaged in several aspects of the internet. Seminal research in this

sub-topic covered the interaction of individuals within an adapted version of the game Second Life which is a massively multiplayer online role-playing game. In there, participants could share their views on creative activities like film-making and fashion (Lally & Sclater, 2013; Sclater & Lally, 2013). Other research takes a more generic approach investigating the applicability of the virtual world for team building and the share of creative ideas (Sclater, 2016).

12-e Socio-ecological system innovation. This sub-topic covers research on new models for improving dynamics of the agents involved in complex socio-ecological systems, like the emergence of bridging organizations or working groups that facilitate interactions among individual actors in the systems (Folke et al., 2005; Holling, 2001).

12-f Digital media for co-creation of knowledge. This subset covers case-studies on digital tools that promote co-creation or help during the creative process, like the use of podcasting in education (McGarr, 2009), or machine learning techniques for music creation (Dubnov et al., 2003). It also includes action-research studies on co-creation via improvisation techniques (Montuori, 2003).

12-g Early childhood education. This sub-topic includes discussions on the learning process in early childhood and the brain of new-borns (Trevarthen, 2011). Research in this sub-topic emphasises the importance of playfulness and that play and learning should not be considered as separated processes (Samuelsson & Carlsson, 2008).

4.3.- Role of leading business and management research

We identified a subset of top research in business and management within the recent trends of creativity research (please find comparative summary in Table 3). Our focus in business and management becomes apparent within the load of articles over recent trends, related to team and organisational creativity. In the case of creative industries and cities,

although management research is present it seems to exist less attention to the topics of creative cities in China. This is possibly caused by a Eurocentric view pervading the management field. Sub-topics 6-h, 2-b, 6-e, 6-I, and 12-b seem instead not to be of relevance for management scholars. Also, with only eight articles, the recent trend 2-a on cultural psychology and distributed creativity seems to mostly be neglected by management and innovation scholars, despite being one of the largest recent trends.

In thirty out of 33 sub-topics where at least one article of management research is present, management research emerges to having been published, on average, before other disciplinary contributions, signalling that those topics may most likely originate from within the management field before spreading elsewhere. This does not happen for sub-topics 6-h, 12-f, and 11-a, where management research is lagging. Sub-topics of creative nonfiction and sports, arts for inclusion and social justice, bilingual creativity, digital media for co-creation of knowledge are the instances where other than management research is receiving more attention from the scientific community based on the citations received. This group of sub-topics that divert from the management literature either represent a corpus of knowledge too specific to other fields of research or represent opportunities for management scholars to incorporate neglected approaches to creativity that may work in practice in the management field.

5.- Discussion

The computer-assisted method adopted in this paper allowed us to identify major trends in the history of creativity research over more than 90 years of literature. Also, recent trends were brought to the surface.

5.1.- Methodological implications: Applying network analysis and text mining for identifying research topics on creativity

This article has applied methods that mix information retrieval and citation network to bring another representation of the knowledge of creativity. If we overlay the findings of previews literature reviews over the landscape provided in this article, we would find correspondence especially to the first four largest clusters explored. However, our approach also surfaced a relevant corpus of knowledge related to creativity as studied in the humanities (Cluster 6, 10, and 12), usually forgotten in other reviews. Such an approach has also revealed recent trends, like those related to the digital world (e.g., sub-topics 6-i, 12-d, 12-e, 12-f). We see these distinct sub-topics as future avenues of research on whether their findings could be transferred to management research and what can we learn from this corpus of knowledge that has been overlooked so far.

We contend that the approach implemented to carry out the review led to a more comprehensive coverage of the field and an insightful overview of future research directions. An additional advantage is the possibility to monitor the trends that characterise the field over time, primarily because the methods can be replicated as the field expands, ultimately enabling to compare the findings at different points in time.

Overviewing research fields by applying reproducible methods that bring forth factual representations of the state-of-research is key to policymakers. It enables them to understand which areas will be affected by a policy decision, where is the need for more funding, avoid duplication in research efforts, and learn from the experience of cases studied in other countries or regions.

5.2.- Theoretical implications: the changing landscape of creativity research

An exploration of creativity research throughout several decades has revealed how the subject has moved away from being solely focused on psychological traits and neurobiological conditions of the individual to uncover creativity in teams and organisations as a key feature to

drive innovation. And then, with the creative class (Florida, 2002), research covers creativity at the levels of industries and cities. Around 50% of all creativity research in the past five years pertains to those three largest topics. The rise of creative studies in the context of business and management can be understood as a response to policies around the world seeking to promote innovation and competitive advantage (Teece, 1986). If we want to achieve innovative organisations and societies, first we need to address how best creativity can be fostered.

Creative industries and cities on the other hand, not only benefit from policies nurturing innovation. They are also studied from the point of view of social agendas, in particular within the context of diversity and inclusion. For instance, the leading work of Richard Florida on the creative class argues that along with the right policies and technologies, tolerance is a predictor of how cities and industries capture creative talent. So, he and his team have proposed the "gay index" and the "diversity index" as means to evaluate creative cities (Florida, 2002; Florida & Goodnight, 2007). Research supporting or debating these and surrounding ideas have been a staple of creativity research over the past decade.

In psychology, recent trends point to cultural psychology and distributed creativity. With a growing corpus of knowledge studying how we create together, and creativity as a social act. We create in groups together or apart, collaborating simultaneously or at different times. For collaborative creativity, digital tools play an important role. Thus, advancements in computing and the interactions in the digital age are observed as a transversal theme across the recent trends in creativity research.

With the buzz of artificial intelligence in recent years, we could have expected a recent trend towards "computational creativity" or "artificial creativity". Artificial creativity refers to computer systems that can perform creative tasks (Colton & Wiggins, 2012). Among the 141 sub-topics, artificial creativity is located within the main trend of Idea Generation (See supplementary material, row "4-5"). We found 444 articles related to the topic with an average

publication year of 2013.0, which is older than the recent trends identified. Ideas of computational creativity have existed since the beginning of computer science with examples of practical applications of computer-assisted creativity since the 1990s (Proctor, 1991). Research on fully autonomous creative systems has appeared scattered through the years without conforming yet a cohesive group of knowledge in recent years. Nevertheless, research on artificial creativity seems to be a far reach within creativity studies.

The role of computers and the digital manifests in different ways within recent creativity research: as an enabler for researchers on creativity, like in this article, to understand the structure of knowledge or to analyse large collaborative networks of persons and industries; and, perhaps of stronger relevance, as an enabler for creative individuals, as identified by recent trends in virtual worlds, digital media co-creation, and video games. Some of these trends also fit into the narrative of distributed creativity, also on the rise, where creativity is a group phenomenon (Glăveanu, 2014), and digital tools help catalyse creativity from individuals who are physically apart.

