



Seven theories for ID

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theory, design, information

Information design has practical as well as theoretical components. It is a “combined academic discipline.” Here the whole is greater than the parts. So far information design has incorporated facts, influences, methods, practices, principles, processes, strategies, and tools from many other fields. However, we also need to borrow and incorporate theoretical approaches from already existing theories. This essay presents seven theories applied to information design.

1 Introduction

There are many definitions and descriptions of information design (ID). In my own work I have used the following definition (Pettersson, 1998): “In order to satisfy the information needs of the intended receivers, information design comprises analysis, planning, presentation and understanding of a message—its content, language and form. Regardless of the selected medium, a well-designed information material will satisfy aesthetic, economic, ergonomic, as well as subject matter requirements.”

Information design has borrowed and received contributions from a large number of established disciplines and professions. Such *contributing disciplines* have been sorted in the following six groups of *base disciplines*: 1) art and aesthetic disciplines, 2) cognitive disciplines, 3) communication disciplines, 4) design disciplines, 5) information disciplines, and 6) language disciplines. Contributions to information design may be facts, influences, methods, practices, principles, processes, strategies, theoretical approaches, and tools.

This model shows how information design (centre) receives contributions from a large number of established disciplines and professions. The received contributions may be facts, influences, methods, practices, principles, processes, strategies, theoretical approaches, and tools.

I have previously presented seven information design theories in the *Journal of Visual Literacy* (Pettersson, 2014). This paper is a summary of that essay. The seven information design theories consist of one *internal theory* and six *external theories*. The internal theory, called *infology theory*, is based on research within information design. The six external theories are based on research within the six groups of base disciplines, and applied to information design.

The six external theories are called 1) aesthetics theory for ID, 2) facilitating theory for ID, 3) communication theory for ID, 4) providing theory for ID, 5) information theory for ID, and 6) language theory for ID. There is no specific theoretical order between the base disciplines or between the external information design theories.

A traditional academic discipline, or *field of study*, is a branch of theoretical knowledge that are researched and taught in higher education. A limited part within a field of study is a sub-branch, or a sub-discipline. Today several academic disciplines may be defined as *fields of knowledge*. A field of knowledge is the sum of combined knowledge gained from practice and from theory. A limited part within a field of knowledge is an *area of knowledge*.

The boundaries of an academic discipline mark what falls *within* its breadth, and also what it *excludes*. Academic disciplines are often defined and recognized by university departments and faculties, by learned societies, and by academic journals. The criteria for the status as an academic discipline differ between universities, even within a single country. Academic disciplines usually have several parts. However, the distinguishing lines between these parts may be both ambiguous and arbitrary. Furthermore a discipline may “belong to” different faculties at different universities.

In this context a *fact* is seen as something known to be true, by experience or by observation. *Hypotheses* are propositions accepted as highly probable in the light of agreed and established facts. A *postulate* is something fundamental that is assumed without proof as a basis for theoretical reasoning. A *theory* is an integrated set of statements (hypotheses) about underlying mechanisms or principles that not only organizes and explains known facts, but also makes predictions about forthcoming information and news (Palmer, 1999, p. 46).

Information design is a young academic discipline, but it is not at all a new field of knowledge. It was not “divided away” from another discipline. Rather it was deliberately “put together” with elements from several different sources of experience and knowledge. Basically this happened in the late 1990s in different parts of the world. I was responsible for this activity at Mälardalen University in Sweden, where information design got the status as an academic discipline 1999-02-15. The same year I became the first professor of information design in Sweden.

This model shows how a new application (1) may develop between information design (ID) and an existing discipline or profession, and also within (2) another discipline or profession. In addition new applications may develop within information design.

Today information design education range from short courses to several years long programs, some even reaching PhD-level. The discipline is also named *communication design*, *document design*, and *presentation design*. In the future it is quite possible that some universities will introduce very similar design subjects and choose to use other names.

2 Infology Theory

The *infology theory* is based on research within information design (Pettersson, 2014). It includes, but is not limited to, the following four fields of knowledge: 1) combined disciplines, 2) infology, 3) infography, and 4) infodidactics.

Combined Disciplines

Traditionally *science* is seen as a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe (Wilson, 1998). In *applied science* people apply basic existing scientific knowledge to develop practical applications. An example of this is engineering and developing of technology. We may view an applied science, as a “combined discipline,” as a “practical theory,” or as a “theoretical practice.” Information design is complementary to information technology in the same way as architecture is complementary to “building technology” and engineering is complementary to technology. Also dance, design, economics, education, fine arts, journalism, medicine, music and theatre, are examples of areas and disciplines that have a practical as well as a theoretical part.

