

# DYNAMIC LITERATURE MAPPING: TYPOGRAPHY IN SCREEN-BASED MEDIA

---

Author

**Joyce S R Yee**

joyce.yee@northumbria.ac.uk

Centre for Design Research

School of Design

Northumbria University

United Kingdom

January 2003

# **DYNAMIC LITERATURE MAPPING: TYPOGRAPHY IN SCREEN-BASED MEDIA**

Joyce S R Yee

## **Biography**

Joyce is a practising designer and researcher in New Media design. She is part of the New Media team at the Centre for Design Research, Northumbria University in the United Kingdom. Prior to this, she has worked as a print designer and lecturer in the subject of Typography for 3 years in Malaysia. She completed her post-graduate degree at London's Central Saint Martins School of Art and Design. Her final thesis was about repositioning the role of letterforms in the face of technological change. Joyce is currently pursuing a part-time PhD degree at Northumbria University, on developing a practice-led framework for the application of typography in screen-based interactive media.

## **Abstract**

This paper chronicles the development of a visual map representing a literature search on key theorists and thinkers in two principal topics: Typography and New Media. Its aim is to visualise and facilitate conceptual connections between key ideas and philosophies across disciplines. This literature map was drawn up by reviewing available influential literature within these topics. Related categories were later added and a further series of literature searches were conducted to build references in each topic. This on-going cyclical process serves to construct a comprehensive contextual map of knowledge. The benefit of the map is twofold. Primarily, aiding the researcher to navigate and understand complex layers of information. Secondly, allowing the researcher to present and share representations of knowledge. The clarity of the representation is crucial in eliciting the participation of fellow design researchers and practitioners to the development and growth of the literature map.

## **Acknowledgements**

This paper is the result of generous contributions from many people. Firstly, I would like to thank my Director of Studies, Dr. R.A Young, Director of the Centre for Design Research (CfDR), Northumbria University, for his initial encouragement to formalise my research process into a paper. He has given me valuable feedback and constructive criticism during the writing of this paper. Secondly, I would like to extend my thanks to my Subject Supervisor, Ted Carden, Northumbria University and my external Supervisor, Professor Robin Baker, Ravensbourne College of Design and Communication for their advice and guidance during the development of the literature map. Finally, I am indebted to fellow design researchers, practitioners and students from Northumbria University for enriching the literature map with their suggestions and comments.

## Introduction

The aim of this paper is to present a snapshot of an on-going process in a PhD research study. This snapshot captures the process of a literature search and review conducted for the PhD research degree (refer to Figure 1). It is not meant to demonstrate the effectiveness of mapping nor provide a comprehensive list of literature in Typography and New Media. The first part of this paper details the development process of the literature map and its scholarship value in relation to the research enquiry. The second part provides instructions to readers who are interested to participate in further developments of the literature map.

A literature search and review are an essential starting point for a PhD research degree. An in-depth literature search will reveal the scope and breadth of ideas, theories and knowledge of the research area. A literature search will lead to a literature review. Hart (1998) writes that the literature review 'is integral to the success of academic research'. He defines a literature review as:

'The selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed.'

*(Hart, 1998:13)*

Friedman (2001) states that there is no substitute for a literature review in pursuit of a research degree. He gives two simple but powerful reasons for this:

'Only a researcher who knows the current state of knowledge in a field can know whether his or her thesis makes an original contribution to the knowledge in that field.'

Only a researcher who convincingly outlines the current state of knowledge in a field can persuade a properly trained examiner or committee that the thesis contribution is original.'

