On Two Desiderata for Creativity Support Tools

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Abstract. This paper discusses two important desiderata for developing creativity support tools, namely ideation and empowerment. We then use them to guide us in designing a new individual creativity support tool codenamed Creative-Pad. Creative-Pad is designed to assist individual advertising creative to develop creative ideas for advertisements. For ideation, Creative-Pad searches and filters information automatically from the internet to present to the user with related words and exemplar sentences. For empowerment, Creative-Pad is designed in such a way that the user is neither distracted nor burdened to do any other tasks unrelated to conjuring up a creative idea for a new advertisement. Creative-Pad is fully implemented and some preliminary results of its use by advertising creatives are reported.

1 Introduction

Developing a creativity support tool is an exciting and a very challenging problem for HCI researchers. This is because the interaction between the computer and the human in this task is almost magical. That is, despite significant past research into the nature of creativity (for example, see [1, 4, 19, 20]), we do not understand how the mind works in a creative way. Yet, the challenge here is to develop tools to assist the mind in its creative endeavour. Shneiderman [17, p. 116] remarked: "Developing software tools to support creativity is an ambitious, but some would say, vague goal.".

Developers of such tools thus face some acute problems. For example, when users of such tools fail to develop a creative solution, it is difficult to know where the problem lies. There are many other factors, such as one's lack of attention, skills, and interests, which could affect the user's performance. The interplay of these factors occurs in the mind of the user and is therefore difficult to weed out. Without doing so, it would be difficult to develop a set of criteria or a framework for developing and evaluating these tools (although attempts were made, see [16, 18]). Another example is a general lack of distinction between a creativity support tool and a problem-solving tool. For instance, if one were to use a sketch pad to help sketch out various ideas, should that be a creativity support tool or a drawing tool? Distinguishing between them might not be a straightforward task. This is because a creativity support tool is often perceived to be very much a part of a problem-solving tool. Yet, without

doing so one could complicate the design of such tools or at worse, be confused with the kind of tool that one is supposed to design.

Attempts to define creativity support tools in the past thus tend to be quite comprehensive. For example, Lubart [10] considered four categories: computer as nanny, pen-pal, coach and colleague, while Johnson and Carruthers [7] considered three classes which range from tools that do not produce creative ideas/artefact to those that could assist in many different ways. Although these classifications provide a good scope for discussing work in this area in general, they lack definitive statements about these tools and in particular those designed to assist individuals to solve a particular problem.

In this paper, we discuss two desiderata for developing creative support tools, namely *ideation and empowerment*. The former emphasizes on generating new ideas to the user and the latter, empowering the user to be creative. Section 2 discusses these two desiderata in details. We then show how they guide us in our design and implementation of a new creativity support tool, codenamed Creative-Pad. Creative-Pad is designed to assist individual advertising creative. An advertising creative (or, in short, a creative) is a person working for an advertising agency who is responsible for developing creative ideas for a new advertisement. For ideation, we emphasize on developing a process which generates ideas that bear some relations to the problem on hand. For empowerment, we emphasize on providing the user much time to conjure his/her idea for a new advertisement while being hinted with some "seed" ideas. Section 3 discusses the design and implementation of Creative-Pad. Section 4 concludes the paper with a general discussion of future work and the lessons learned from developing Creative-Pad.

2 Desiderata

The first desideratum, ideation, emphasizes a process which has been well observed to be an inherent part of creative thinking, namely the ability to generate/discover new ideas. Much has already been said in the literature regarding the way in which ideas emerge in a creative process, first as a set of divergent ideas and then as a set of convergent ideas. However, we argue that the ideation process implemented for any creativity support tool should focus only on generating a set of divergent ideas. In particular, we consider the convergent part, for now, to be the responsibility of the user. Partly, this is because we lack an understanding of how creative thinking arises and partly this provides a clear goal for designing these tools. If not, the design of these tools would become too intertwined with the two roles and thus becoming unnecessary complicated.

Furthermore, the ideation process should be able to generate a new set of ideas when used repeatedly and the ideas generated must somehow be able to inspire the user to then work towards a creative solution. If not, the tool itself will be limited in its ability to support creative thinking, both in terms of quantity and quality of ideas generated. It is worthwhile distinguishing between creative thinking tools from creativity support tools as defined here. The former incorporates methods (such as Osborn's [13] brainstorming, de Bono's [5] lateral thinking, and MacCrimmon and

Wagner's [11] techniques for "making connections") which encourage users to come up with new ideas themselves whereas the latter automatically generates ideas to inspire/lead the users to develop a more creative solution for the problem on hand.

