
Visualizing Information to Stimulate Stakeholder Creativity

Graham Dove

Centre for HCI Design
City University London
London, UK
graham.dove.1@city.ac.uk

Sara Jones

Centre for Creativity in
Professional Practice
City University London
London, UK
s.v.jones@city.ac.uk

Abstract

There is a growing interest in tools and techniques that can stimulate stakeholders' creativity during participatory workshops at the early stages of product or service design projects. Here we outline our research investigating how information visualization techniques might be used to make abstract data more accessible and engaging, and therefore stimulate creative thinking. We illustrate this with reference to two experimental studies and a case study in which our ideas were put into practice during a service design workshop held in conjunction with a major energy supplier.

Author Keywords

Information visualization; creativity support; design workshops.

ACM Classification Keywords

H.5.2. [Information interfaces and presentation]: User Interfaces, User-centered design, Theory and methods

Introduction

The growing influence of user experience, human-centred and participatory approaches to interaction, service and product design has resulted in an increasing interest in tools and techniques for capturing stakeholder requirements and desires [10]. Amongst

these, are a number of workshop techniques that have proved effective in utilising participants' applied creativity during the early stages of the design process to generate ideas for system requirements [6] and explore future experiences with potential users [9]. In our research [2,3] we are investigating new techniques for using the data generated by our everyday activities to stimulate the creative thinking of stakeholder representatives during participatory creative workshops.

Background and Motivation

The data we leave behind as we go about our daily lives has grown exponentially [5]. Smart phones are commonplace, social media all consuming and interest in personal health monitors is growing rapidly. In addition, the data generated by devices such as smart energy meters are increasingly seen as key elements in the response to major societal issues [1]. All this suggests that such data offer a potentially rich resource of information and inspiration, and are set to play an increasingly prominent role in the design of new products and services.

Shneiderman [11] has argued that visualizing information is a key tool for supporting creativity in the twenty-first century. He tells us that encoding abstract data with visual variables, such as colour and size, enables us to employ the power of the human perceptual system to spot patterns, trends or outliers and therefore gain insight. This in turn enables users to rapidly and thoroughly compare alternatives, and to form and test hypotheses.

Creativity, according to one well-accepted definition, is 'the ability to produce work that is both novel (i.e.

original, unexpected) and appropriate (i.e. useful, adaptive concerning task constraints)' [12]. It is often discussed in terms of the 4-Ps model of *person, process, product* and *press* [8] and with reference to four stages that include *preparation, incubation, idea generation* and *verification* [12].

In our on-going work [2,3], we are investigating how the data we generate can be visualized to make them more accessible and engaging to key stakeholder representatives, and therefore used to stimulate creative thinking during early stage design workshops. In so doing we investigate the impact of different representations on participants' creative processes and on the creative products that our workshop activities produce. We have investigated the effectiveness of visualizing data for use during preparation and idea generation phases. Our aim is to use the creativity of workshop participants to place data in their wider context, to investigate the impact they might have on the lives of various stakeholders, and to suggest ideas for new products or services that respond appropriately.

In this paper we briefly outline two experimental studies and one case study that explore different aspects of our research into how information visualization can support creative ideation and how different design decisions impact on the effectiveness of that support. We then discuss the lessons we have learnt and outline areas for future investigation.

Ambiguity

In the first experimental study [2], we investigate whether employing a greater or lesser degree of ambiguity when visualizing energy consumption data is

more productive in stimulating creative thinking. This is of interest because of the frequent associations between the concepts of ambiguity and creativity [4], and the lines of work that suggest using ambiguous stimuli might stimulate participants' creativity when exploring future experiences [9].

We found that in this context, increasing the degree of ambiguity in the visual representation had a negative impact on participants' creative performance, particularly with reference to the appropriateness of the ideas generated. This seems to be because participants' sense making and insight seeking activities can be impaired where greater ambiguity is employed. Following this we feel that information visualization should be used in conjunction with other creativity techniques that help participants to exploit the ambiguity in the data, in the design context the data come from and the different interpretations that participants' personal experiences suggest.

