

How a Creative Product Evolves: A Structural Analysis of Creative Trajectories in Graphic Design

Short title: Creative trajectories in graphic design

Steven Brown

Department of Psychology, Neuroscience & Behaviour,
McMaster University
stebro@mcmaster.ca

Zoë Lazar-Kurz

Department of Psychology, Neuroscience & Behaviour,
McMaster University, lazarkzc@mcmaster.ca

ABSTRACT

The psychology of creativity has traditionally had a narrow focus on idea generation alone, even though creative work requires extensive processes of exploration of an initial idea in order to develop it into a final product. In the present study, we attempt to characterize the evolutionary trajectory of design work from inception to final product by analyzing the full progression of structural changes occurring over the course of a creative project. Graphic design students were tasked with brainstorming ideas for a business advertisement during an initial session, and then developing one of these ideas into a final advertisement across 6 daily sessions of exploration. Because this study is ongoing, we present a case study of a single designer's progression and the creative dynamics of its unfolding from initial sketch to final product.

CCS CONCEPTS

• **Applied computing** → Arts and humanities; Media arts; Arts and humanities; Fine arts; Law, social and behavioral sciences; Psychology.

KEYWORDS

Creativity, Graphic Design, Exploration, Revision

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1 INTRODUCTION

The study of creativity attempts to explain how novel products come into being. However, one limitation of this field is that much work on the psychology of creativity has had a restrictive focus on the process of idea generation on its own [1-4], despite the fact that the brunt of creative work requires exploration, validation, and revision in order to create a finished product [5-9]. While

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generation is a critical process for creativity, it does not stand alone. An emphasis on idea generation has pervaded all domains of creativity, including graphic design [10-11]. In the current study, we are attempting to look at the full process of creative production from initial idea to final product. To do so, we are carrying out an experimental study of graphic design and are quantifying the types and time-courses of changes that occur to a design over the course of the exploratory phase of the work. To date, few studies have examined the intermediate drafts produced during the creative process, although drawing plays a key role in the design process [7]. One such study assessed all 46 preliminary sketches produced by Picasso for his renowned painting *Guernica* [8]. By looking at intermediate drafts, we can begin to understand the processes by which creators execute their ideas. The aim of the present study is not only to characterize the trajectory of creative work, but to distinguish the strategies that lead to either high-creative or low-creative products.

2 METHODS

Data collection for the study is ongoing. Graphic design students from a professional graphic design school are being recruited to participate in the study. Due to Covid restrictions, the study is being carried out remotely. The recruited designers were tasked with developing a single-page advertisement over the course of a week for a food-delivery service named "Supper," which is aimed at university students. During the initial session, the designers were presented with the name and description of the business. They were asked to brainstorm sketches for no fewer than three independent design-concepts for the ad, ultimately selecting the one that they would like to develop further. The sketches were required to have three design constituents: 1) graphic elements, 2) a logo, and 3) a background. Over the following week, the designers carried out daily exploratory work on their design for no more than one hour per day, resulting in 6 drafts of their design. We asked the participants to rate the quality of each sketch and to provide a short description of what changes they made with each iteration and why. We also asked them to report any external sources of inspiration, for example ads they happened to see during the course of the experiment. At the end of the week, the participants were invited back for an interview in which they explained their overall creative process as well as identified those changes that they thought were most important in achieving their design. In the overall study, the initial and final sketch of each participant will be evaluated for their originality and quality by professional graphic designers. This will allow us to examine the creative *strategies* of designers who

produce high-creative versus low-creative products. As this study is ongoing, there are no group results to report at the present time. Therefore, we will present a detailed case study of a typical result from one female participant (age 20) in order to exemplify the analytical approach and the results that are obtained from it.

2.1 Structural features

As a first level of analysis, we catalogue the basic structural features of the ad's graphic elements, logo, and background over time, including the following features: whether the logo is logographic or pictographic; the typography of the logo; the color and texture of the background; the form and shape of the graphic elements; the spatial frequency of the elements; Gestalt compositional features related to similarity, continuation, closure, proximity, figure/ground organization, symmetry, and order; dimensionality (2D vs. implied 3D); degree and pattern of repetition; the color pattern; and the degree of color contrast. Finally, we note the basic narrative of the ad and how it relates to the business. This includes any characters depicted in the ad and any plot-lines that would be related to an implied sequence of actions and/or interactions.