Developing such an ideation process suggests that its design needs to be crafted in a way that combines both the need to have fresh ideas and ideas that are in creative ways linked to the problem on hand. Consequently, attention needs to be paid to the exact nature of the creative aspect of the problem for which the tool is designed and to where the possible source of inspiration lies. Bonnardel [2, p.158], in analysing the use of analogies in creative activities, also emphasized the importance of knowing "the nature of the situations that can be used as sources of inspiration".

The second desideratum, empowerment, relates to the tool's usability. Following from the first desideratum, it becomes clear that this should be about empowering the users to develop his/her ideas freely. By "freely", it is meant as little interruption as possible to the user's thought process. Again, this is important because we lack an understanding of how creative thinking arises. The user is best left alone to develop a creative solution.
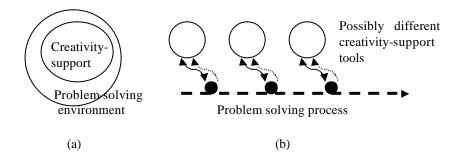

Fig. 1. Two different views of a creativity support tool: (a) Creativity support embedded in a problem-solving environment; (b) Creativity support view as independent moments in a problem-solving process – after each session, the tool could be updated (dotted arrow)

One way to ensure that this desideratum is met is to separate one's initial thinking process from one's later "action" process. The latter is when the user begins to implement his/her initial ideas fully. A creativity support tool when designed to assist only the former activity would require an interface whereby the user literally has to do nothing. In contrast, researchers who focus on developing a suitable environment to support creative thinking (example, [6]) often tend to provide many tools or a tool with many functions. These environments often allow the users to experiment with alternative ideas prior to moving on to developing the final idea. Creativity support in this latter case is very much embedded as part of the problem-solving process (see Fig. 1a) whereas in our approach, creativity support is very much an independent process (see Fig. 1b). It captures the moments when users take time out to think about certain aspects of the problem. There could be more than one such moment and each might require the use of a different creativity support tool.

3 Creative-Pad: Design and Implementation

The process of creating an advertisement could succinctly be described as having three key elements, namely a message, an idea, and an execution. A creative first draws out a message from the brief describing the product. Then he/she develops an idea which in turn is executed to produce an advertisement. It is evidently clear that much of the process for finding some initial good ideas for developing an advertisement involves words association. It is interesting to note that this method is also one of the simplest and most popular methods used for generating ideas in many of the commercial creative software. For example, IdeaFisher is one such program and it has an idea bank of more than 700,000 words associations to generate ideas for its user. However, creatives working in this area have often noted that if the word associations are generated in a manner unrelated to the problem on hand, there is a danger that the ideas generated may not be of much use [15]. Furthermore, Poltrack [15] noted that for advertising, related ideas should come from "all corners of life" and one need to "stay tune with the world". These observations suggest the need for a rich source of contemporary ideas.

Without doubt, one rich source of such contemporary ideas is the World-Wide-Web, or in short, the web. It also has the added advantage of being a huge resource which is readily available, constantly updated, and information is literally coming from "all walks of life". However, using search tools to retrieve information from the web often produce an overwhelming amount of information [9]. Consequently, researchers are constantly designing new ways to help filter the information. Of particular interests here are Otsubo's Goromi-Web [14] and Koh et al.'s combinformation [8]. The former extracts and displays keywords that frequently appear in the search results and also displays images and blocks of text as floating images on the screen. The latter extracts text and image clippings from the found documents. These clippings are then presented to the user in a composition space as a group of related ideas and with which the user can interact. For instance, he or she could mouse over it to retrieve further information.

However, unlike Goromi-Web and combinformation, an ideation process for Creative-Pad must not detract the users unnecessary. Consequently, we design a process which does not engage the user with its search for ideas. The user simply enters the keywords from the message and the extraction of ideas is then done automatically. Our current ideation algorithm is as follows:

1. User enters keywords from message;
2. Send request to search engine (currently using Altavista.com) for related information on the web;
3. Extract links from the results returned and download Html files from each link;
4. Extract all sentences from the Html files that contain the keywords;
5. Extract "interesting" words from these sentences; for now, a simple algorithm is used. We extract all adjectives and verbs found in these sentences.
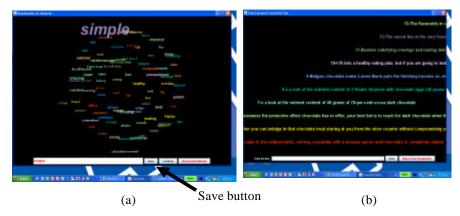
(a)   Save button   (b)

Fig. 2. Creative-Pad Interface

Thus, the ideation process produces as ideas, a set of words and sentences. To provide an environment conducive for the user to develop his/her own creative ideas for an advertisement, we developed an interface whereby the demand on the user is again kept to a minimum. Basically, Creative-Pad projects ideas onto the screen and the user constantly works on his/her ideas with little interruption. Each session using Creative-Pad consists of the following steps:

