



## Digital creativity: Research themes and framework



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### ABSTRACT

Digital creativity is defined as the creativity manifested in all forms that are driven by digital technologies. Due to its novelty and interdisciplinary nature, the scope, perspective, and main research themes of digital creativity study are still unclear to date. Therefore, we utilized the intellectual structure technique developed by the information scientist to help clarify the scope and themes of this research domain. We analyzed 3591 relevant literatures and tentatively identified major research themes to facilitate the comprehension and study of digital creativity. The resulting framework summarizes the progress in digital creativity research and provides future research directions.

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### 1. Introduction

With the rapid penetration of ubiquitous communication devices, such as smartphones and sophisticated laptop computers into nearly all aspects of our everyday life, the need to understand various forms of digital creativity has gained increased attention (Jackson et al., 2012; Schmitt, Buisine, Chaboissier, Aoussat, & Vernier, 2012; Zaman, Anandarajan, & Dai, 2010). The current definition of digital creativity is “all forms of creativity driven by digital technologies.” (Lee, 2013) In other words, digital creativity occurs when digital devices are used for various creative activities. However, the scope, perspective, and main research themes of digital creativity study are still unclear to date. Therefore, we utilized the intellectual structure technique developed by the information scientist to help clarify the scope and themes of this research domain.

Digital creativity is a dynamic field of research because of its relative novelty and rapid growth. Digital creativity-related literature has accumulated over the past two decades and is comprehensive. Researching the content of this literature and presenting the results in an easy-to-understand visual structure would be helpful and informative, and would facilitate the understanding of the main research themes in this field. An intellectual structure for digital creativity study was derived from this literature analysis, which revealed the major research themes and the interrelationships among these themes. It also indicates popular, peripheral, and central importance research themes. A research framework

derived from the result summarizes the progress in digital creativity research and provides future research directions.

The goal of this study is to illustrate the scope and major themes of digital creativity-related studies. The ability to provide a high-level view of the research field and reveal the intellectual structure of emerging disciplines is essential for articulating the distinct fundamental concepts in digital creativity. This study conducts an original systematic literature review by utilizing the intellectual structure technique in mapping the digital creativity field. We hope to provide a source for anyone interested digital creativity research and help simulate further interest. In addition, this study also intends to be a quick reference for novice researchers to become familiar with the field of study. In this article, we apply the research methodology that has been applied successfully in analyzing other domains (Lee & Chen, 2012).

The remainder of this article is structured as follows. In Section 2, the intellectual structure research methodology is presented. In Section 3, the top twenty main research themes of digital creativity research are explained. Section 4 presents the map of intellectual structure of digital creativity research. In Section 5, this paper explains the analytical results, from which a research framework of digital creativity was derived. Finally, the conclusion drawn from this study is presented in Section 6.

### 2. Research methodology

We utilized the intellectual structure technique developed by the information scientist to help clarify the scope and themes of this research domain. The term “intellectual structure” refers to the distribution of activities within a scientific field at a specific point in time. Activities in a given scientific field are markedly

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represented by its publications. The intellectual structure of a field is consequently derived from its literatures. Among other things, intellectual structure shows the research themes in a scientific domain, and the relationships between these themes. Intellectual structure is usually presented in a graphical format to facilitate the comprehension of the relationship between themes and the scope of a research field.

An intellectual structure of a research field is derived from the co-citation network, which is derived from the citation relationships between literatures in the research field. The co-citation is an induced relationship derived from the action of citation; two articles are co-cited if there exists another article that cites both of them. The citation data were collected by querying the Microsoft Academic Search (MAS) citation database with the key phrases “digital creativity” and retrieved the initial 512 seed papers. These seed papers were then used as the initial seed set to retrieve papers that are citing or are cited by literatures in this initial seed set. The full citation network initially consists of 3591 document nodes, which is further condensed by keeping documents that have been cited at least once. The condensed citation network is used to derive the co-citation network, which includes 188 nodes. The intellectual structure is then built from the co-citation network by applying factor analysis and PFNET. The intellectual structure diagram is graphically represented by applying a graph drawing algorithm over the PFNET. The research process in deriving the intellectual structure is shown in Fig. 1.