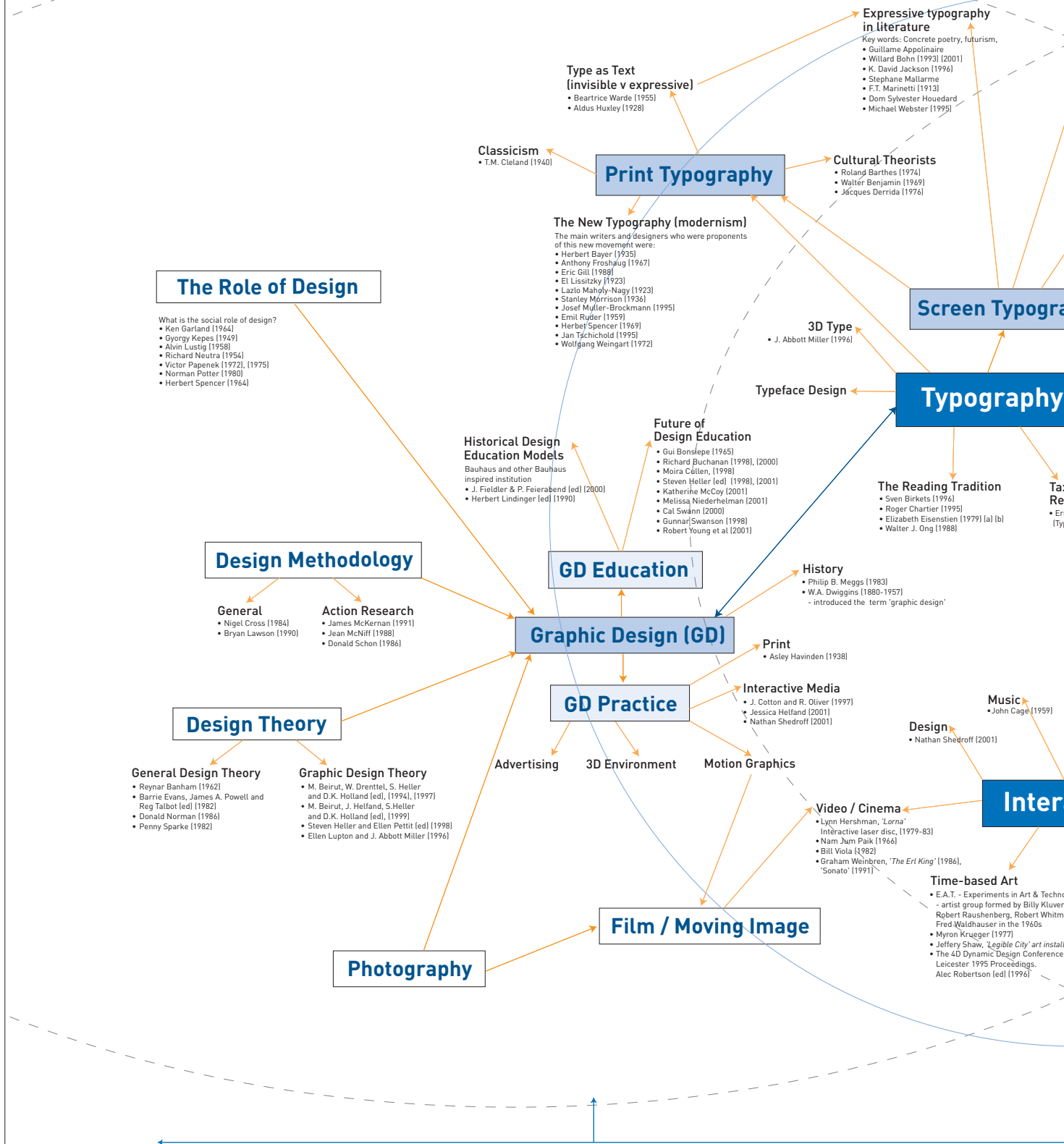
*(Friedman, 2001)*

## Subject of the Literature Search and Review

This literature search and review was conducted as part of a PhD research degree currently undertaken by the researcher. The primary aim of the research enquiry is to develop a practice-led framework for the application of typography in screen-based interactive media. Current theory and vocabulary utilised to describe typographic practice and scholarship are based on a historically print-derived framework. As a result, this research seeks to address the knowledge gap by conducting a cross-disciplinary enquiry. Its aim is to develop a critical practice-led framework designed to inform design practitioners and educators about the future application of typography in screen-based interactive media.

# DYNAMIC LITERATURE MAPPING: TYPOGRAPHY IN SCREEN

## VISUAL COMMUNICATION



PERIPHERAL AREA

SECONDARY FOCUS AREA

PRIMARY

©2003 Joyce S R Yee  
Centre for Design Research  
Northumbria University  
United Kingdom

This poster is a visual map representing a literature search on key theorists and thinkers for a PhD research study. The PhD research investigates the relevance of typography in the face of technological and social changes brought on by the digital revolution. Its primary aim is to develop a practice-led framework for the application of typography in screen-based interactive media.

Figure 1. Dynamic Literature Map: Typography in Screen-Based Media



## Flatlands – Visualising Knowledge

The idea of 'flatland' is based on the classic book by Edwin A. Abbott, entitled *Flatland: A Romance of Many Dimensions*. The narrator is A. Square, a four-sided polygon in a world of two-dimensional creatures (and thinking). Its inhabitants are geometric shapes that only see each other as lines of varied colour and light. They live in Flatland, where they think themselves as superior to their poor neighbours in Lineland who only have a point cross-section to deal with and can never get ahead of whoever is in front of them. All is orderly and unchanging until they get a visitor from the world of three-dimensionality, which challenges their fixed way of thinking and living.

According to Tufte, 'Escaping this flatland is the essential task of envisioning information – for all the interesting worlds (physical, biological, imaginary, human) that we seek to understand are inevitably and happily multivariate in nature.'  
(*Tufte, 1990: 12*)

Maps are essentially our attempts to escape flatlands. Any information that needs to be communicated must be translated from a multifaceted representation into a two-dimensional surface. Maps come in a variety of forms and sizes. We are probably most familiar with cartographic maps, which provide geographic information about a place. Maps are used to communicate a specific kind of information through the usage of symbols, text, models and graphics. At its most basic level, to map is to visualise and communicate a specific group of information. Maps are useful to emphasize spatial relatedness, classification and connection. Almost any groups of information can be mapped out. As MacEachren points out in his paper, *An evolving cognitive-semiotic approach to geographic visualization and knowledge construction* (2000), the role of mapping has evolved from being an information storage and communication device to a method for processing and analysing information. This perspective may have led to the increased application of mapping in other fields where a large body of information needs to be organised, analysed and communicated through other map users.

In the course of looking at alternate forms and usages of maps, the researcher discovered many variations. Some of the more commonly used maps are Concept Maps (Lawless and Smeed, 1998; Oughton and Reed, 2000), Knowledge Maps (Wexler, 2001), Content Maps (Kinchin and Hay, 2000), Idea Maps (Pritchard, 1997), Cognitive Maps (Eden, 1988; Langfield-Smith, 1992), Strategy Maps (Fletcher and Huff, 1990) and Mind Maps (Buzan and Buzan, 1997). These maps may have different functions, but essentially they are tools to facilitate the organisation of complex information and to visualise the representation of data in a manner understandable to other map users.

To start the mapping process, some form of information organisation is required. Organising information into sections and subsections will enable the mapmaker to construct connections between them. In the process of a literature review, a researcher will come across varied ideas and theories contained in different articles, books and published works over a given period of time (Hart, 1998). This provides a starting point for the researcher who will start constructing and deconstructing connections between the layers of information. Just as there are several layers of information to separate, there are also several layers of mapping to be constructed. In this study, the first step was to classify the literature into two principal topics.

## Structuring the Map

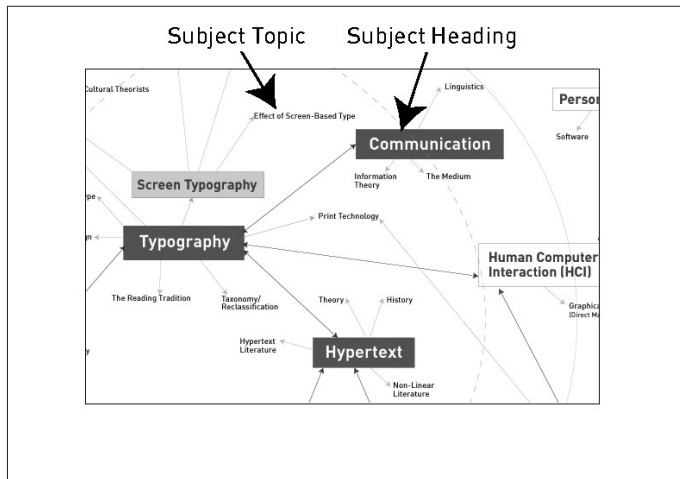
### Classification

Before the literature search was conducted, a topic list was compiled for the purpose of the search. The list began with the two principal topics: Typography and New Media. These two topics were obvious choices as they related directly to the topic of the research subject. However, as the nature of the research enquiry required a cross-disciplinary search, the map needed to present a wider representation of other disciplines. As a result, the literature map was divided into two general discipline areas. Definitions used for the purpose of this literature mapping are listed below.

*Visual Communication* as a design discipline referred to the usage of a single, or a combination of, any graphic, photographic, moving imagery or textual element for the purpose of communicating a message to an audience.

*New Media* referred to specific forms of digital and interactive technologies such as the Internet, Interactive television and CD-ROM medium.