2.2 Change analysis

The "change analysis" is the central feature of the method. It takes advantage of the structural features mentioned above but focuses on how and when these features change over the course of the exploratory phase. These changes apply to those occurring relative to the initial sketch, as well as those occurring relative to the preceding drafts. The goal of this study is to define the trajectories of the creative changes occurring over the course of the work. A basic phasing of the work is assumed to occur from *conception* (the initial sketches) [6] to *development* (the iterations) [12] to *completion* (the final product). The features analyzed in the change analysis include those related to the objects (i.e., the graphic elements) and the time course. *Object* features include: features that are added and/or taken away; refinement of existing objects vs. replacement of objects; accrual of objects over time vs. maintenance of a fixed number of objects vs. elimination of objects; employment of repetition of structural elements; blending of existing elements together to create fusions; and restructuring of the ad by moving existing parts to new locations. *Time course* features include: progression from general to specific; making changes globally (holistically) across all elements vs. locally to specific elements during each revision; honing in on one element at a time, thereby blocking out the rest (i.e., *irising out*); continuity vs. discontinuity in style over drafts; amount of change, from minor tweaks to large (abrupt) changes; examining whether large changes are made early or late in the process; examining the rate of turnover of elements, including whether changes are made at a constant rate or whether they are concentrated at a particular phase in the process; and the shape of the trajectory across time, such as linear, sigmoid, zigzag, parabolic, and exponential progressions.

3 RESULTS

Figure 1 presents the participant's three initial sketches from the brainstorming session (top) and the drafts produced from the 6 daily rounds of exploratory work (bottom), resulting in the completed

product on Day 7. Figure 2 presents a summary of the change analysis for this participant, describing the trajectory of her exploratory work with regards to the three design components of the graphic elements (blue, solid line), the logo, (orange, short dashed line), and the background (green, long dashed line).

Since the vast majority of the changes occurred to the graphic elements, we will summarize the results for the logo and background first, and then present a more detailed analysis of the graphic elements. *Logo*. The logo remained relatively unchanged from the initial sketch up until the final draft at Day 7, at which time the font, style, and color changed, while its location remained fixed. The logo's color changed from black to dark blue, and the font changed from flat, horizontal, and uppercase to three-dimensional, hand-drawn, and title case. *Background*. In the first sketch, the background was excluded. The image of a lake, inspired by the background of one of the non-selected initial sketches, was incorporated into the background at Day 2, but then removed at Day 4, again leaving no background until the final day. The background color underwent its final change on Day 7 from white to sky-blue, with the added inclusion of some faint white clouds.

The graphic elements. The remaining results will describe the structure, organization and change analysis for the graphic elements. The basic narrative of the ad remained relatively unchanged from the initial sketch to the final ad, depicting 1) a male chef hovering over a restaurant that prepares the meals, 2) a curvy road leading to a customer (whether drawn or implied), and 3) a customer's location and a piggy bank (indicating the good value of the service). However, many of these elements changed over time.

Figure 2 presents a "change analysis" that describes the creative trajectory of the participant's work. There were three major phases of the exploratory work: 1) an initial phase in which the global plan of the ad was established, as based on the initial sketch, 2) a second phase of sequential detailing in which individual elements of the ad were worked on individually in a serialized fashion, from top to middle to bottom, and 3) a final sprint in which all loose ends were resolved, including elements such as the logo and background that had not been worked on previously. A global vision of the graphic elements was established by Day 3, with the later stages merely refining that initial vision. The first alterations (Day 1 to Day 2) were characterized by *blending*, in which aspects of the two non-selected sketches were incorporated into the design of the chosen sketch. A student-customer and a truck were *borrowed* from these discarded sketches and reimaged within the design. The arrangement of the objects was also reimaged. The placement of the student was swapped with the books and piggy bank. This was the only instance of *rearranging*. Interestingly, in the next draft (Day 3), the delivery truck was exchanged for a delivery person on a scooter. This change from inanimate object to human being exemplifies the artist's stated goal of creating a story. The participant recounted that it was also at this point that she took inspiration from flat illustrations viewed online and decided on a two-dimensional aesthetic for her ad.