Beyond the digital, the other transversal theme in recent research is that of interdisciplinarity, meaning that research on creativity is leaning toward the merge of arts and humanities to other fields like engineering and management as seen in the recent 12-b of the inclusion of arts in engineering curricula. This interdisciplinarity can also be observed in how creative industries are defined. For instance, both the UK and the US include those working in IT and Research and Development within the creative industries (Harris, Connections & Collins, 2013; Statman & Glushkov, 2016), therefore extending the idea of a creative class beyond artists.

Finally, by looking at major and recent trends, we pointed out that the history of creativity research consists of a succession of studies covering individual traits to large-group phenomena. Concretely, the studies of creativity started with the biological and psychological traits of the

individual, followed by the creativity of teams, then organisations, industries, and societies to finalise in the construct of cultural creativity. Recent research on the application of digital tools may even lead us to transcultural creativity where individuals of different backgrounds around the world contribute to creative outputs (Glăveanu & Clapp, 2018). An abstraction of the state of creative research is shown in Figure 8.

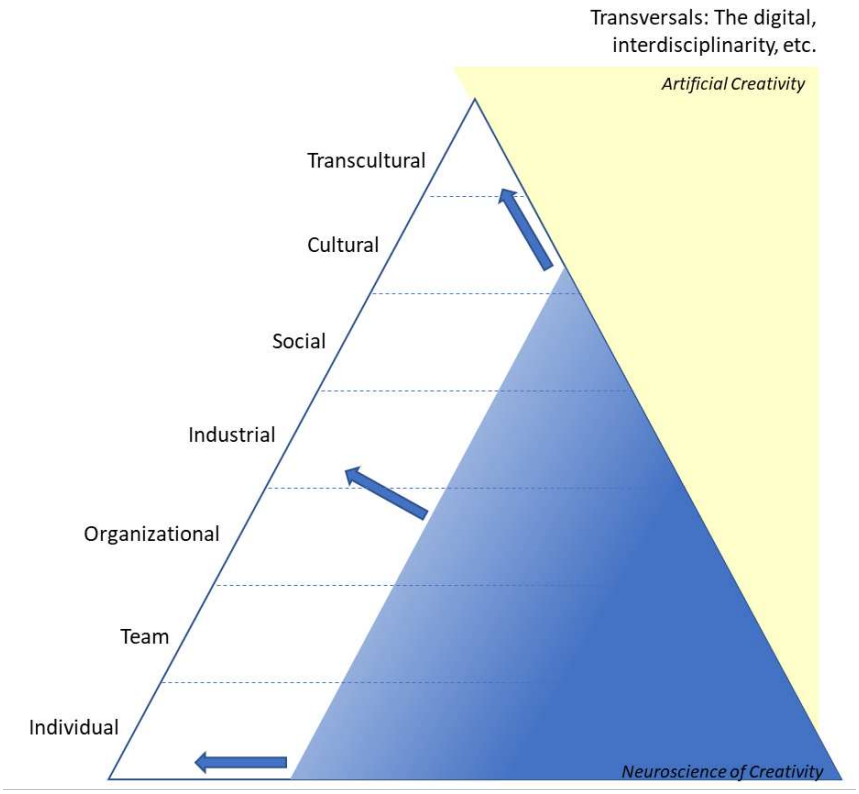

Figure 8. *An abstraction of the state of creativity research.*

Over the years, researchers have contributed to the foundations of creativity research covering the bio and neuroscientific aspects of creativity, psychological traits, and environmental effects of individual creativity. We visualise this gradient as a triangle where the foundation and largest corpus of literature refers to the creativity in individuals. From the studies targeting the individual, we climb up the horizon of inquiry to reach beyond the concept of culture. With the digital and globalised world, we could talk of transcultural creativity, although this is yet to be seen; it is not from so long ago that cultural psychology is considered

a priority within creativity research. As we go up, transversal themes like the digital and the interdisciplinary take more relevance. Out and beyond human creativity, the artificial one may spark interest in the future once general artificial intelligence will be solved (these transversalities and far-reaching topics are indicated in the yellow cross section).

Future creativity research should aim for an interdisciplinary scope. In general, based on the volume of publications, creativity research on innovation management, psychology, creative industries, and idea generation can already be considered mature. Although sixteen out of the 36 recent trends belong to those four domains, the remaining 20 come mainly from creativity and the arts and other digital trends. Scholars should attempt integrative efforts with those other fields in order to bring synergies and new learnings to those already mature. From our results, we observe the possibility of transferring knowledge on creativity enhancement to the organisations from the learnings on creativity in education, as in sub-topics covering creativity improvement techniques in the classroom and the role of universities in forming creative human capital. One recent sub-topic on organisational creativity explores the benefit of creative training (i.e. 1-d). However, what type of training or pedagogical techniques for teaching, learning, and managing creativity would bring better results to the organisation remains as an open question. In a similar direction, recent trends on art as therapy could help organisations to improve work life balance of their members while enhancing their creative outputs, paving the way for a future research avenue.

5.4.- Limitations

Computer-assisted methods help navigate large corpora of knowledge, but they also have shortcomings. Our method detects trends from academic articles. There is a delay from the research idea and experimentation to the actual publication of the academic paper. Even more for new published concepts to generate a volume of research that can be captured as a cluster.

So, certain labs or researchers may already be aware of some trends reported in this manuscript. Nevertheless, we consider these methods of great support in providing an exhaustive understanding of a field, where the cutting-edge fronts of research are relative to the time covered.

New methodologies to detect emerging fronts in academia could include the study of contents in current academic conferences, academic discussions in social media platforms like Twitter, or observing which recent publications receive more attention in Mendeley or ResearchGate. Integrating those approaches constitute interesting avenues worthy of future exploration.

6.- Conclusion

Creativity research is expanding and spreading well beyond the psychology and evaluation of individual creativity, to also tackle on team and organisational creativity to improve innovation. Creative industries and cities have also largely been studied in recent years due to its features in promoting economic growth and empowering individuals in new ways of interaction and workstyles. The neuroscience of creativity has been a constant theme over the existence of creative research. Also, studies on idea generation are a large and transversal theme covering from how individuals come with ideas to how societies distribute the creative power over the different groups that conforms to them. A plurality of other topics like creative art, creative destruction, and multiculturalism have enriched the perspective of creativity research from the fields of art, humanities, and economics.

The study of recent trends surfaced the interest of the academic community in understanding creativity as social and cultural phenomena where the digital play an important role in collaboration and idea generation. However, as these new ways of collaboration came to be, new concerns within the creative labour are being spotted and discussed, like the

precarity of creative labour. Finally, inclusion and interdisciplinary efforts are also part of those current developments.