Combined disciplines are complex areas to research and study. It is obvious that information design as an academic discipline needs to incorporate theoretical contributions from other disciplines. Adding a theoretical view to the practice of design is to reflect on the aims, methods and the results of this practice. In order to make qualified reflections regarding practice and theory we need concepts both to structure our thoughts, and to describe them verbally (Nordegren, 2004, p. 23-24). When studying a *combined discipline* it is important for the students involved to work with realistic and true problems, and problem-oriented learning methods.

Yin and yang, or yin-yang, is a concept used in old Chinese philosophy to describe how some seemingly opposite forces are interconnected and interdependent, and how they give rise to each other. We think of many natural dualities, such as life–death and light–dark, as physical manifestations of these concepts. Yin and yang can also be seen as complementary forces interacting to form a *dynamic system* in which *the whole is greater than the parts*. In my view the combination *theory–practice* is such an example in information design.

This model shows the relationships between infology (theory), infography (practice), and infodidactics (teaching), that is embracing infology and infography.

Infology

As an academic discipline, information design rests on a *foundation*, which can be expressed by the following four *basic statements*: 1) ID is inter-disciplinary and multi-disciplinary. 2) ID is multi-dimensional. 3) Theory and practice co-operate in ID. 4) There are no firm rules in ID. In my opinion these four basic statements are more than postulates and theories. These statements represent facts that are already established and recognised by people who are working within information design all around the world.

The theoretical part of information design, as well as message design, is called *infology*. It has been defined as the “science of verbal and visual presentation and interpretation of messages” (Pettersson, 1989, p. x). On the basis of man’s prerequisites, infology encompasses studies of the way a combined verbal and visual representation should be designed in order to achieve optimum communication between a sender and a group of intended receivers. Infology contains both theoretical (descriptive) elements, as well as normative (prescriptive) elements.

Complicated language, in both texts and pictures, will impair the understanding of the message. Thus producers of information and learning materials can facilitate communication, and the learning processes of the intended receivers. Information sets providing the wrong information may actually give a *negative result*, and the receiver may end up less competent than before (Pettersson, 2002, p. 53). Shedroff (1999, p. 269) pointed out that *understanding* is a continuum that leads from data, through information to knowledge, and ultimately to wisdom.

Any graphic message should be legible, readable, and well worth reading for the intended audience and any audio message should be audible, distinct, and well worth listening to. Every information designer needs to have theoretical knowledge as well as practical skills related to the discipline.

Infography

The practical part of information design is called *infography* (Pettersson, 1989, p. 206). It includes all the intellectual and practical work and skills needed for design of messages. The *information designer* is a person with competence to transform data into high-quality information. The information designer has to identify the communication and information problems and create plans, with schemes and specifications, to solve the problems.

An information designer often works as a project manager. The task is often to coordinate production of words, visuals and graphic design, but sometimes also the use of light, sound, space and time, for the presentation of messages in different media. The task of designing complete information materials may often be far too overwhelming for one single individual. For that reason a team of people, with skills in different areas, are often working close together. According to Schriver (2011) professional information designers possess *tacit knowledge* about genres, processes, stakeholders, symbols, and tools.

Waller (1995) discussed the mutual incomprehension among designers and psychologists (p. 6): "Designers are frequently appalled by the poor standard of stimulus material used by psychologists, while psychologists are frustrated by designers' lack of a theoretical framework, their lack of evidence, and their apparent unwillingness or inability to articulate their processes." Later Waller concluded (p. 9): "What underlies this apparent incompatibility of psychology and design is a fundamental difference in the kind of knowledge they employ. Scientists are committed to building explicit knowledge that is public and accountable. Designers are committed to building tacit knowledge that is private and unarticulated. Explicit knowledge is taught by explaining. Tacit knowledge is taught by showing, and learned by doing."

The creative processes are influenced and supported by *message design principles*, and are performed with *message design tools* suitable for the type of representation that has been selected to solve a specific problem. Message design principles can be seen as a set of guidelines for design and development of a verbal/visual message. Main creative processes for a verbal/visual message include the following four activities: 1) analysis and synopsis, 2) production of draft, 3) production of script, and 4) production of original and master (Pettersson, 2002, p. 32). Each activity includes a review process. When the production is finished the final product may be evaluated.