Further classifications were added under each of the two principal topics. These were referred to as Subject Headings. However, this does not present the view that the Subject Headings were fixed in their categorisation. It only implies that the Subject Heading was influential in the development of knowledge and scholarship for that Topic. This list was not categorised based on any hierarchy, though the spatial placement of each Subject Heading illustrated their relative connection to each other. The further apart the Subject Headings were placed, the less related they were to each other when judged against the research subject.



**Figure 2**  
A close-up view indicating the Classification levels in the Literature Map.

Under each Subject Heading, Subject Topics were added (Figure 2). Each source was classified based on its core ideas, concepts and narrative focus. The darker and lighter shaded arrows indicated possible links between key ideas and concepts. The researcher utilised the map to visualise possible theoretical influence and connections between different Subject Topics. Each Subject Topic had been allocated different gradient colour background to indicate their level of relevance and importance to the research study. The level of relevance receded in relation to the colour tint. A secondary role of the map was to help frame the research boundary and to focus the literature search to only relevant key topics. However, by including peripheral Subject Topics in the map, it provided a much more holistic view of the research enquiry. This was crucial as the research subject was dealing with issues that straddled many different disciplines.

It must be stressed that the classification put forward in this map is neither fixed nor definitive. They are considered as sign posts to assist the mapmaker and the map user to navigate through mass amounts of ideas, concepts and methodologies encountered in the literature. For the purpose of clarity, selected definitions of the Subject Headings are listed in the 'Contributing Instructions' section at the end of this paper. It is not the intention of the researcher to review all literature references contained in the map. Instead, the researcher will focus on literature mapped in the 'Typography', 'Communication', 'Hypertext' and 'Interactivity' groups. While these areas are the core focus of the theoretical development in the research enquiry, understanding their relationship with other disciplines are an essential process to understand the current state of knowledge within the research field.



## **Joining the Dots – Creating Contextual Links**

As the literature search widens, the list of classification subjects expands and changes. Finding relationships between the ideas, concepts and methodologies allows the researcher to think analytically about the key ideas and to construct new knowledge structures in relation to the research subject. These links are indicated by the unidirectional and multidirectional arrows between Subject Headings with Subject Headings, and between Subject Headings with Subject Topics. However, these links have not been defined and include stylistic, methodological, argumentation, theoretical, influential, historical and beliefs connections.

## **Contributions to the Literature Map**

### **Facilitating a Discourse**

A key part to the development of the literature map is the contribution of fellow design researchers and practitioners. While the researcher has visualised the main structure and suggested contextual links in the map, participants are encouraged to add or suggest possible literature references and links. Two separate sessions were held by the researcher to facilitate contributions from fellow design researchers and practitioners. The first session was conducted at the Centre for Design Research, Northumbria University, where the research study is based.

A brief power-point presentation was given to explain the aim of the literature map and to provide a contextual understanding of the subjects and classification. Subject Headings and Topics used in the map were listed and introduced to the participants. The participants' design backgrounds were varied, ranging from Product Designers, Graphic Designers, Design Researchers to Medical Product Researchers. This collection of multi-disciplinary participants was ideal as it reflected the cross-disciplinary approach of the literature search. Each discipline has its own established structure of knowledge classification and interpretation. These differences has helped enrich the content of the map.

Basic instructions were given to the participants on how they can contribute to the map.

They were asked to:

1. Add any Literature which they think was missing from the map
2. Add, delete or reroute existing contextual connections inferred by the researcher on the map
3. Highlight 'hot' issues which have a higher relevance to the research study and should be given more emphasis by the researcher

Five copies of the literature map were posted around the presentation and seating area. The participants were asked to alter or add directly onto the map. Most participants took a few minutes to study the map in more detail before adding any comments to it. The participants' views and comments were recorded on these posters. These new references were then added formally to the map after the researcher has reflected on the relevance of the contribution to the research enquiry. Figures 3 and 4 are close-up examples of the commented posters collected during the first session.

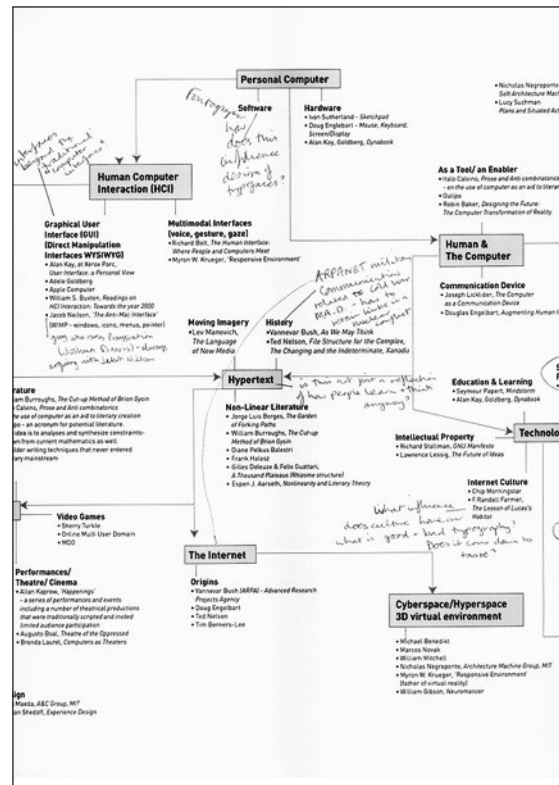
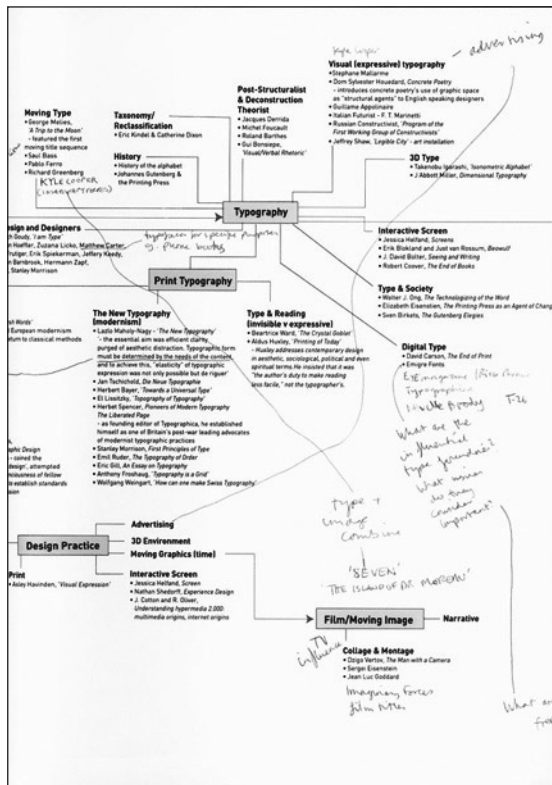


Figure 3 and 4

A close-up of the literature map with participants' comments and contributions

## As an Educational Tool

Following on from the first session held with design researchers and practitioners, a second session was held with second and third year Graphic Design students from Northumbria University. While there were interesting contributions from the students, the primary aim of this session was to introduce the richness of literature in a field traditionally deprived of quality and depth in its critical discourse. As Steven Heller writes, until fifteen years ago, Graphic Design has been seen but not heard. And when critical discourse did start in the 1950s and 1960s, it was usually only in the academic arena, used mostly as critical design textbooks. It was only at the start of the 1980s that the profession looked to other ideas rooted in semiology and deconstruction theories to influence the critical discourse in Graphic Design (Beirut ed. et al, 1997).