The present article has contributed to bringing a snapshot of creativity research to inform scholars of their place in this broad field and draw attention to those trends that connect creativity with other research areas. It may also contribute to research and policy road-mapping by informing on the current efforts and needs as the field evolves.

References

Abernathy, W.J., Clark, K.B. (1985) Innovation: Mapping the Winds of Creative Destruction. *Research Policy*, 14, 3–22.

Adai, A.T., Date, S. V., Wieland, S., Marcotte, E.M. (2004) LGL: Creating a Map of Protein Function with an Algorithm for Visualizing Very Large Biological Networks. *Journal of Molecular Biology*, 340, 179–90.

Aghion, P., Howitt, P. (1992) A Model of Growth Through Creative Destruction. *Econometrica*, 60, 323.

Agogué, M., Levillain, K., Hooge, S. (2015) Gamification of Creativity: Exploring the Usefulness of Serious Games for Ideation. *Creativity and Innovation Management*, 24, 415–29.

Amabile, T.M., Conti, R., Coon, H., Lazenby, J., Herron, M. (1996) Assessing the Work Environment for Creativity. *Academy of Management Journal*, 39, 1154–84.

Amabile, T.M., Hill, K.G., Hennessey, B.A., Tighe, E.M. (1994) The Work Preference Inventory: Assessing Intrinsic and Extrinsic Motivational Orientations. *Journal of Personality and Social Psychology*, 66, 950–67.

Andreasen, N.C. (1987) Creativity and Mental Illness: Prevalence Rates in Writers and Their First-Degree Relatives. *American Journal of Psychiatry*, 144, 1288–92.

Audretsch, D.B., Link, A.N. (2012) Entrepreneurship and Innovation: Public Policy Frameworks. *Journal of Technology Transfer*, 37, 1–17.

Balfour, B., W-P Fortunato, M., Alter, T.R. (2018) The Creative Fire: An Interactional Framework for Rural Arts-Based Development. *Journal of Rural Studies*, 63, 229–39.

Beghetto, R.A., Plucker, J.A., MaKinster, J.G. (2001) Who Studies Creativity and How Do We Know? *Creativity Research Journal*, 13, 351–7.

Birkle, C., Pendlebury, D.A., Schnell, J., Adams, J. (2020) Web of Science as a Data Source for Research on Scientific and Scholarly Activity. *Quantitative Science Studies*, 1, 363–76.

Blanco-Herrera, J.A., Gentile, D.A., Rokkum, J.N. (2019) Video Games Can Increase Creativity, but with Caveats. *Creativity Research Journal*, 31, 119–31.

Blondel, V.D., Guillaume, J.-L., Lambiotte, R., Lefebvre, E. (2008) Fast Unfolding of Communities in Large Networks. *Journal of Statistical Mechanics: Theory and Experiment*, 2008, P10008.

Brem, A., Utikal, V. (2019) How to Manage Creativity Time? Results from a Social Psychological Time Model Lab Experiment on Individual Creative and Routine Performance. *Creativity and Innovation Management*, 28, 291–305.

Butler, N., Stoyanova Russell, D. (2018) No Funny Business: Precarious Work and Emotional Labour in Stand-up Comedy. *Human Relations*, 71, 1666–86.

CABS (2018) Chartered Association of Business Schools [WWW Document]. *ABS academic journal guide 2018*. URL https://charteredabs.org/academic-journal-guide-2018/ [accessed on 4 December 2019]

Cai, W., Lysova, E.I., Khapova, S.N., Bossink, B.A.G. (2018) Servant Leadership and Innovative Work Behavior in Chinese High-Tech Firms: A Moderated Mediation Model of Meaningful Work and Job Autonomy. *Frontiers in Psychology*, 9.

Castillo-Vergara, M., Alvarez-Marin, A., Placencio-Hidalgo, D. (2018) A Bibliometric Analysis of Creativity in the Field of Business Economics. *Journal of Business Research*, 85, 1–9.

Chen, S., Chandler, J., Venkatesh, A. (2020) The Influence of Objects on Creativity. *Creativity and Innovation Management*, 29, 481–94.

Chiang, M., Reid-Varley, W.B., Fan, X. (2019) Creative Art Therapy for Mental Illness. *Psychiatry Research*,