Information ethics is one of the *administrative principles* in information design. According to this principle the information designer *must respect copyright* as well as other laws and regulations that are related to design, production, storage, distribution, and use of information materials. This concerns the use of artwork, illustrations, logos, lyrics, music, photographs, specific sounds, symbols, text, and trademarks. It is also very important to respect different ethical rules, media-specific ethical guidelines, and honour all business agreements.

The ethical rules for the press, radio and TV clearly take exception to any falsification and manipulation of picture contents through digital modifications and montages, or through misleading captions. *Image manipulation* implies the improper control of people's perception of a given reality through the use of visuals. Normally we are allowed to crop an original picture, as well as enlarge and reduce its size. Obviously the information designer can use modern computers and graphics processing programs to create, and edit her or his own drawings, photographs as well as moving pictures on film and video. In order to convey high-quality information to the user the information designer sometimes will have to suggest modifications, and ask the original authors, draftsmen, and photographers for permission to make changes in

their original works. In many cases the information designer may also be a stakeholder as far as copyright is concerned. The information designer should never engage in any falsification, unethical, or illegal manipulation of contents.

Infodidactics

The special methods that are used for education and for teaching the various aspects of information design are called *infodidactics* (Pettersson, 1998, p. 7). The huge spread among the different disciplines makes information design an interesting, but also a complex area of research, study and teaching. Understanding is the goal of all scientific enterprise. When we understand a subject matter we are able to explain phenomena and predict new phenomena.

Although information design theories frequently refer to descriptive theory and propositions, their main function is to guide the information designers in how to actually design, present and produce information sets. Information design students have to learn how to actually design, present and produce information sets that work for the intended audiences. Students need realistic experience with true problems, regular information providers, actual information sets, real information interpreters, and experience with budgets and time limits. Information design students also need to work with theoretical assignments.

In an international project, coordinated by the International Institute for Information Design, information design faculty defined essential competencies for an information designer. According to this group professional information designers need to know methods and theories, which govern the design and interpretation of information, and all relevant facts and tools for qualified professional activities in the discipline (idX, 2007, p. 6). These “core competencies” include properties, that constitute effective information, facts, tools and the skills needed for the structuring, rendering and applying of information, capabilities of information and communication technologies, related insights gained through research done in cognitive and social sciences, existing conventions and applicable legislation and standards, implications of business management, and the social demands underlying successful professional practice.

3 Aesthetics Theory for ID

The group *art and aesthetic disciplines* includes fields such as aesthetics, architecture, art history, computer graphics, film, fine art, iconography, iconology, illustration, music, painting, photography, and sculpture. At present the *aesthetics theory for ID* includes, but is not limited to, the following four fields of knowledge: 1) aesthetic proportion principle, 2) beauty theories, 3) harmony principle, and 4) colour theories.

Art is valued for its originality and expressiveness. Focus is on individual artefacts crafted through the manual and aesthetic virtuosity of the artist. Design, in contrast, is valued for its fitness to a particular user and to a particular task (Mullet & Sano, 1995, p. 8). Of course many designers want to provide aesthetic experiences where possible, but the design aesthetic is always related to the intended function of the information products intended for widespread distribution and use.

The *aesthetic proportion principle* is one of the two aesthetic principles in information design (Pettersson, 2010). It is very much a subjective concept and related to the appropriate and pleasing relations between elements in information and learning materials. According to Lidwell et al. (2010, p. 20) aesthetic designs are perceived as easier to use than less-aesthetic designs.

In *fine art* classical formats are based on the *divine proportion* or the principle of the *golden ratio* (Livio, 2002, p. 3). For 2,500 years the principle of the golden ratio has been used in art and architecture to create harmonious proportions. However, proportions according to the “golden section” are not always appropriate in information design (Pettersson & Strand, 2006).

Aesthetically pleasing visuals may *not* be of great instructional value. However, they attract more readers (Holmes, 1993; Malamed, 2009).

Aesthetic theories that are based on perception favour sensation over intellect, favour seeing over reading, favour universality over cultural differences, and favour physical immediacy over social mediation (Lupton & Miller, 1999, p. 62). *Harmony* in design can be said to be a pleasing arrangement and combination of elements to form a consistent and orderly whole. Harmony is the other *aesthetic principle* in information design. Certain design elements look good when they are placed together and when they interact in a final design.

Historical *colour theories* have included principles used to create harmonious colour combinations in architecture and painting. Every historical colour wheel is a visual representation of a specific colour theory (Anderson Feisner, 2006). Colour can be described in aesthetical, physical, physiological, psychological, and technical terms. For the receiver it must always be absolutely clear if colour is used for decoration, or if it has some kind of cognitive importance.