1. Words, in randomly assigned colour, are beamed to the user one at a time and up to a maximum of 150 words per screen (see Fig. 2a). While the words are presented, music is being played in the background Note that words are deliberately presented in an overlapping fashion to discourage the user from reading the words.
2. As each word appears, the user could select it if he/she finds it interesting or inspiring. This is done by either typing the word at the box at the bottom of the screen or clicking the save button (see Fig. 2a).
3. When the maximum number of words is displayed, the screen pauses. The user is given time to work on any ideas brewing in his/her mind.
4. If there are still words to be displayed, the user can repeat step (2) or if the user has had enough ideas, he/she could go to the next step.
5. The user-selected words are then re-beamed to the user together with some randomly generated words. The latter is added partly to add some random ideas and partly to increase the number of ideas in case the user has selected insufficient words.
6. When all the words are displayed, they will be rotated for a few seconds and re-displayed in random positions. During this time, the user is supposed to continue developing his/her ideas. He/she might record his/her ideas by typing a succinct sentence at the bottom of the screen.
7. When the user has had sufficient time developing his/her ideas, he/she will press the continue button to move to the next step.
8. Creative-Pad will then display sentences to the user, moving them from the top right corner to the bottom left corner of the screen. These sentences contain the user selected words and each sentence is numbered (see Fig. 2b). The user could

select those sentences of interests by entering their number at the box at the bottom of the screen.

9. Finally, the user views all words and sentences that he/she has selected or created. He/she continues to develop his/her ideas further.

10. When the session concludes, a report will be generated which contains all the words and random words generated during this session and all the words, sentences and idea sentences generated by the user during this session.

Fig. 3 shows our basic model for Creative-Pad. Step 1 is the ideation process which consists of retrieving information from the web using some keywords from the message and then processing the information for relevant ideas. In Step 2 ideas are presented to the users in four phases. Firstly, the retrieved words, $W_1...W_t$, are presented to the user to help evoke possible ideas for advertisement. User at this stage only needs to select the words that are of interests to him/her. Secondly, the selected words, $W_{s1}...W_{sm}$ will be re-displayed and if necessary, together with some randomly generated words, $R_1...R_p$. User at this stage will have a chance to refine his/her thoughts further and describe each of them with single sentences. Thirdly, sentences, $S_1...S_o$, which contain the selected words, $W_{s1}...W_{sm}$ are displayed as exemplar of ideas using those words. User at this stage can select sentences which are of interests to him/her. Finally, both selected words and sentences are displayed and user can continue to refine his/her ideas.
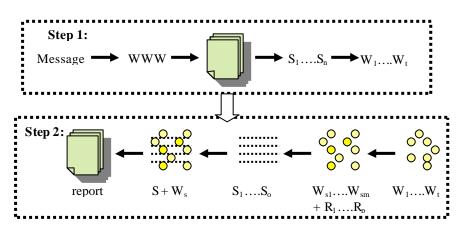

Fig. 3. Basic model of Creative-Pad

Several experiments were conducted where creatives were asked to use Creative-Pad to develop ideas for some imaginary advertisements. Details of these experiments are reported in [12]. One such experiment with two creatives from two different advertising companies is reported here. The experiment was conducted as follows: Duration - 30 minutes; Instruction given - You will need to enter the phrase "car + family + space" into Creative-Pad and during the experiment, develop ideas for an advertisement with the message "a car with more family space". At the end of the

experiment, use an A4 sized paper and a black marker to draw or write whatever you think you need to describe your concept.

Note that although ideas generated using Creative-Pad is not intended to be used immediately to generate a graphic display, we nonetheless asked the creatives to do so. This might help us to understand better the ideas currently in the mind of the creatives. Ideally though, they should put the ideas in the drawer and re-visit them later to produce the advertisement required. Figs. 4a and 5a show the words and sentences selected, and the ideas generated by the user (arrows indicate a possible connection between the idea generated and the words/sentences selected). Figs. 4b and 5b show the graphic output of a possible ad.

Selected words	User's ideas	Selected Sentences
Buy Interior Buying Camping Rental Comfortable Compact Feel Top Easy Speed Owned Search Appeal Set Cheap National Personal Excellent Ideal automotive	Sleeping in car

Cheap accommodation

Built in stove

Has a shower Sleeps 2 people Double bed Seats fold away Large space Camper car Roof expands

Transforms to a camper car

Electric hybrid | Pros: Great Price, Comfortable Ride, Lots of space, Great family car

You feel very little movement in the car and it wouldn't be a terrible exaggeration to say that you could easily fall asleep in the backseat.