275, 129–36.
Clauset, A., Moore, C., Newman, M.E.J. (2008) Hierarchical Structure and the Prediction of Missing Links in Networks. *Nature*, 453, 98–101.
Coll-Martínez, E., Moreno-Monroy, A.-I., Arauzo-Carod, J.-M. (2019) Agglomeration of Creative Industries: An Intra-Metropolitan Analysis for Barcelona. *Papers in Regional Science*, 98, 409–31.
Colton, S., Wiggins, G.A. (2012) Computational Creativity: The Final Frontier? In *Frontiers in Artificial Intelligence and Applications*. IOS Press, pp. 21–6.
Comunian, R., Taylor, C., Smith, D.N. (2014) The Role of Universities in the Regional Creative Economies of the UK: Hidden Protagonists and the Challenge of Knowledge Transfer. *European Planning Studies*, 22, 2456–76.
Connor, A.M., Karmokar, S., Whittington, C. (2015) From STEM to STEAM: Strategies for Enhancing Engineering & Technology Education. *International Journal of Engineering Pedagogy (iJEP)*, 5, 37.
Cropley, D.H., Kaufman, J.C., Cropley, A.J. (2008) Malevolent Creativity: A Functional Model of Creativity in Terrorism and Crime. *Creativity Research Journal*, 20, 105–15.
Csardi, G., Nepusz, T. (2006) The Igraph Software Package for Complex Network Research. *InterJournal Complex Systems*, Complex Sy.
David, M. (2017) Moving beyond the Heuristic of Creative Destruction: Targeting Exnovation with Policy Mixes for Energy Transitions. *Energy Research & Social Science*, 33, 138–46.
Dayan, M., Zacca, R., Di Benedetto, A. (2013) An Exploratory Study of Entrepreneurial Creativity: Its Antecedents and Mediators in the Context of UAE Firms. *Creativity and Innovation Management*, 22, 223–40.
Desrochers, P., Leppälä, S. (2011) Creative Cities and Regions: The Case for Local Economic Diversity. *Creativity and Innovation Management*, 20, 59–69.
Dietrich, A., Kanso, R. (2010) A Review of EEG, ERP, and Neuroimaging Studies of Creativity and Insight.
Dubnov, S., Assayag, G., Lartillot, O., Bejerano, G. (2003) Using Machine-Learning Methods for Musical Style Modeling.
Enkel, E., Gassmann, O., Chesbrough, H. (2009) Open R&D and Open Innovation: Exploring the Phenomenon. *R and D Management*.
Epstein, R., Kaminaka, K., Phan, V., Uda, R. (2013) How Is Creativity Best Managed? Some Empirical and Theoretical Guidelines. *Creativity and Innovation Management*, 22, 359–74.
Ersoy, E., Başer, N. (2014) The Effects of Problem-Based Learning Method in Higher Education on Creative Thinking. *Procedia - Social and Behavioral Sciences*, 116, 3494–8.
Evans, G. (2009) Creative Cities, Creative Spaces and Urban Policy. *Urban Studies*, 46, 1003–40.
Feist, G.J., Runco, M.A. (1993) Trends in the Creativity Literature: An Analysis of Research in the Journal of Creative Behavior (1967–1989). *Creativity Research Journal*, 6, 271–83.
Fleming, L., King, C., Juda, A.I. (2007) Small Worlds and Regional Innovation. *Organization Science*, 18, 938–54.
Fleming, L., Marx, M. (2006) Managing Creativity in Small Worlds. *California Management Review*, 48, 6–27.
Florida, R. (2002) *The Rise of the Creative Class*. Washington Monthly.
Florida, R., Goodnight, J. (2007) Managing for Creativity.
Folke, C., Hahn, T., Olsson, P., Norberg, J. (2005) Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*.
Galvagno, M., Giaccone, S.C. (2019) Mapping Creative Tourism Research: Reviewing the Field and Outlining Future Directions. *Journal of Hospitality & Tourism Research*, 43, 1256–80.
Gill, R., Pratt, A. (2000) PRECARITY AND CULTURAL WORK IN THE SOCIAL FACTORY? IMMATERIAL LABOUR, PRECARIOUSNESS AND CULTURAL WORK. Bell. Sennett.
Gilmore, A., Comunian, R. (2016) Beyond the Campus: Higher Education, Cultural Policy and the Creative Economy. *International Journal of Cultural Policy*, 22, 1–9.
Gino, F., Ariely, D. (2012) The Dark Side of Creativity: Original Thinkers Can Be More Dishonest. *SSRN Electronic Journal*.
Glăveanu, V.P. (2010) Paradigms in the Study of Creativity: Introducing the Perspective of Cultural Psychology. *New Ideas in Psychology*, 28, 79–93.
Glăveanu, V.P. (2014) Distributed Creativity: What Is It? In *Distributed Creativity: Thinking Outside the Box of the Creative Individual*. pp. 1–13.
Glăveanu, V.P., Clapp, E.P. (2018) Distributed and Participatory Creativity as a Form of Cultural Empowerment: The Role of Alterity, Difference and Collaboration. In *Alterity, Values, and Socialization: Human Development Within Educational Contexts*. pp. 51–63.
Granpayehvaghei, T., Bonakdar, A., Zandiatashbar, A., Hamidi, S. (2019) The Quest for Creative Industries: A Multilevel National Study of the Impacts of Urban Form on the Geography of Creative Industries. *Transportation Research Record: Journal of the Transportation Research Board*, 2673, 157–68.

Gregory, E., Hardiman, M., Yarmolinskaya, J., Rinne, L., Limb, C. (2013) Building Creative Thinking in the Classroom: From Research to Practice. *International Journal of Educational Research*, 62, 43–50.
Guilford, J.P. (1967) Creativity: Yesterday, Today and Tomorrow. *The Journal of Creative Behavior*, 1, 3–14.
Hall, J., Stickler, U., Herodotou, C., Iacovides, I. (2019) Player Conceptualizations of Creativity in Digital Entertainment Games. *Convergence: The International Journal of Research into New Media Technologies*, 135485651988079.
Harris, C., Connections, C.H., Collins, M. (2013) America's Creative Economy: A Study of Recent Conceptions, Definitions, and Approaches to Measurement Across the USA.
He, J., Huang, X., Xi, G. (2018) Measuring Urban Metrics of Creativity Using a Grid-Based Geographically Weighted Regression Model. *Journal of Urban Planning and Development*, 144, 05018008.
Hesmondhalgh, D., Baker, S. (2010) 'A Very Complicated Version of Freedom': Conditions and Experiences of Creative Labour in Three Cultural Industries. *Poetics*, 38, 4–20.
Hevner, A.R., March, S.T., Park, J., Ram, S. (2004) DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH 1. Design Science in IS Research MIS Quarterly.
Holling, C.S. (2001) Understanding the Complexity of Economic, Ecological, and Social Systems. *Ecosystems*.
Hsiao, H.-S., Chang, C.-S., Lin, C.-Y., Hu, P.-M. (2014) Development of Children's Creativity and Manual Skills within Digital Game-Based Learning Environment. *Journal of Computer Assisted Learning*, 30, 377–95.
Hughes, D.J., Lee, A., Tian, A.W., Newman, A., Legood, A. (2018) Leadership, Creativity, and Innovation: A Critical Review and Practical Recommendations. *The Leadership Quarterly*, 29, 549–69.
Jia, X., Wang, Q., Lin, L. (2020) The Relationship Between Childhood Neglect and Malevolent Creativity: The Mediating Effect of the Dark Triad Personality. *Frontiers in Psychology*, 11, 3566.
Johansson-Sköldberg, U., Woodilla, J., Çetinkaya, M. (2013) Design Thinking: Past, Present and Possible Futures. *Creativity and Innovation Management*, 22, 121–46.
Kahl, C.H., Da Fonseca, L.H., Witte, E.H. (2009) Revisiting Creativity Research: An Investigation of Contemporary Approaches. *Creativity Research Journal*, 21, 1–5.
Kajikawa, Y., Ohno, J., Takeda, Y., Matsushima, K., Komiyama, H. (2007) Creating an Academic Landscape of Sustainability Science: An Analysis of the Citation Network. *Sustainability Science*, 2, 221–31.
Kandemir, M.A., Tezci, E., Shelley, M., Demirli, C. (2019) Measurement of Creative Teaching in Mathematics Class. *Creativity Research Journal*, 31, 272–83.
Keane, M. (2009) Creative Industries in China: Four Perspectives on Social Transformation. *International Journal of Cultural Policy*, 15, 431–43.
Kessler, M. (1963) An Experimental Study of Bibliographic Coupling between Technical Papers (Corresp.). *IEEE Transactions on Information Theory*, 9, 49–51.
Kivimaa, P., Kern, F. (2016) Creative Destruction or Mere Niche Support? Innovation Policy Mixes for Sustainability Transitions. *Research Policy*, 45, 205–17.
Klavans, R., Boyack, K.W. (2017) Which Type of Citation Analysis Generates the Most Accurate Taxonomy of Scientific and Technical Knowledge? *Journal of the Association for Information Science and Technology*, 68, 984–98.
Kumar, S., Mondol, A.K., Kumar Verma, M. (2013) Citations Analysis of Journal of Creative Behavior: A Critical Story. *International Journal of Information Research*, 2, 326–38.
Kwon, O.N., Park, J.S., Park, J.H. (2006) Cultivating Divergent Thinking in Mathematics through an Open-Ended Approach. *Asia Pacific Education Review*, 7, 51–61.
Lally, V., Sclater, M. (2013) The Inter-Life Project: Researching the Potential of Art, Design and Virtual Worlds as a Vehicle for Assisting Young People with Key Life Changes and Transitions. *British Journal of Guidance & Counselling*, 41, 318–38.
Lazzeretti, L., Boix, R., Capone, F. (2008) Do Creative Industries Cluster? Mapping Creative Local Production Systems in Italy and Spain. *Industry & Innovation*, 15, 549–67.
Lengelle, R., Meijers, F., Poell, R., Post, M. (2013) The Effects of Creative, Expressive, and Reflective Writing on Career Learning: An Explorative Study. *Journal of Vocational Behavior*, 83, 419–27.
Leung, A.K. yee, Maddux, W.W., Galinsky, A.D., Chiu, C. yue (2008) Multicultural Experience Enhances Creativity: The When and How. *American Psychologist*, 63, 169–81.
Ley, D. (2003) Artists, Aestheticisation and the Field of Gentrification. *Urban Studies*, 40, 2527–44.
Li, X., Liu, R. (2019) Urban Villages as Incubators of Creative Clusters: The Case of Guangzhou. *International Development Planning Review*, 41, 375–98.
Long, H., Plucker, J.A., Yu, Q., Ding, Y., Kaufman, J.C. (2014) Research Productivity and Performance of Journals in the Creativity Sciences: A Bibliometric Analysis. *Creativity Research Journal*, 26, 353–60.
Maddux, W.W., Galinsky, A.D. (2009) Cultural Borders and Mental Barriers: The Relationship Between Living Abroad and Creativity.
Markusen, A., Schrock, G. (2006) The Artistic Dividend: Urban Artistic Specialisation and Economic