The usage of maps as an education tool or technique has been well researched and documented. For example, many teachers have accepted 'Mental Maps' or 'Ideas Maps' as a useful way to establish or clarify students' knowledge about a particular topic. (Pritchard, 1997). Pritchard mentions the idea of using maps to aid learning have been discussed in Novak and Govin's work (Novak and Govin, 1984) and also the work of Harry-Augstein et al. (Harry-Augstein, Smith and Thomas, 1982). The construction of the mental maps or ideas maps are dependent on the level of understanding and application of skills to classify and organise the text given to the students. Farrand, Hussain and Hennesy presented the usage of 'Mind Maps' as 'an effective study technique when used to improve factual recall from written material' (Farrand, Hussain and Hennesy, 2002: 427). Kinchin and Hay writes that the process of constructing and reconstructing knowledge using 'Concept Maps' will lead to meaningful learning (Kinchin and Hay, 2000). They go on to illustrate this point with a statement by Novak and Govin that 'students and teachers constructing concept maps often remark that they recognise new relationships and hence new meanings or, at least meanings they did not consciously hold before making the map (Novak and Govin, 1984:17).

Based on the positive and enthusiastic attitude shown by the students and the tutors of the course, the researcher feels that there is an opportunity to introduce key literature in the field of Graphic Design, Typography and New Media using this map as the main communicative device. It is an effective and powerful visual tool for students to investigate and form new links between cross-disciplinary subjects with their own design discipline.

## The Next Step

### Contributing Instructions

The second part of this paper aims to provide some basic guidelines for interested readers to participate in the further development of the literature map. Interested readers are advised to go through these steps to clarify how and what they can contribute to the growth and development of the literature map.

#### *Step 1*

Selected definitions of Subject Headings are listed in order of importance and relevance to the research project. It is recommended the participant read through them to reduce any ambiguity in way the classification has been set.

Typography:	The arrangement and appearance of type with a specific aim to communicate an implicit or explicit message to a reader.
Print Typography:	Relates specifically to typography produced for the medium of print and includes the aesthetic, philosophical and historical development of it.
Screen Typography:	Relates specifically to typography produced for the medium of screen and includes the aesthetic, philosophical and historical development of it.
Hypertext:	A term coined by Theodore H. Nelson in the 1960s. He defined it as 'non-sequential writing – text that branches and allows choices to the reader, best read at an interactive screen' (Nelson, 1981).
Interactivity:	A process of describing a continuous two-way transfer of information between two or more sources.
Communication:	Communication as a discipline involves studying the nature, processes and effects of human communicative interaction. This encompasses the study of both oral and symbol-based written communication.
Graphic Design:	As defined by the American Institute of Graphic Arts (AIGA) is the profession that plans and executes the design of visual communication according to the needs of audiences and in the context for which communication is intended.
Technology & Society:	The effects and role of technology in shaping all aspects of human society specifically human communication.

### *Step 2*

Take a few minutes to peruse through the map. In order to view the map online, you can access it at [www.cfid.co.uk/joyce/map.pdf](http://www.cfid.co.uk/joyce/map.pdf). Participants are encouraged to read through the general instructions below before contributing to the map.

- a. List down bibliographic references with corresponding Subject Heading or Titles from the map. If you disagree with the categorisation of subjects, and need to create a new Subject Heading or Title for your contribution, please indicate so in your response. The bibliographic reference should include the author's full name where possible and the title of the piece. If the date and publisher is known, please include those details as well.
- b. If you disagree with the placement of the existing literature links on the map, please indicate where you think it should be placed.
- c. If you disagree with the subject links suggested by the researcher, indicate where the new or alternate connections should be by listing down the two related subjects. In addition, indicate if the connections are unidirectional or multidirectional.

Send in your comments and contribution to the researcher at [joyce.yee@northumbria.ac.uk](mailto:joyce.yee@northumbria.ac.uk).

## **Discussion**

This poster and accompanying paper has provided a snapshot of the process and the result of the literature mapping conducted for a PhD research study. The development of the literature map has demonstrated an objective and subjective value. It remains an invaluable tool for the researcher to facilitate the understanding and construction of prior knowledge in the research enquiry. At the same time, it has provided an effective means of engaging participants to reveal their implicit knowledge and attitudes towards their own and other disciplines. Moving beyond the context of the research subject, the mapping process represents a valuable contribution to design research process methods as it helps contextualised and formulate the framework for practice-based enquiry.

While it is important to consolidate the comments and contributions of fellow design researchers and practitioners, it is vitally important that this process remains on-going and evolving. As the interpretation of the literature presented by the researcher is directly related to the research enquiry, the structures and relationships in it may change and shift in accordance to the development of the study. This evolutionary shift will continue to occur as the researcher develops a declarative, procedural and finally content knowledge of the research subject (Hart, 1998).