Who should buy this car

Best car I've ever owned |

(a)   (b)

Fig. 4. Result obtained using keywords: car, family, space

Selected word	User's ideas	Selected Sentences
More Extra Larger Designed Organize Stowed Uses Ground- breaking full	More room for your precious cargo Designed with them in mind (family) It's all about them It's like a spare room	The firm claims it combines the practicality of a larger car with the appeal of a supermini An extra flex room gives you plenty of creative ways to use this space

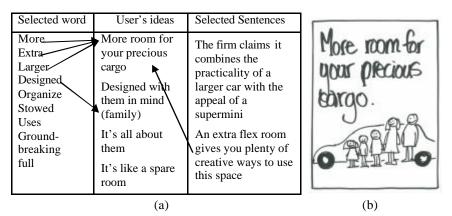(a)   (b)

Fig. 5. Another result obtained using keywords: car, family, space

For Fig. 4, two themes emerge from the words selected by the elective: room and them. Interestingly, the word "room" appears in one of the selected sentences. The number of words displayed was: 234 adjectives, 43 verbs, and 30 random words. The creative selected 9 words and 2 sentences, and generated 4 ideas. For Fig. 5, the emerging theme is a camper car. The number of words displayed was: 283 adjectives, 78 verbs, and 20 random words. User selected 22 words and 4 sentences, and generated 2 ideas.

4 Discussion and Conclusion

Given that creative thinking is still very much a mystery process, we argued that the development of creativity support tools should focus on:

1. Ideation – the tool must be able to generate a new set of ideas when used repeatedly *and* the ideas generated must somehow be able to inspire the user to then work towards a creative solution. To achieve the latter, we find words which have some relevance to the problem on hand.
2. Empowerment – the tool must be designed to support the user to be creative in deriving a solution to his/her problem. It aids the "thinking" part as opposed to the "action" part in solving a problem and it should afford minimum interference to the user's thought process.

With the above properties, a creative support tool could generate ideas that are more relevant than one which supports creative thinking in general and yet it supports finding a solution but not solving the problem itself.

The web undoubtedly provides a rich source of information for the ideation process in Creative-Pad. However, unlike many of the earlier approaches which use this resource, we do not involve the user to search and filter the information retrieved. The ideation process automatically extracts what it believes is useful and the user's role is to focus on developing a creative solution based upon the information presented to

him/her. In this implementation, a simple algorithm is used for extracting words from it. Nonetheless, the resource is so rich that our simple mechanism proves to be adequate, in the sense that the creatives found the information useful and interesting. In addition to the words, we also present sentences that contain the words that the creatives have chosen. One surprising finding is that many of them found that the sentences generated interesting. One possible explanation is that these sentences are like tidbits of news or opinions or commentaries related to the product on hand and thus they kept the creatives informed. They enable the creatives to "stay tune with the world" as if he is gathering the information from a stroll down the street. The creatives could develop an advertisement to position the product in light of these tidbits of information.

Our initial experiments with Creative-Pad are not intended to test the effectiveness of Creative-Pad in helping the creatives to generate creative ideas. As noted earlier in the introduction, such a test is ill-defined, at least for the moment. Rather, they are designed to test whether the ideas generated are sufficiently interesting for the creatives. This, we argue, proves to be the case. Creative-Pad could now serve as a platform for developing and testing these algorithms further. However, a closer inspection of the words generated shows many of the words are judged not interesting. Furthermore, if we treat each word generated as an idea for the creatives, Creative-Pad has generated on average 200 words per experiment and the creatives chose, on average, about 10-15 words. Does the ideation process need to be more "thoughtful" in generating ideas? The initial phase of our ideation process closely resembles a brainstorming session; an extremely popular idea in creative thinking and which has influenced our implementation of the ideation process. Is brainstorming, where quantity of ideas is of essence, the only and best way to interact with the creatives? Or, would it be better to present fewer but better developed ideas? Creative-Pad would provide a suitable platform to experiment with these different alternatives in the future.

In our framework, one way to empower the user to think freely is to identify clearly different areas within the problem where creative thinking is needed and then develop separate creativity-support tools for them. In advertising, there are two different sub-problems, namely getting an idea for the advertisement and developing the final advertisement itself. Creative-Pad is successfully developed for the former. In implementing the interface, we provide ample of time for the users to develop his/her ideas. However, this is done in an ad hoc fashion; more study is needed to develop an interface that better suits the way creatives work.

In summary, creative thinking is such a remarkable feat of the human mind that researchers attempting to develop tools to support such an endeavour must develop a multitude of approaches for experimentation. One such approach is being presented in this paper whereby the focus is on developing an ideation process and an interface which requires the user to almost do nothing except to focus on generating creative ideas for the problem on hand. Using this approach, a tool for advertising creatives has been developed and tested successfully. The tool now provides a platform for future experimentation and discovery about creativity support tools in general and creativity support tools for advertising in particular. Much more research needs to be carried out to establish whether these two desiderata are essential for all such tools or whether we need different desiderata for different tools. If the latter, what are these?

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