Development Implications. *Urban Studies*, 43, 1661–86.
Martin, L., Wilson, N. (2017) Defining Creativity with Discovery. *Creativity Research Journal*, 29, 417–25.
McGarr, O. (2009) A Review of Podcasting in Higher Education: Its Influence on the Traditional Lecture. *Australasian Journal of Educational Technology*, 25, 309–21.
Mednick, S. (1962) The Associative Basis of the Creative Process. *Psychological Review*, 69, 220–32.
Mejia, C., Kajikawa, Y. (2017) Bibliometric Analysis of Social Robotics Research: Identifying Research Trends and Knowledgebase. *Applied Sciences*, 7, 1316.
Merkel, J. (2019) 'Freelance Isn't Free.' Co-Working as a Critical Urban Practice to Cope with Informality in Creative Labour Markets. *Urban Studies*, 56, 526–47.
Montuori, A. (2003) The Complexity of Improvisation and the Improvisation of Complexity: Social Science, Art and Creativity. *Human Relations*, 56, 237–55.
Nicholls, S. (2009) Beyond Expressive Writing. *Journal of Health Psychology*, 14, 171–80.
O'Connor, J., Gu, X. (2014) Creative Industry Clusters in Shanghai: A Success Story? *International Journal of Cultural Policy*, 20, 1–20.
Oldham, G.R., Cummings, A. (1996) Employee Creativity: Personal and Contextual Factors at Work. *Academy of Management Journal*.
Padgett, D.K., Smith, B.T., Derejko, K.S., Henwood, B.F., Tiderington, E. (2013) A Picture Is Worth... ? Photo Elicitation Interviewing with Formerly Homeless Adults. *Qualitative Health Research*, 23, 1435–44.
Pan, J., Liu, S., Ma, B., Qu, Z. (2018) How Does Proactive Personality Promote Creativity? A Multilevel Examination of the Interplay between Formal and Informal Leadership. *Journal of Occupational and Organizational Psychology*, 91, 852–74.
Paulus, P.B., Yang, H.C. (2000) Idea Generation in Groups: A Basis for Creativity in Organizations. *Organizational Behavior and Human Decision Processes*, 82, 76–87.
Peck, J. (2005) Struggling with the Creative Class. *International Journal of Urban and Regional Research*, 29, 740–70.
Perruzza, N., Kinsella, E.A. (2010) Creative Arts Occupations in Therapeutic Practice: A Review of the Literature. *British Journal of Occupational Therapy*.
Pollard, D., Olizko, Y. (2019) ART AND ESP INTEGRATION IN TEACHING UKRAINIAN ENGINEERS. *Advanced Education*, 6, 68–75.
Post, F. (1994) Creativity and Psychopathology. A Study of 291 World-Famous Men. *British Journal of Psychiatry*, 164, 22–34.
Post, F. (1996) Verbal Creativity, Depression and Alcoholism: An Investigation of One Hundred American and British Writers. *British Journal of Psychiatry*, 168, 545–55.
Proctor, T. (1991) Brain, A Computer Program to Aid Creative Thinking. *The Journal of Creative Behavior*, 25, 61–8.
Puryear, J.S., Lamb, K.N. (2020) Defining Creativity: How Far Have We Come Since Plucker, Beghetto, and Dow? *Creativity Research Journal*, 32, 206–14.
R Core Team (2019) R: A Language and Environment for Statistical Computing. *R Foundation for Statistical Computing*.
Ren, X., Sun, M. (2012) Artistic Urbanization: Creative Industries and Creative Control in Beijing. *International Journal of Urban and Regional Research*, 36, 504–21.
Rhodes, M. (1961) An Analysis of Creativity. *The Phi Delta Kappan*, 42, 305–10.
Richards, G. (2011) Creativity and Tourism. The State of the Art. *Annals of Tourism Research*.
Rodrigues, M., Franco, M. (2019) Composite Index to Measure Cities' Creative Performance: An Empirical Study in the Portuguese Context. *Sustainability*, 11, 1–21.
Root-Bernstein, R. (2015) Arts and Crafts as Adjuncts to STEM Education to Foster Creativity in Gifted and Talented Students. *Asia Pacific Education Review*, 16, 203–12.
Runco, M.A., Jaeger, G.J. (2012) The Standard Definition of Creativity. *Creativity Research Journal*, 24, 92–6.
Samuelsson, I.P., Carlsson, M.A. (2008) The Playing Learning Child: Towards a Pedagogy of Early Childhood. *Scandinavian Journal of Educational Research*, 52, 623–41.
Schulz, K.-P., Geithner, S., Woelfel, C., Krzywinski, J. (2015) Toolkit-Based Modelling and Serious Play as Means to Foster Creativity in Innovation Processes. *Creativity and Innovation Management*, 24, 323–40.
Sclater, M. (2016) Beneath Our Eyes: An Exploration of the Relationship between Technology Enhanced Learning and Socio-Ecological Sustainability in Art and Design Higher Education. *International Journal of Art & Design Education*, 35, 296–306.
Sclater, M., Lally, V. (2013) Virtual Voices: Exploring Creative Practices to Support Life Skills Development among Young People Working in a Virtual World Community. *International Journal of Art & Design Education*, 32, 331–44.
Scott, A.J. (2006) Creative Cities: Conceptual Issues and Policy Questions. *Journal of Urban Affairs*, 28, 1–17.
Scott, G., Leritz, L.E., Mumford, M.D. (2004) The Effectiveness of Creativity Training: A Quantitative Review.