The main purposes of the factor analysis (FA) are: (1) to reduce the number of variables and (2) to detect structure in the relationships between variables. Therefore, FA is applied as a data reduction or structure detection method (Stevens, 1999). We use FA to combine correlated variables (papers) into one factor (research theme). In our case, 188 papers are represented by 20 themes,

whereas the first theme is a surrogate for 19 papers. The FA method extracts the most significant factor first, which accounts for the largest possible variance, and each succeeding factor extracted in turn accounts for less variance. The co-citation network is abstracted into a matrix and input to FA processing.

Twenty factors are extracted from the co-citation matrix processed by FA. Factors other than the top twenty factors accounted for much smaller explained variances are conveniently omitted to focus the analysis on the more significant themes. The FA procedure also generates a Pearson correlation coefficients' matrix, which stores the correlation values between papers. The correlation coefficients in the matrix are used as a relatedness measurement among papers. Pathfinder (Schvaneveldt, 1990) scaling is then applied to extract the most important relationships from the graph represented by the correlation matrix.

The result from the Pathfinder procedure is a pruned network called PFNET that provides unique representations of the underlying structure for domains in which objective measures of distance are available. The popularity of a research theme is proportional to the variances explained by it in the FA analysis, whereas the importance of a theme is indicated by its position in the PFNET. A theme is peripheral if it is positioned on the fringe of the PFNET graph. We have succinctly introduced the intellectual structure derivation process that involved much more steps, which have been computerized and built into a literature review-aiding system (Chen, 2012).

### 3. Research themes of digital creativity

The leading twenty factors, which explained 88.5 of the total variances derived, were selected as the representative major

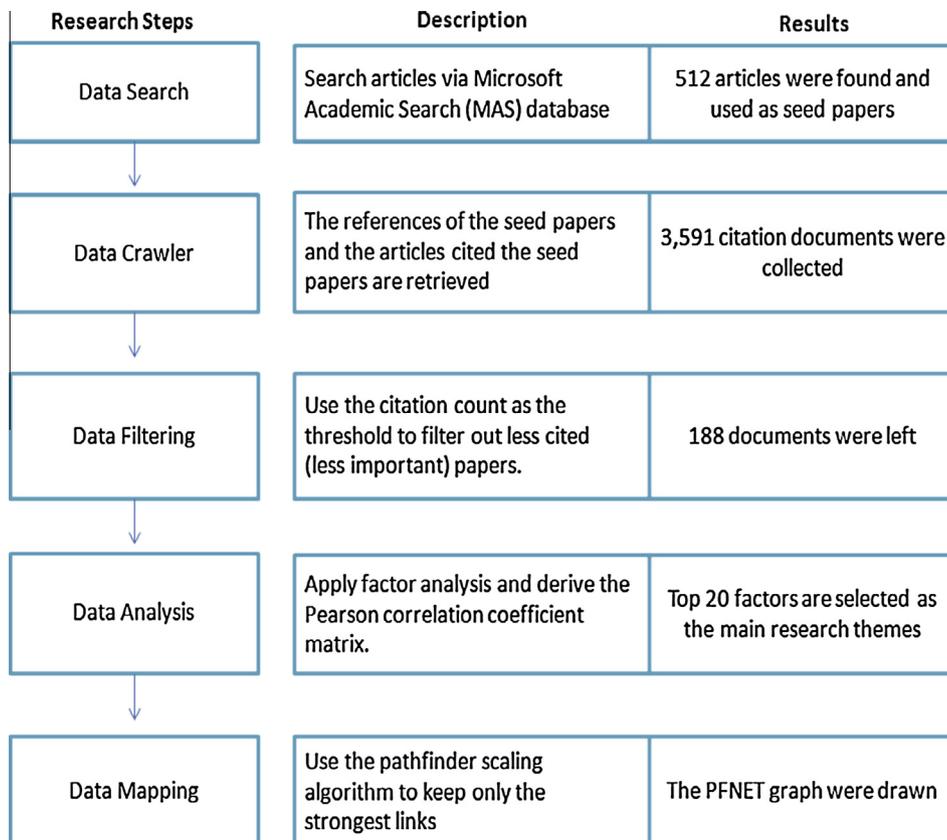


Fig. 1. Processing steps in deriving the intellectual structure.

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