## Bibliography

- Buzan, T. and Buzan B. (1997) *The Mind Map Book*. London, BBC Books.
- Eden, C. (1988) 'Cognitive mapping'. *European Journal of Operational Research*, Vol 36, No.1. p.1-13.
- Farrand, P., Hussain, F. and Hennessy, E. (2002) 'The efficacy of the "mind map" strategy technique. *Medical Education*, 36. p.426-431.
- Fletcher, K.E. and Huff, A.S. (1990) 'Strategic argument mapping: a study of strategy reformulation at AT&T'. In Huss, A.S. (Ed.) *Mapping Strategic Thought*, Chichester, Wiley. p.165-194.
- Friedman, K. (2001) 'Literature and an original contribution to knowledge'. PHD-DESIGN@JISMAIL.AC.UK.
- Harri-Augstein, S., Smith, M., and Thomas, L. (1982) *Reading to learn*. London, Methuen.
- Hart, C. (1998) *Doing a Literature Review*. London, Sage Publications.
- Hellar, S. (1997) 'Introduction: a closer look at looking closer'. In Beirut, M., Drenttel, W., Heller, S. and Holland, DK. (Ed.) *Looking closer 2: critical writings on graphic design*. New York, Allworth Press.
- Kinchin, I.M. and Hay, D.B. (2000) 'How a qualitative approach to concept map analysis can be used to aid learning by illustrating patterns of conceptual development.' *Educational Research*, Vol. 42, No.1 Spring. p.43-57.
- Langfield-Smith, K. (1992) 'Exploring the need for a shared cognitive map'. *The Journal of management Studies*, Vol.20, No. 3. p.349-368.
- Lawless, C. and Smees, P. (1998) 'Using concept sorting and concept mapping in business, public administration and in education'. *Educational Research*, Vol. 40, No. 2. p.219-235.
- MacEachren, A.M. (2000) 'An evolving cognitive-semiotic approach to geographic visualization and knowledge construction'. *Information Design Journal*, 10(1), John Benjamins Publishing Company. p.26-36.
- Nelson, T.H. (1981) 'Literary Machines', Swarthmore, Pa.: self-published. p.0/2.
- Novak, J.D. and Govin, D.B. (1984) *Learning how to learn*. Cambridge, Cambridge University Press.
- Oughton, J.M. and Reed, W.M. (2000) 'The effect of hypermedia knowledge and learning style on student-centred concept maps about hypermedia'. *Journal of Research on Computing in Education*, Vol 32, No.3. p.366-384.
- Pritchard, A. (1997) 'The refinement of an "Ideas Map" as a means of assessment and of enhancing children's understanding of texts.' *Reading*, November 1997, London, Blackwell London. p.55-59.
- Tufte, E. R. (1990) *Envisioning Information*. Cheshire, Connecticut, Graphic Press.
- Wexler, M. N. (2001) 'The who, what and why of knowledge mapping'. *Journal of Knowledge Management*, Vol. 5, No. 3. p.249-263.

## APPENDIX 1

### BIBLIOGRAPHIC REFERENCES FEATURED IN THE LITERATURE MAP

- Aarseth, E. J. (1994) 'Nonlinearity and Literary Theory'. In G. Landow (Ed.) *Hyper/text/theory*. Baltimore, Johns Hopkins University Press. p.51-86.
- Aarseth, E. J. (1997) *Cybertext: Perspectives on ergodic literature*. Baltimore, Johns Hopkins University Press.
- Agre, P. and Rotenberg, M. (Ed.) (1987) *Technology and privacy: The New Landscape*. Cambridge, MIT Press.
- Baecker R. M. and Buxton, William A.S. (Ed.) (1987) *Readings in human-computer interaction*. San Mateo, CA, Morgan Kaufmann.
- Baker, R. (1993) *Designing the future: the computer transformation of reality*. London, Thames and Hudson.
- Banham, R. (1962) *Theory and design in the first machine age*. London, Architectural Press.
- Barthes, R. (1974) *S/Z*. Trans. Richard Miller. New York, Hill and Wang.
- Baudrillard, J. (1983) *Simulations*. Trans. Paul Foss, Paul Patton and Philip Beitchman. New York, Semiotext(e).
- Bayer, H. (1935) 'Towards a universal type' *PM*, 4(2), December-January 1939-1940.
- Beirut, M., Drenttel, W., Heller, S. and Holland, DK. (Ed.) (1994) *Looking closer 1: critical writings on graphic design*. New York, Allworth Press.
- Beirut, M., Drenttel, W., Heller, S. and Holland, DK. (Ed.) (1997) *Looking closer 2: critical writings on graphic design*. New York, Allworth Press.
- Beirut, M., Helfand, J., Heller, S. and Poynor, R. (Ed.) (1994) *Looking closer 3: classic writings on graphic design*. New York, Allworth Press.
- Bellantoni, J., and Woolman, M. (1999) *Type in motion: innovations in digital graphics*. London, Thames and Hudson.
- Benedikt, M. (1991) 'Cyberspace: some proposals'. In M. Benedikt (Ed.) *Cyberspace: first steps*. Cambridge, MIT Press. p.119-224.
- Benjamin, W. (1969) 'The work of art in the age of mechanical reproduction.' In H. Arendt (Ed.) *Illuminations*. Trans. Harry Zohn. New York, Schocken. p.217-252.
- Berners-Lee, T. and Fishetti, M. (1999) *Weaving the web: the original design and ultimate destiny of the world wide web, by its inventor*. Harper San Francisco.
- Birkets, S. (1996) *The gutenbergeglegies: the fate of reading in an electronic age*. London, Faber and Faber.
- Blokland, E. and Van Rossum, J. (1989) *Beowulf* [Typeface] Available from <http://www.lettererror.com/foundry/beowulf/index.html>. (Accessed 28th of January 2003)
- Boal, A. (1985) *Theatre of the oppressed*. Trans. Charles A. and Maria-Odilia Leal McBride, New York, Theatre Communications Group.
- Bohn, W. (1993) *Apollinaire, visual poetry and art criticism*. Lewisburg, Bucknell University Press.
- Bohn, W. (2001) *Modern visual poetry*. Newark, University of Delaware Press; London, Associated University Presses.
- Bolt, R. (1980) 'Put that there: Voice and gesture at the graphics interface.' *Computer Graphics* 4(3), July 1980. p.262-270.
- Bolt, R. (1984) *The human interface: where people and computers meet*. Belmont, Calif.; London, Lifetime Learning.