Creativity Research Journal, 16, 361–88.
Scott, S.G., Bruce, R.A. (1994) Determinants of Innovative Behavior: A Path Model of Individual Innovation in the Workplace. *Academy of Management Journal*, 37, 580–607.
Shao, Y., Nijstad, B.A., Täuber, S. (2019) Creativity under Workload Pressure and Integrative Complexity: The Double-Edged Sword of Paradoxical Leadership. *Organizational Behavior and Human Decision Processes*, 155, 7–19.
Shibata, N., Kajikawa, Y., Sakata, I. (2011) Detecting Potential Technological Fronts by Comparing Scientific Papers and Patents. *Foresight*, 13, 51–60.
Shibata, N., Kajikawa, Y., Takeda, Y., Matsushima, K. (2008) Detecting Emerging Research Fronts Based on Topological Measures in Citation Networks of Scientific Publications. *Technovation*, 28, 758–75.
Shweder, R. (1991) *Thinking Through Cultures: Expeditions in Cultural Psychology*. Harvard University Press.
Sievert, C., Shirley, K. (2014) LDAvis: A Method for Visualizing and Interpreting Topics. *Proceedings of the Workshop on Interactive Language Learning, Visualization, and Interfaces*, 63–70.
Simonton, D.K. (1997) Creative Productivity: A Predictive and Explanatory Model of Career Trajectories and Landmarks. *Psychological Review*.
Simonton, D.K. (2018) Defining Creativity: Don't We Also Need to Define What Is *Not* Creative? *The Journal of Creative Behavior*, 52, 80–90.
Simpson, R.M. (1922) Creative Imagination. *The American Journal of Psychology*, 33, 234.
SJ. Shin, J. Zhou (2003) Transformational Leadership, Conservation, and Creativity: Evidence from Korea. *Academy of Management Journal*, 46, 703–14.
Slavich, B., Svejenova, S. (2016) Managing Creativity: A Critical Examination, Synthesis, and New Frontiers. *European Management Review*, 13, 237–50.
Small, H. (1973) Co-Citation in the Scientific Literature: A New Measure of the Relationship between Two Documents. *Journal of the American Society for Information Science*, 24, 265–9.
Spooner, H., Lee, J.B., Langston, D.G., Sonke, J., Myers, K.J., Levy, C.E. (2019) Using Distance Technology to Deliver the Creative Arts Therapies to Veterans: Case Studies in Art, Dance/Movement and Music Therapy. *Arts in Psychotherapy*, 62, 12–8.
Statman, M., Glushkov, D. (2016) Classifying and Measuring the Creative Industries. *Journal of Portfolio Management*, 42.
Steen, M., Manschot, M., de Koning, N. (2011) Benefits of Co-Design in Service Design Projects. *International Journal of Design*.
Sternberg, R.J. (1999) *Handbook of Creativity*. Cambridge University Press.
Stierand, M., Dörfler, V., MacBryde, J. (2014) Creativity and Innovation in Haute Cuisine: Towards a Systemic Model. *Creativity and Innovation Management*, 23, 15–28.
Stuckey, H.L., Nobel, J. (2010) The Connection between Art, Healing, and Public Health: A Review of Current Literature. *American Journal of Public Health*, 100, 254–63.
Teece, D.J. (1986) Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy. *Research Policy*, 15, 285–305.
Tierney, P., Farmer, S.M. (2002) Creative Self-Efficacy: Its Potential Antecedents and Relationship to Creative Performance. *Academy of Management Journal*, 45, 1137–48.
Titchener, E.B. (1922) A Note on Wundt's Doctrine of Creative Synthesis. *The American Journal of Psychology*, 33, 351.
Torrance, E.P. (1962) *Guiding Creative Talent.* Guiding creative talent. Prentice-Hall, Inc, Englewood Cliffs, NJ, US.
Torrance, E.P. (1966) *Torrance Tests of Creative Thinking*. Personnel Press, Princeton N.J.
Torrance, E.P. (1972) Can We Teach Children To Think Creatively? *The Journal of Creative Behavior*, 6, 114–43.
Trabucchi, D., Pellizzoni, E., Buganza, T., Verganti, R. (2017) Interplay between Technology and Meaning: How Music Majors Reacted? *Creativity and Innovation Management*, 26, 327–38.
Trevarthen, C. (2011) What Is It like to Be a Person Who Knows Nothing? Defining the Active Intersubjective Mind of a Newborn Human Being. *Infant and Child Development*, 20, 119–35.
Uzzi, B., Spiro, J. (2005) Collaboration and Creativity: The Small World Problem. *American Journal of Sociology*, 111, 447–504.
Vogel, R., Hattke, F., Petersen, J. (2017) Journal Rankings in Management and Business Studies: What Rules Do We Play By? *Research Policy*, 46, 1707–22.
Walker, J.T., Fenton, E., Salter, A., Salandra, R. (2019) What Influences Business Academics' Use of the Association of Business Schools (ABS) List? Evidence From a Survey of UK Academics. *British Journal of Management*, 30, 730–47.
Warren, J.A., Nash, A. (2019) Using Expressive Arts in Online Education to Identify Feelings. *Journal of Creativity in Mental Health*, 14, 94–104.

Wehner, L., Csikszentmihalyi, M., Magyari-Beck, I. (1991) Current Approaches Used in Studying Creativity: An Exploratory Investigation. *Creativity Research Journal*, 4, 261–71.
Williams, R., Runco, M.A., Berlow, E. (2016) Mapping the Themes, Impact, and Cohesion of Creativity Research over the Last 25 Years. *Creativity Research Journal*, 28, 385–94.
Wright, A., Marsh, D., Mc Ardle, L. (2019) A Darker Side of Creative Entrepreneurship. *The Design Journal*, 22, 177–88.
Yu, E., Sangiorgi, D. (2018) Service Design as an Approach to Implement the Value Cocreation Perspective in New Service Development. *Journal of Service Research*, 21, 40–58.
Zhang, S., Ke, X., Frank Wang, X.-H., Liu, J. (2018) Empowering Leadership and Employee Creativity: A Dual-Mechanism Perspective. *Journal of Occupational and Organizational Psychology*, 91, 896–917.
Zhang, W., Zhang, Q., Yu, B., Zhao, L. (2015) Knowledge Map of Creativity Research Based on Keywords Network and Co-Word Analysis, 1992–2011. *Quality and Quantity*, 49, 1023–38.
Zheng, J. (2011) 'Creative Industry Clusters' and the 'Entrepreneurial City' of Shanghai. *Urban Studies*, 48, 3561–82.
Zhu, J., Liu, W. (2020) A Tale of Two Databases: The Use of Web of Science and Scopus in Academic Papers. *Scientometrics*, 123, 321–35.
Ziff, K., Ivers, N., Hutton, K. (2017) "There's Beauty in Brokenness": Teaching Empathy Through Dialogue with Art. *Journal of Creativity in Mental Health*, 12, 249–61.