Analytical and Intuitive Creative Thinking

Applied creativity techniques have been described along a continuum ranging from *analytical* to *intuitive* [7]. In a recent experimental study, yet to be published, we compared two different visualization styles, one aimed at supporting an analytical style of creative thinking and one aimed at supporting an intuitive approach.

Here we found that participants felt their creative process was supported significantly more effectively using the tool designed for analytical visualization and that this style was significantly more effective in directly stimulating the generation of new ideas. This seems to be because visualizing the data in such a way better supports participants' exploration and

collaboration, the creativity factors they felt to be most important, and also engendered a greater feeling of agency or creative self-efficacy.

Case Study: E.ON Energy

This case study [3], outlines a workshop held in Milton Keynes, UK in conjunction with E.ON, a major European energy supplier. The objective being to design possible new consumer services that use the data generated by smart energy meters. Here we combined exploration of visualized information with generative creativity to design activities that investigated participants' understanding of the context and experience in which energy is consumed. These activities were used as the preparation stage for later idea generation activities.

In this case study we found that the information visualization tool we presented as creative stimulation, supported collaboration and engaged participants. It also supported their insight seeking and enabled them to build on existing knowledge. This helped support participants' idea generation and led to them producing creative outputs that display what might be described as incremental creativity as they build on ideas that may already be familiar.

Discussion and Future Work

Our work investigating the use of information visualization as a tool to stimulate stakeholder creativity is in its very early stages. However, we have seen how we are able to make abstract data engaging to an audience who are not skilled data analysts. We have also seen how we can stimulate ideas considered to be more appropriate for the context of the design problem at hand, and how visual or interaction design choices can impact on participants' perceptions of the

support provided for their creative process. Finally we have also seen how participants are able to combine the insights found exploring the data with their own knowledge and experiences and how this can provide us with key understanding of the context for the design problem from which the data come.

One key area for future work is to investigate the factors that might lead to ideas that are judged significantly more novel as well as more appropriate. Also, in order to better understand the impact of our techniques on the full lifecycle of a design project, we should undertake a longitudinal case study to include the use of information visualization during phases of problem identification and idea evaluation as well as during preparation and idea generation.

References

- [1] DECC, (2012). Key milestone for smart meters rollout. Online. Available at <https://www.gov.uk/government/news/key-milestone-for-smart-meters-rollout>
- [2] Dove, G., & Jones, S., (2014). Using data to stimulate creative thinking in the design of new products and services. To appear in Proc. *DIS 2014*
- [3] Dove, G., & Jones, S., (2014). Using Information Visualization to Support Creativity in Service Design Workshops. To appear in Proc. *ServDes 2014*

- [4] Guilford J.P., (1957) Creative abilities in the arts. *Psychological Review*. 64(2), (pp. 110-118).
- [5] Helbing, D., & Ballester, S. (2011). From social data mining to forecasting socio-economic crises. *The European Physical Journal Special Topics*, 195(1), 3-68.
- [6] Maiden, N., Gizikis, A., & Robertson, S. (2004). Provoking creativity: Imagine what your requirements could be like. *Software, IEEE*, 21(5), 68-75.
- [7] Miller, W. C. (1987). *The creative edge: Fostering innovation where you work*. Reading, MA: Addison-Wesley.
- [8] Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan*, 305-310.
- [9] Sanders E.B.N, (2005). Information, Inspiration and Co-creation. In Proc. *6th International Conference of the European Academy of Design*.
- [10] Schneider, J., & Stickdorn, M. (2011). *This is service design thinking*. Hoboken, New Jersey, John Wiley & Sons, Inc.
- [11] Shneiderman, B., (2000) *Creating Creativity: User Interfaces for Supporting Innovation*. In *Trans on Computer-Human Interaction*, 7(1) pp.114-138
- [12] Sternberg, R. J. & Lubart, T. I. (1999) *The Concept of Creativity: Prospects and Paradigms*, in *Handbook of Creativity*, R. J. Sternberg (ed), Cambridge University Press.
- [13] Wallas, G.: *The Art of Thought*. New York, Harcourt Brace. (1926)