- Bolter, J. D. (2001) *Writing space: computers, hypertext and the remediation of Print*. (2nd Ed.) Mahwah, New Jersey, Lawrence Erlbaum Associates.
- Bolter, J. D. and Grusin, R. (1999) *Remediation*. Cambridge, Massachusetts, MIT Press.
- Bonsiepe, G. (1965) 'Education for visual design.' *Ulm* no. 13/14, March 1965.
- Borges, J.L. (1941) 'The garden of the forking paths.' In D. A. Yates and J. E. Irby, (Ed.) *Labrinths: selected stories and other writings*, Trans. D. A. Yates. New York, New Directions, p.19-29.
- Buchanan, R. (1998) 'Education and professional practice in design.' *Design Issues*, 14 (2) Summer 1998, p.63-66.
- Buchanan, R. (2000) 'The problem of character in design education: liberal education and professional specialization.' In *Reinventing design education in the University*, Perth, Australia, 11-13 December 2000.
- Burroughs, W. (1978) 'The cut-up method of Brion Gysin.' In *The Third Mind*, New York, Viking. p.29-33.
- Bush, V. (1945) 'As we may think.' *The Atlantic Monthly*, 176(1). p.101-108.
- Cage, J. (1959) *Indeterminacy: new aspect of form in instrumental and electronic music*. Reading by John Cage: Music by David Tudor [12inch record]. New York, Folkways Records.
- Calvino, I. (1981)(a) *If on a winter's night a traveller*. Trans. W. Weaver. New York. Harcourt Brace Jovanovich.
- Calvino, I. (1981)(b) *Prose and anti-combinatorics*. Motte, 1986, Paris, Gallimard. p.143-152.
- Calvino, I. (1986) 'Cybernetics and ghosts.' In *The uses of literature*, New York, Grove Press. p.3-27.
- Calvino, I. (1995) 'The burning of the abominable house'. In *Numbers in the Dark*, Trans. Tim Parks, New York, Grove Press. p.176-189.
- Chartier, R. (1995) *Forms and meanings*. Pennsylvania, University of Pennsylvania Press.
- Chomsky, N. (1968) *Language and mind*. New York, Harcourt, Brace & World.
- Chomsky, N. (1975) *Reflections on language*. New York, Pantheon Books.
- Cleland, T.M. (1940) 'Harsh Word'. In M. Beirut et al (Ed.) *Looking closer 3: classic writings on graphic design*. New York, Allworth Press.
- Coover, R. (1992) 'The end of books.' *The New York Times Book Review*, 21 June 1992, 11, p.23-25.
- Cotton, J., and Oliver, R. (1997) *Understanding hypermedia 2.000: multimedia origins, internet origins*. London, Phaidon Press.
- Crawford, D. (Ed.) (1999) *Intellectual property in the age of universal access*. New York, ACM Press.
- Cross, N. (Ed.) (1984) *Developments in design methodology*. Chichester, Wiley.
- Crystal, D. (1987) *The cambridge encyclopedia of language*. Cambridge, Cambridge University Press.
- Cullen, M. (1998) 'Future Te<a>ch.' In S. Heller, (Ed.) *The education of a graphic designer*, New York, Allworth Press.
- De Landa, M. (1991) *War in the age of intelligent machines*. New York, Zone Books.
- Deleuze, G. and Guattari, F. (1987). 'Introduction: Rhizome'. In *A thousand plateaus: capitalism and schizoprenia part II*, Trans. B. Massumi. Minneapolis, University of Minnesota Press, p.3-7.
- Derrida, J. (1976) *Of Grammatology*. Trans. G. C. Spivak. Baltimore, Johns Hopkins University Press.



- E.A.T. (1966) *9 Evenings: Theatre and Engineering*. Program.
- Eisenstein, E. L. (1979)(a) *The printing press as an agent of change: communications and cultural transitions, Vol.1*. Cambridge, Cambridge University Press.
- Eisenstein, E. L. (1979)(b) *The printing press as an agent of change: communications and cultural transitions, Vol.2*. Cambridge, Cambridge University Press.
- Engelbart, D. (1962) *Augmenting human intellect: a conceptual framework*. Summary report AF0SR-3223 under Contract AF 49, SRI Project 3578 for Air Force Office of Scientific Research, Menlo Park, California, Stanford Research Institute. p.638-1024.
- Evans, B., Powell, J. and Talbot, R. (1982) *Changing design*. Chichester, Wiley.
- Fiedler, J. and Feierabend, P. (Ed.), (2000) *Bauhaus*. Koln, Konemann.
- Fiske, J. (1987) *Television culture*. London, Routledge.
- Froshaug, A. (1967) 'Typography is a grid'. *Designer*, no 167: January 1967.
- Garland, K. (1964) 'First things first' In M. Beirut et al (Ed.) *Looking closer 3: classic writings on graphic design*. New York, Allworth Press. p.154-155.
- Gentner, D. and Nielsen, J. (1996) 'The anti-mac interface'. *Communications of the ACM* 39, no.8, April, p.70-82.
- Gibson, W. (1986) *Neuromancer*. London: Grafton.
- Gill, E. (1988) *An Essay on Typography*. (A facsimile reissue of the 1936 ed.), London, Lund Humphries.
- Goffman, E. (1959) *The presentation of self in everyday life*. New York, Doubleday.
- Goldberg, A. and Kay, A. (1977) 'Personal dynamic media'. *Computer* 10 (3), March 1977, p.31-41.
- Goldberg, A. (Ed.) (1988) *A history of personal workstations*. New York, ACM Press History Series.
- Haraway, Donna J. (1991) *Simians, cyborgs and women: the reinvention of nature*. London, Free Association Books.
- Hayles, N. K. (1994). 'Boundary disputes: homeostasis, reflexivity, and the foundations of cybernetics'. *Configurations* 2, p.441-467.
- Heidegger, M. (1977) *The question concerning technology and other essays*. Trans. W. Lovitt. New York, Harper and Row.
- Helfand, J. (2001) *Screen*. New York, Princeton Architectural Press.
- Heller, S. (Ed.) (1998) *The education of a graphic designer*. New York, Allworth Press.
- Heller, S. (Ed.) (2001) *The education of an e-designer*. New York, Allworth Press.
- Heller, S. and Petit, E. (Ed.) (1998) *Design dialogues*. New York, Allworth Press.
- Hershman, L. (1979-83). *Lorna* [online]. Available from [http:// www. lynnherhshman.com/ investigations/voyerism/lorna/lorna.html](http://www.lynnhershman.com/investigations/voyerism/lorna/lorna.html) (Accessed 26 January 2003).
- Hershman, L. (1990) 'The fantasy beyond'. In *Illuminating video: an essential guide to video art*. New York: Aperture/BAVC. p.267-273.
- Huxley, A. (1928) *Introduction, printing of to-day: An illustrated survey of post-war typography in Europe and the United States*, London: Peter Davies Limited/Harper and Brothers.
- Jackson, K. David, Vos, E. and Drucker, J. (Ed.) (1996) *Experimental, visual, concrete: avant-garde poetry since the 1960s*. Amsterdam; Atlanta, Ga., Rodopi.
- Joyce. M. (1987) *Afternoon, a story*. [CD-ROM] Eastgate Systems.
- Kaprow, A. (1961) 'Happenings in the New York scene'. *Art News* 60(3), p.36-39, p.58-62.
- Kaprow, A. (1966) *Assemblage, environments and happenings*. New York, Harry N. Abrams.