Compared to the progressive processes of modification and refinement that occurred on Days 2 and 3, Day 4 introduced an interruptive strategy into the design process, one that we will refer to as *irising out*. This cinematographic term is rooted in a scene-transition technique popularized in silent films in which the camera's focus would progressively narrow until all but a single spotlight faded

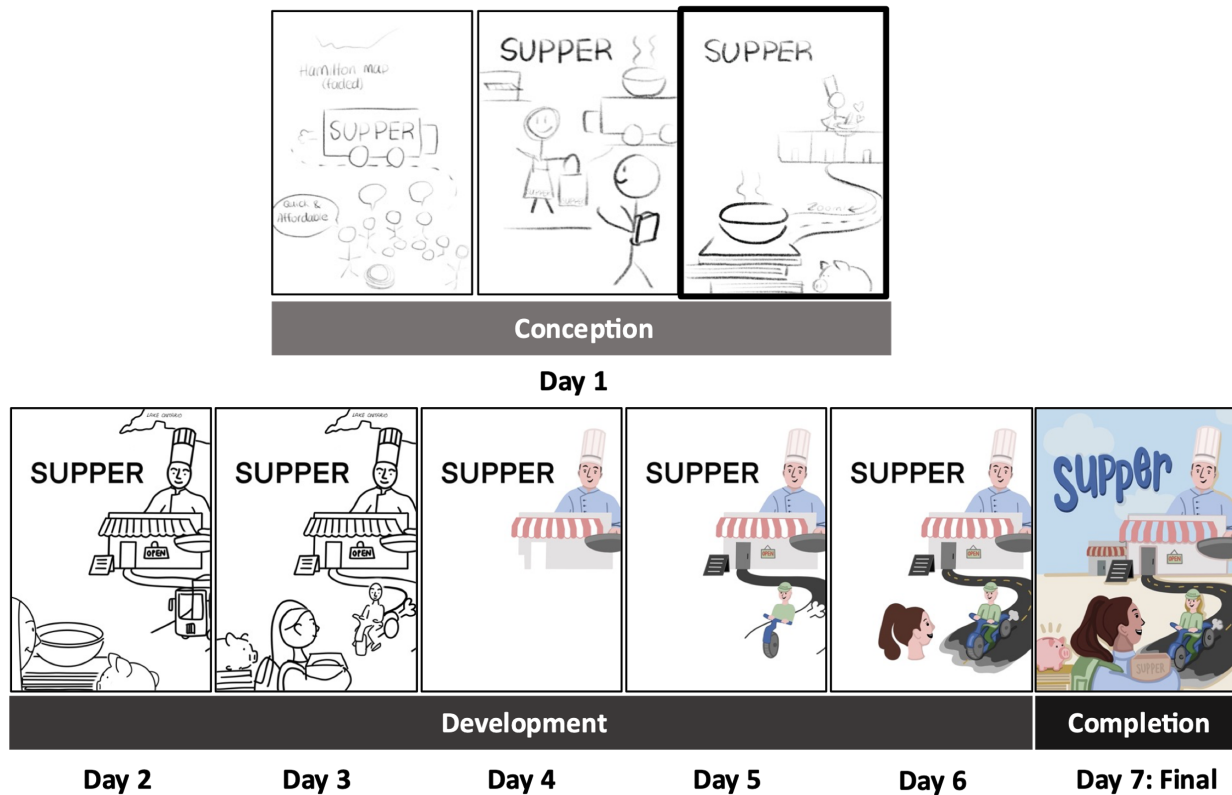


Figure 1: The full set of daily sketches, from the initial brainstorming sketches (Day 1) to the final product (Day 7). The top-right sketch with the dark outline was the one selected by the designer for further development.

to black [13]. In the present study, all elements of the ad except for one focal component were removed, creating a large degree of blank space in regions that previously contained content. This is essentially a process of recreating the design by *replacing* each region of the ad, one region at a time, and resulting in a process of sequential detailing. In the same way that the brainstorming draft from Day 1 served as the sketch for the drafts on Days 2 and 3, the draft from Day 3 now served as a new sketch for the remainder of the design process. It was at the iris-ing-out stage that color was introduced into the ad. In particular, the graphic elements were *colored in* at this stage. Through iris-ing out, features of the ad were reintroduced successively – from top to bottom – when the previous element was deemed satisfactory. This process re-established the global content of the ad from scratch, using the draft from Day 3 as the sketch. For each detail, the participant reported that she employed trial-and-error strategies to both her brush strokes and color choices in order to decide on her preferences. Once one detail was completed and a new focus was established, there were no *reiteration loops* back to previous elements. In addition, each time a character was drawn, the bust was drawn first, followed by their accessories (e.g., the scooter for the driver, the books and meal for the customer).