Table 1. Bibliometric studies on creativity research

Authors	Year	Data search strategy	Database	Number of articles	Years of study	Objective	Methodology	Main topics found
Wehner, Csikszentmihalyi, and Magyari-Beck (Wehner, Csikszentmihalyi & Magyari-Beck, 1991)	1991	Topic="creativ*" or "innov*" or "scien*" or "entrepreuner*" Document type = Dissertation Abstracts	Dissertation Abstracts Online	100	1986	Describe research trends based on dissertation abstracts	Descriptive statistics	Education; Business and Economics; History; Political science.
Feist and Runco (Feist & Runco, 1993)	1993	Articles from Journal of Creative Behavior	NA	311	1967-1989	Describe general trends in creativity research	Descriptive statistics	Enhancement; Education; Problem solving/incubation; Social influences; Personalities
Khal, Fonseca, and Witte (Kahl, Da Fonseca & Witte, 2009)	2009	Topic="creativ*" or "innov*" Document type = Dissertation Abstracts	Dissertation Abstracts Online	119	2005-2007	Describe research trends based on dissertation abstracts	Descriptive statistics	Psychology; education; business administration and economics; science and engineering; and miscellaneous.
Beghetto, Plucker, and MaKinster (Beghetto, Plucker & MaKinster, 2001)	2010	Articles from Journal of Creative Behavior	PsycINFO	554	1967-1998	Describe patterns of authoring in creativity research	Descriptive statistics	NA
Kumar, Mondol, and Verma (Kumar, Mondol & Kumar Verma, 2013)	2013	Articles from Journal of Creative Behavior	NA	41	2006-2008	Describe citation trends on creativity research	Descriptive statistics	NA
Long, Plucker, Yuc, Ying, and Kaufman (Long et al., 2014)	2014	Articles from the journals: Journal of Creative Behavior, Gifted Child Quarterly, Creativity Research Journal, and Psychology of Aesthetics, Creativity, and the Arts.	WOS	1,891	1965-2012	examine the research performance of the field of creativity using bibliometric methods.	Descriptive statistics	NA
Zhang, Zhang, and Zhao (Zhang et al., 2015)	2015	Topic = “creativity” (In abstract and full text)	WOS	4,575	1992-2011	Clarify the spatial structure of creativity research	Co-word analysis	Regions, countries, specialties, and industries; psychology of individual creativity; individual-level creativity; organisational-level creativity; basic theories and methodologies in creativity.
Williams, Runco, and Berlow (Williams, Runco & Berlow, 2016)	2016	Topic = “creative process” or “creative personality” or “creative product” or “creative place” or “creativity research” or “creative style” or “creative potential” or “creative problem” Document types =article, review, proceedings paper. Documents having at least two unique keywords in author keywords and/or keywords plus.	WOS	1,472	1990-2016	Describe themes over 25 years of creativity research	A network of articles by keyword similarity; Keyword analysis	(a) innovation in the workplace, (b) the role of personality and intelligence in divergent thinking, and (c) creative performance with a focus on idea generation.

Authors	Year	Data search strategy	Database	Number of articles	Years of study	Objective	Methodology	Main topics found
Slavich and Svejenova (Slavich & Svejenova, 2016)	2016	Topic = "creativity" Journals = Administrative Science Quarterly, Academy of Management Journal, Academy of Management Review, Organization Science, Strategic Management Journal, Journal of Management, Organization Studies, Journal of Management Studies, Academy of Management Perspectives, Harvard Business Review and California Management Review, and Creativity and Innovation Management.	EBSCO	400	1990 – 2014	Clarify the concept of creativity	Meta-analysis and content analysis	Outcome, synthesis, creation, interactions, impact, engagement.
Castillo, Alvarez, and Placencio (Castillo-Vergara, Alvarez-Marin & Placencio-Hidalgo, 2018)	2018	Topic = "creativity" or "creatify"[*sic*] or "creative" or "creatively" or "creativeness" or "creativize" or "creativa" or "creativities". Research areas = Business Economics. Document type = articles.	WOS	5,710	1975-2018	Establish the results of creativity research in the scope of business economics	Co-author network, keyword analysis	Innovation, Cities, Behavior, Communities, Strategy, Impact, Culture, Science, Careers, Teams.
Puryear and Lamb (Puryear & Lamb, 2020)	2020	Title = "creativity" Journals = Research Journal and the Journal of Creative Behavior	EBSCO, ERIC, PsycINFO	600	2004-2016	Study changes on the definition of creativity	Content analysis	Uniqueness/Novelty, Artistic, Psycometric, Usefulness/Appropriateness, Stakeholder defined, Accessible for all, Divergent thinking, Problem solving