- Kay, A. (1990) 'User interface: a personal view'. In B. Laurel (Ed.) *The Art of Computer Interface Design*, 1995. Reading, Mass., Addison-Wesley, p.191-207.
- Kepes, G. (1949) 'Function in modern design'. In *Graphic Forms: The Arts as Related to the Book*, Cambridge, Mass., Harvard University Press.
- Kernan, Alvin B. (1987) *Printing technology, letters & Samuel Johnson*. Princeton; Guildford, Princeton University Press.
- Kinder, E. (Ed.) *Typeform dialogues: a comparative survey of typeform history and description*, compiled at Central Saint Martins College of Art & Design, London, Hyphen Press. (to be published)
- Kluver, B. (1968) 'The garden party'. In *The machine as seen at the end of the mechanical age*. New York, Museum of Modern Art. p.168-171.
- Kluver, B. (1972) 'The pavilion'. In B. Kluver, J. Martin and B. Rose (Ed.) *Pavillion*. New York, Dutton.
- Kruger, M. (1977) 'Responsive environments'. *AFIPS 46 National computer conference proceedings*. Montvale, N.J., AFIPS Press, p.423-433.
- Kurzweil, R. (1990) *The age of intelligent machines*. Cambridge, Mass.; London, MIT Press.
- Landow, G.P. (Ed.) (1994) *Hype/text/theory*. Baltimore, Johns Hopkins University Press.
- Landow, G.P. (1992) *Hypertext: the convergence of contemporary critical theory and technology*. Baltimore, Johns Hopkins University Press.
- Laurel, B. (Ed.) (1990) *The art of human-computer interface design*. Reading, Mass.; Wokingham, Addison-Wesley.
- Laurel, B. (1993) *Computers as theatre*. Reading, Mass.; Wokingham, Addison-Wesley.
- Lawson, B. (1990) *How designers think: the design process demystified* (2nd Edition). Oxford, Butterworth Architecture.
- Lessig, L. (2001) *The future of ideas*. New York, Random House.
- Licklider, J.C.R. and Taylor R.W. (1968) 'The computer as a communication device'. *Science and Technology*, April. Reprinted in Digital SRC Research Report 61, 7 August 1990. Available from <http://gatekeeper.dec.com/pub/DEC/SRC/research-reports/abstracts/src-rr-061.html>.
- Lindinger, H. (Ed.) (1990) *Ulm Design: The morality of objects: Hochschule für Gestaltung Ulm 1953-1962*. Berlin, Ernst & Sohn.
- Lissitzky, E. (1923) 'Topography of typography', *Merz*, no.4, July 1923, Hannover.
- Lupton, E. and Miller, J. Abbott (1996) *Design writing research: Writing on graphic design*. New York, Kiosk.
- Lustig, A. (1958) *The collected writings of Alvin Lustig*. New Haven, CT, Holland R, Melson, Jr.
- Maholy-Nagy, L. (1923) 'The new typography'. Staatliches Bauhaus in Weimer, 1919-1923, Munich.
- Magnus Enzensberger, H. (1974) 'Constituents of a Theory of the Media'. In *The Consciousness Industry*. Trans. Stuart Hood. New York, Seabury Press.
- Manovich, L. (2001) *The language of new media*. Massachusetts, MIT Press.
- Marinetti, F.T. (1913) 'Destruction of syntax-imagination without strings-words-freedom'. Lacerba, 15 June, Florence, P. Lang.
- McCoy, K. (2001) 'Recent directions in graphic design education'. In S.Heller (Ed.) *The education of an e-designer*. New York, Allworth Press.
- McKernan, J. A. (1991) *Curriculum action research: a handbook of methods and resources for the reflective practitioner*. London, Kogan Page.
- McLuhan, M. (1962) *The gutenbergalaxy: the making of typographic man*. London, Routledge & Kegan Paul.

- McLuhan, M. (1964) *Understanding media: the extensions of man*. London, Routledge & Kegan Paul.
- McLuhan, M. and Fiore, Q. (1967) *The medium is the message*. New York, Random House.
- McNiff, J. (1988) *Action research: principles and practice*. Basingstoke, Macmillan Education.
- Meggs, P. B. (1983) *A history of graphic design*. London, Allen Lane.
- Miller, J. Abbott (1996) *Dimensional typography: case studies on the shape of letters in virtual environments*. Princeton, Princeton Architectural Press.
- Mitchell, W. (1995) *City of Bits: Space, Place, and the Infobahn*. Cambridge, MIT Press.
- Morningstar, C. and Farmer, F.R. (1991) 'The lessons of lucasfilm's habitat'. In Michael Benedikt, (Ed.) *Cyberspace: First steps*. Cambridge, MIT Press.
- Morrison, S. (1936) *First principles of typography*. New York, The Macmillan Company.
- Moulthrop, S. (1995) *Victory garden*. [CD-ROM] Eastgate Systems.
- Muller-Brockmann, J. (Ed.) (1995) *Josef Muller-Brockmann: designer: a pioneer of Swiss graphic design*. Baden, Switzerland, Verlag Lars Muller.
- Nam, J.P. (1966) 'Cyberneted Art'. *Manifestos, Great Bear Pamphlets*. New York, Something Else Press. p.24.
- Negroponte, N. (1970) *The architecture machine*. Cambridge, MIT Press.
- Negroponte, N. (1995) *Being digital*. New York, Hodder Stoughton.
- Nelson, T. (1965) 'A file structure for the complex, the changing and the indeterminate'. In Lewis Winner, (Ed.) *Association for Computing Machinery: Proceedings of the 20th National Conference*, p.84-100.
- Neutra, R. (1954) *Survival through design*. Oxford, Oxford University Press.
- Niederhelman, M. (2001). 'Interactivity is not an elective'. In S. Heller (Ed.) *The education of an e-designer*. New York, Allworth Press.
- Nielsen, J. (2000) *Designing web usability*. Indianapolis, Ind., New Riders.
- Norman, D.A. (1986) *The psychology of everyday things*. New York, Basic Books.
- Novak, M. (1991) 'Liquid architectures in cyberspace. In M. Benedikt (Ed.) *Cyberspace: first steps*. Cambridge, MIT Press. p.225-254.
- Ong, W. J. (1988) *Orality and literacy: The technologizing of the word*. London, Routledge.
- Papanek, V. (1972) *Design for the real world*. London, Thames and Hudson.
- Papanek, V. (1975) 'Edugraphology – The myth of design and the design of myths' *Icographic*, no.9, Croydon, England.
- Papert, S. (1980) 'Computers and computer cultures'. In *Mindstorms*. New York, Basic Books, p.19-37.
- Papert, S. (1993) *The children's machine: rethinking school in the age of the computer*. New York, Basic Books.
- Papert, S. (1996) *The connected family: bridging the digital generation gap*. Atlanta, Longfellow Press.
- Perec, G. (1980) *Life a user's manual*. Trans. David Bellos. Boston, David Godine.
- Pinker, S. (1994) *The language instinct*. New York, W. Morrow and Co.
- Porter, D. (1997) *Internet Culture*. New York, Routledge.
- Potter, N. (1980) *What is a designer: things, places, messages* (Rev. and extended). Reading, Berkshire, Hyphen.
- Queneau, R. (1961) 'One hundred thousand million poems'. In H. Mathews and A. Brotchie (Ed.) *Oulipo Compendium*, Trans. Stanley Chapman. London, Atlas Press, 1988, p.15-33.
- Queneau, R. (1973) 'Story as you like it'. *Motte*, Paris, Gallimard, 1986, p.32-39.