On Day 6, much of the ad still remained blank. Therefore, in order to achieve a final draft within the allotted period of time, the

participant engaged in a third and final phase that appeared as a “final sprint” toward completion. Although most of the ideas had been decided on by Day 3, the remaining details underwent a rapid series of refinements. Details regarding the piggy bank, food-delivery vehicle, and restaurant were reported to have been conceived so as to “fill space” and “clarify the narrative.” As mentioned above, it was also during this final draft that the logo and background underwent an exponential process of development, compared to the far more linear development of the graphic elements, although the iris-ing-out procedure created a type of reset in the middle of the design progression for the graphic elements. Although the participant did not spend more time on the final session than the previous ones, much more was completed during it.

4 DISCUSSION

The current project looks at creativity beyond the process of brainstorming initial ideas and tries to develop a holistic perspective on the entire creative process from the initial idea to the final product. The project’s major innovation is a descriptive analysis that attempts to catalogue and analyze the full trajectory of creative change as a time course, looking at both the “what” and the “when” of the design process. The case-study results presented here demonstrated one designer’s method for carrying out the creative process. It begins by developing the global picture, followed by focusing on

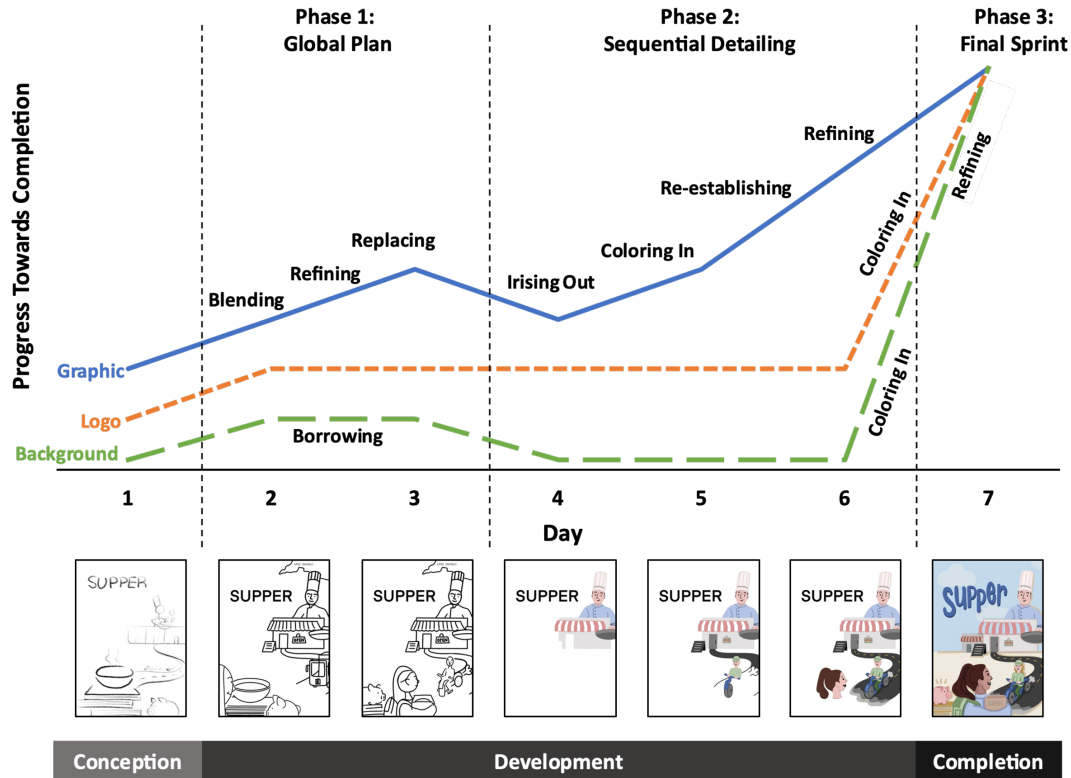


Figure 2: The “change analysis” for the creative trajectory of the weeklong graphic-design project is shown as a three-phase process. Key processes of change are written alongside the curves for the graphic elements (blue, solid), logo (orange, short dashed), and background (green, long dashed). The y-axis represents the progress towards completion for each design element.

key details one at a time, then shifting back to the big picture. The final outcome was quite related to the initial sketch, with no evidence of starting over or developing a new concept. However, the strategy of iris-ing out meant that much of the content of the ad at Day 3 was eliminated and then added back successively over the remaining days. Whether this trend of broadening and narrowing focus is conserved in longer processes of creative production remains to be seen. However, the creative trajectory observed for this participant is very much in line with Mace and Ward’s [6] seminal work on the creative process in professional visual artists producing art works over much longer time courses. This trajectory also follows the design phases of planning and development described by Nini [12]. The same trajectory can be seen in the earliest iterations of Picasso’s *Guernica* sketches [8]. Picasso began with one kernel idea that was elaborated upon and executed, rather than amalgamating many disparate ideas or incorporating drastic changes into the final painting.