Table 2. Main trends in creativity research

Cl	Cluster name	Articles	Ave. Year	Ave. Citation	Top Authors	Top Journals
1	Organizational creativity and team creativity	6342	2014.0	22.5	Choi, Jn Zhou, J Lee, Kc Shalley, Ce Cerne, M	Creat Innov Manag J Creative Behav Acad Manage J Sustainability-Basel J Organ Behav
2	Social-psychology of creativity	6297	2008.0	9.4	Kaufman, Jc Glaveanu, Vp Runco, Ma Karwowski, M Beghetto, Ra	J Creative Behav Creativity Res J Think Skills Creat Procd Soc Behv Gifted Child Quart
3	Creative industries and creative cities	5435	2014.5	12.9	Comunian, R Nijkamp, P Gibson, C Florida, R Kacerauskas, T	Int J Cult Policy Eur Plan Stud Cities Urban Stud Environ Plann A
4	Idea generation	4496	2012.5	11.6	Miller, Sr Chakrabarti, A Daly, Sr Paulus, Pb Seifert, Cm	Lect Notes Comput Sc Design Stud Int J Eng Educ Int Conf Eng Des Ai Edam
5	Neuroscience of creativity	3009	2011.1	16.2	Benedek, M Fink, A Qiu, J Beaty, Re Neubauer, Ac	Front Psychol Creativity Res J J Creative Behav Neuroimage Psychol Aesthet Crea
6	Creative arts and art therapy	2652	2013.1	9.4	Edwards, J Reynolds, F Jakovljevic, M Orkibi, H Daykin, N	Art Psychother J Creat Ment Health Arts Health Dementia-London Cult Geogr
7	Creativity and mental illness	1461	2004.7	13.6	Rothenberg, A Kaufman, Jc Richards, R Sabelli, H Norlander, T	Creativity Res J Pers Indiv Differ J Creative Behav Int J Psychoanal J Affect Disorders
8	Expertise and productivity	1456	2007.8	14.0	Simonton, Dk Sternberg, Rj Gabora, L Lubinski, D Kaufman, Jc	Creativity Res J J Creative Behav Psychol Aesthet Crea Scientometrics Intelligence
9	Enhancing creativity	1103	2002.9	12.7	Mumford, Md Basadur, M Treffinger, Dj Isaksen, Sg Connelly, S	J Creative Behav Creativity Res J Psychol Rep Procd Soc Behv Leadership Quart
10	Identity and multiculturalism	1064	2012.4	25.6	Forster, J Chiu, Cy De Dreu, Ckw Galinsky, Ad Baas, M	Creativity Res J J Exp Soc Psychol Front Psychol Think Skills Creat J Pers Soc Psychol
11	Creative destruction	1012	2012.2	23.6	Liang, Cy Antonelli, C Aghion, P Zhang, Wb Rothaermel, Ft	Res Policy Ind Corp Change J Evol Econ Technol Anal Strateg Strategic Manage J
12	Others	3963	2011.5	13.8	Harper, G Zhang, Lf Koslow, S Mulej, M Schmidhuber, J	J Advertising Res New Writ Viewp J Advertising Procd Soc Behv New Writ

Table 3. Recent trends in creativity and the participation of leading business and management research (lbmr).

Id	Sub-topic	Articles	Ave. publication year	Ave. citations	Non-lbmr article	Lbmr articles	Proportion	Non-lbmr ave. year	Lbmr ave. year	Non-lbmr ave. citations	Lbmr ave. citations
1-a	Transformational leadership	1134	2014.7	20.0	895	239	21.1%	2015.6	2011.8	5.2	76.3
1-b	Drivers of innovative work behaviour	883	2014.8	19.9	632	251	28.4%	2015.6	2012.9	4.9	58.0
1-c	Empowering creative self-efficacy	687	2015.4	18.5	473	214	31.2%	2016.1	2014.0	5.2	48.1
1-d	Creativity management	935	2014.2	21.1	646	289	30.9%	2015.1	2012.2	5.4	56.4
2-a	Cultural psychology and distributed creativity	565	2014.4	8.0	557	8	1.4%	2014.4	2009.9	6.2	138.4
2-b	Problem-based learning and creative thinking	312	2015.2	3.7	311	1	0.3%	2015.2	2005.0	3.5	76.0
3-a	Creative cities	1013	2014.8	14.5	880	133	13.1%	2015.1	2012.3	7.2	63.1
3-b	Labor precarity in the creative industries	779	2015.2	8.8	651	128	16.4%	2015.4	2014.2	6.0	23.1
3-c	Urban policies	535	2014.8	11.6	360	175	32.7%	2015.7	2013.0	3.0	29.4
3-d	Clusters of creative industries	433	2014.9	7.7	389	44	10.2%	2015.1	2013.2	4.5	36.0
3-e	Creative tourism	340	2015.5	8.7	293	47	13.8%	2015.8	2013.5	3.3	42.9
3-f	Creative industries in China	133	2015.0	6.8	124	9	6.8%	2015.2	2012.7	6.1	16.4
3-g	Universities and the creative city	127	2014.6	9.5	115	12	9.5%	2015.2	2009.9	6.9	34.4
3-h	Gentrification and coworking spaces	575	2015.0	16.6	482	93	16.2%	2015.6	2011.9	11.8	42.4
4-a	Design thinking and gamification	177	2016.3	5.6	162	15	8.5%	2016.3	2015.6	4.2	21.0
4-b	Design thinking for new service development	124	2015.0	14.9	116	8	6.5%	2015.1	2013.8	11.8	62.9
5-a	Verbal fluency and semantic networks	365	2015.3	16.6	354	11	3.0%	2015.3	2014.3	16.7	28.0
6-a	Creative geographic methods	244	2014.3	12.5	216	28	11.5%	2014.4	2012.9	10.1	31.6
6-b	The elderly and creative arts	214	2014.2	7.9	211	3	1.4%	2014.2	2011.3	7.8	24.0
6-c	Creative research methods in the social sciences	159	2014.2	11.5	147	12	7.6%	2014.6	2009.8	8.8	45.0
6-d	Creative nonfiction and sports	153	2015.0	10.4	142	11	7.2%	2015.0	2013.8	10.7	7.6
6-e	Creativity in counseling	90	2016.6	3.0	90	0	0.0%	2016.6	0.0	3.0	0.0
6-f	Writing therapy	80	2015.2	4.8	76	4	5.0%	2015.2	2013.8	4.2	16.8
6-g	Collaborative and social network methods	77	2014.3	9.2	68	9	11.7%	2014.8	2010.7	6.1	33.4
6-h	Arts for inclusion and social justice	70	2014.3	4.4	69	1	1.4%	2014.2	2020.0	4.5	0.0
6-i	Digital art therapy	55	2016.8	3.0	55	0	0.0%	2016.8	0.0	3.1	0.0

9-a	Sustainable development and creativity	55	2015.4	13.1	46	9	16.4%	2016.0	2012.1	11.5	21.3
10-a	Malevolent creativity	111	2014.8	9.2	96	15	13.5%	2014.8	2014.3	6.8	24.5
11-a	Creative destruction and policy mixes	54	2016.0	13.3	46	8	14.8%	2016.0	2016.4	11.5	23.5
12-a	Bilingual creativity	377	2014.5	13.0	374	3	0.8%	2014.5	2014.0	13.2	7.7
12-b	STEAM: Art integration in STEM education	108	2015.7	4.0	108	0	0.0%	2015.7	0.0	4.0	0.0
12-c	Creativity and academic writing	96	2015.1	4.9	93	3	3.1%	2015.2	2010.3	4.7	10.3
12-d	Virtual worlds	96	2015.9	7.2	94	2	2.1%	2016.0	2014.0	6.4	53.0
12-e	Video games and creativity	95	2014.3	56.5	84	11	11.6%	2014.8	2010.9	50.6	110.6
12-f	Digital media for co-creation of knowledge	94	2014.5	12.6	91	3	3.2%	2014.5	2015.3	12.9	3.0
12-g	Early childhood education	64	2014.9	4.8	61	3	4.7%	2015.5	2003.3	4.1	18.7