- Robertson, A. (Ed.) (1996) *4D Dynamics Conference Proceedings*, revised edition. Leicester, DeMontfort University.
- Ruder, E. (1959) 'The typography of order'. *Graphis* 85, September/October, Zurich.
- Saporta, M. (1962) *Composition no. 1*. Roman. [A series of loose leaves, to be read in any order.] Paris.
- Saussure, F. D. (1960) *Course in general linguistics* (3rd Ed.) C. Bally and A. Sechehaye in collaboration with A. Reidlinger (Ed.), Trans. Wade Baskin. New York, McGraw-Hill.
- Schon, D. A. (1986) *Educating the reflective practitioner: toward a new design for teaching and learning in the professions*. San Francisco, California, Jossey-Bass.
- Shaw, J. (1990) *Legible City* [Interactive Art Installation]. Available from [http://www.jeffrey-shaw.net/html\\_main/show\\_work.php3?record\\_id=83](http://www.jeffrey-shaw.net/html_main/show_work.php3?record_id=83). (Accessed 26 January 2003).
- Shedroff, N. (2001) *Experience design 1*, Indianapolis, Ind., New Riders.
- Shneiderman, B. (1983) 'Direct Manipulation: a step beyond programming languages'. *IEEE, Computer* 16 (8), p.57-69.
- Simon, H. A. (1968) *The sciences of the artificial*. Cambridge (Mass.); London, M.I.T. Press.
- Sparke, P. (1982) *An introduction to design and culture in the twentieth century*. London, Allen & Unwin.
- Spencer, H. (1964) 'The responsibilities of the design profession'. *Penrose Annual* 57, London.
- Spencer, H. (1969) *Pioneers of modern typography*. London, Lund Humphries.
- Stallman, R. (1985) 'The GNU manifesto'. *Dr. Dobbs' Journal*, 10(3):30, March 1985.
- Stallman, R. (1999) 'The GNU operating system and the free software movement'. In C. DiBona, S. Ockman, and M. Stone (Ed.) *Open sources: voices from the open source revolution*. Sebastopol, Calif., O'Reilly & Associates.
- Sterne, L. (1873) *The life and opinions of Tristram Shandy*, vol 1. London, Navarre Society Ltd.
- Suchman, Lucy A. (1987) *Plans and situated actions: the problem of human-machine communication*. Cambridge, Cambridge University Press.
- Sutherland, I.E. (1963) 'Sketchpad: a man-machine graphical communication system'. In *American Federation of Information Processing Societies (AFIPS) Conference Proceedings 23*, Spring Joint Computer Conference, p.229-246.
- Swann, C. (2000) 'Meanwhile, back on the ranch...' In *Foundations for the future, doctoral education in design*, La Clusaz, France, 8-12 July.
- Swanson, G. (1998) 'Graphic design education as a liberal art: design and knowledge in the university and the "Real World"'. In S. Heller (Ed.) *The education of a graphic designer*. New York, Allworth Press.
- Thimbleby, H. (1990) *User interface design*. New York: ACM; Wokingham, Addison-Wesley.
- Toffler, A. (1970) *Future shock*. New York, Random House.
- Tschichold, J. (1995) *The new typography: a handbook for modern designers*. Trans. Ruari McClean. Berkeley, University of California Press.
- Turing, A. (1950) 'Computing machinery and intelligence'. *Mind: a quarterly review of psychology and philosophy*, 59(236), October. p.433-460.
- Turkle, S. (1984) (a) 'Video games and computer holding power'. In *The second self: computers and the human spirit*, London, Granada. p.64-92.
- Turkle, S. (1984) (b) *The second self: computers and the human spirit*. London, Granada.
- Turkle, S. (1995) *Life on the screen: Identity in the age of the internet*. New York, Simon & Schuster.
- Viola, B. (1982) 'Will there be condominiums in data space?' In Robert Violette (Ed.) *Reasons for Knocking at an Empty House*. 1995. Cambridge, MIT Press. p.121-135.
- Virilio, P. (1997) *Open sky*. Trans. Julie Rose, London, Verso.

- Virilio, P. (2000) *The information bomb*. Trans. Chris Turner, London, Verso.
- Warde, B. (1955) *The crystal goblet: sixteen essays on typography*. H. Jacob (Ed.) London, Sylvan Press.
- Webster, M. (1995) 'Reading visual poetry after futurism: Marinetti, Apollinaire, Schwitters, Cummings'. *New Foundations*, vol.4, New York, P. Lang.
- Weinbren, G. (1991) *Sonata* [online]. Available from <http://www.hyperbole.com/lumiere/sonata.html> (Accessed 26 January 2003).
- Whorf, B. L. (1967) *Language, thought, and reality: selected writings of Benjamin Lee Whorf*. John B. Carroll (Ed.), Cambridge, Mass., The M.I.T. Press.
- Wiener, N. (1948) *Cybernetics: or control and communication in the animal and the machine*. New York, John Wiley & Sons.
- Wiener, N. (1950) *The human use of human beings: cybernetics and society*. London, Eyre and Spottiswoode.
- Williams, R. (1972) *Television: technology and cultural form*. London, Fontana.
- Winner, L. (1986) *The whale and the reactor: a search for limits in an age of high technology*. Chicago, University of Chicago.
- Wolfgang, W. (1972) 'How can one make swiss typography?' reprinted in *Octavo*, no.4, London 1987.
- Young, R., Cooper, A. and Blair, S. (2001) 'Redesigning design education, the next Bauhaus?' In *ICSID Educational Seminar*, Seongnam, South Korea, 5-7 October 2001.