In like form, the results showed that the global scheme of the ad, including its overall narrative, was nearly fixed from the initial to the final sketch. The designer spent nearly half the week developing a strong initial strategy (or sharpening her axe, as Nini would say [12]), requiring very little revision later in the process. She developed a blueprint early on and then executed it. While the graphic

elements showed a relatively linear trajectory of development – with work on them occurring continuously with each sketch – the logo and background showed a more exponential trajectory, with work concentrated at the last draft. After the global vision of the graphic elements of the ad was established in the initial sketch and first two drafts, an *iris-ing* method was used to work on each graphic element on its own, with the remaining elements of the global sketch eliminated. The global form of the ad was then *re-established* in a successive, piecemeal manner across the last four sketches. Color was introduced during this iris-ing stage to each element separately through a process of *coloring in*. Other strategies of this designer included addition, elimination, refinement, blending, and replacement, with only minimal spatial relocation. The designer made mention of external inspirations for certain design elements. In addition, some internal inspiration, such as borrowing ideas from the non-selected brainstorming sketches, occurred early on in the process. Borrowing and blending are examples of creative *synthesis*, an integral practice of graphic design [9, 12].

Graphic design is an ideal medium in which to look at creativity in this manner since there is a hard-copy record of the changes that are made with each iteration [8]. However, the method could be applied across a variety of creative domains. Writing is perhaps the closest domain to which this method can be applied, although

writing extends in space far more broadly than a single-page ad, since even short stories can span many pages, making it more difficult to visualize the changes that have occurred. The method could also be applied to musical composition since music is notated graphically, and so a change analysis could be employed to visualize musical changes over time. While the method is more difficult to apply to a performing art, this is unquestionably feasible. The aim of this approach is to be able to characterize the evolutionary progression of creative products from start to finish. In addition, the current project involves an evaluative component in which expert graphic designers will rate the originality and quality of the initial sketch and final product. This will allow us to distinguish high-creative from low-creative *strategies* for generating such products, as based on observable differences in the change analyses between high-creative and low-creative designs.

Ultimately, we would like to develop a general model of the creative process that applies across all creative domains. While the structural features described here may be specific for graphic design, most of the mechanisms of change should be applicable across nearly all domains of creativity. Hence, while creativity is linked to both a specific domain and a particular skill-set [14], the mechanisms by which an initial idea is translated into a final product through exploratory work might show significant cross-modal similarities across domains, similarities that conform with creativity models such as Geneplora that posit generalized progressions of generation, exploration, and revision [4]. While the initial idea for a creative product – and where that idea came from – is unquestionably an important consideration for the creative process [1-3], it is by no means the only one. For domains like technology, science, and the arts in which creative exploration can take years to generate products, the brunt of creative work is based on exploration and not the initial idea, which is mainly an overarching framework for the process. To the extent that generation is indeed important for creativity, our approach grounds the brainstorming process in a functional task like graphic design – using participants who have the necessary expertise and internal motivation to skillfully carry out such a task – rather than the abstract tasks that are looked at in classic divergent-thinking tasks in the psychology lab [1-2].

One way to look at the creative process in a global manner is to conceptualize it as a microcosm of cultural evolution. A reasonable model of the creative process is a genealogical representation that shows the successive changes to a creative product over time and how these features become modified with repeated iterations of exploration. For many creators, the various sketches of an idea are often documented at each step in the process [8]. We can analyze these intermediate sketches genealogically and identify the features that are added and removed at each stage, as demonstrated in the current study. The result is no different than a cultural phylogeny [15], although operating at a very small scale of time and “culture.” Taken together, the creative process seems to be nearly identical to the process of cultural evolution, but occurring on a very local scale, even that encompassing a single person. This lens can begin to explain the elusive decisions designers make to separate pursued ideas from those that gather dust on the shelf [16], and how designers’ environments can modulate the success of certain trajectories with the failure of others. The development of a creative product occurs as an evolving lineage, just as cultural products

do. The method of “change analysis” that we have presented here should provide one avenue for developing a genealogical view of creative work as a process of successive changes leading to the development of a creative product. This idea is compatible with the view that creativity is intimately related to the notions of style and style change [17]. While only one trajectory is reported here, we are hopeful that the upcoming group-level analysis will provide a foundation for future studies to identify diverse creative strategies that can be categorized and contrasted. This classification may lead to a greater understanding of the creative process and the genesis of innovation within graphic design and beyond.

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