4 Facilitating Theory for ID

The group *cognitive disciplines* includes fields such as cognitive science, didactics, pedagogy, psychology, sociology and their subareas. At present the *facilitating theory for ID* includes, but is not limited to, the following four fields of knowledge: 1) attention theories, 2) perception theories, 3) processing theories, and 4) practical application theories.

Fleming and Levie (1993) provided about two hundred principles for instructional message design. Some of these principles, especially those related to the receiver's attention, perception, and interpretation, are also important and valid for information design. *Facilitating attention, facilitating perception, facilitating processing, and facilitating memory* are important *cognitive principles* in information design (Pettersson, 2010).

The information designer needs to *facilitate* attention, perception, learning, and memory of the messages provided in layout, pictures, and texts in information sets. We are not able to attend to more than one stimulus at a time, and graphic form, pictures, sound, and words compete for our attention. The intended audience must be able to notice the message, and then mentally process data and information in order to understand it. However, in information design actual learning is rarely required.

Perception entails fast, holistic, parallel, and simultaneous processing. It may take only 2-3 seconds to recognize the content in an image, but 20-30 seconds to read a verbal description of the same image, and 60-90 seconds to read it aloud. We look for, recognize patterns, and combine them into something meaningful. The *main goal* in information design and instruction design should always be *clarity of communication* (Pettersson, 2002).

We select some elements in a picture as the *figure*, the object of interest. The remaining parts constitute the *ground* on which the figure rests. Our visual system has a strong preference to ascribe the contour to just one of its border regions and to perceive the other side as part of a surface extending behind it (Palmer, 1999).

The essential thesis in *Gestalt psychology* is that in perception *the whole is different from the sum of its parts* (Palmer, 1999). There are many Gestalt principles, and the following nine provide most opportunities for designers: 1) closure principle, 2) common fate principle, 3) continuity principle, 4) contrast principle, 5) good form principle, 6) grouping principle, 7) objective set principle, 8) proximity principle, and 9) similarity principle.

Day and Lloyd (2007) argued that concepts derived from *affordance theories* are highly useful in understanding the role of online technologies in learning. Waller (2011) discussed affordance qualities in documents and graphic design. In a document we tend to see significance in the way things are aligned, and in their relative prominence.

Schema theory describes how knowledge is acquired, processed and organized. The focus is on how we assign meaning to things through social experience (Davis, 2012, p. 80). We use schemata to organize current knowledge and provide a framework for future understanding. We are more likely to notice things that fit into our already existing schemata.

Action theory is a theory of personal change that is oriented towards professional education, especially related to leadership in organizations. Here the focus is on solving problems that are complex and badly structured. Then it is necessary to change underlying values and assumptions.

The *dual-code memory model*, or the *dual coding theory*, proposes that rather than just one sensory memory, one short-term memory, and a long-term memory, as might be implied in information processing theory, there are actually separate memory systems for different types of information. We have a *verbal system* for processing and storing linguistic information and a separate *non-verbal system* for spatial information and mental imagery.

Our memory for pictures is superior to our memory for words. This is called the *pictorial superiority effect*. Careful integration of words and pictures engage people more effectively than words or pictures alone (Sadoski & Paivio, 2001). In the *generative theory of textbook design* learning is viewed as a constructive process (Mayer et al. 1995). Based on the *dual coding theory*, the *cognitive load theory*, and the *constructivist learning theory* Mayer (1997) proposed a *cognitive theory of multimedia learning*. Generally multimedia researchers define multimedia as the combination of text and pictures (Mayer, 2005). The words can be spoken or written. The pictures can be animations, illustrations, photos, or video. Multimedia learning occurs when we build mental representations from these words and pictures. Multimedia instructional design attempts to use cognitive research to combine words and pictures in ways that maximize learning effectiveness. According to this theory multimedia explanations allow students to work easily with verbal and non-verbal representations of complex systems.

5 Communication Theory for ID

The group *communication disciplines* includes fields such as advertising, communication theory, cultural studies, educational technology, gender studies, human computer interaction, instructional technology, journalism, media, persuasion design, planned communication, television, and video production. At present the *communication theory for ID* includes, but is not limited to, the following four fields of knowledge: 1) audience reception theories, 2) culture theories, 3) interaction theories, and 4) media literacy theories.

There are a large number of communication theories, attempts to explain *how* and *why* humans communicate with each other. Several theories may be labelled *audience reception theories*. Examples are the encoding/decoding model, the reader-response theory, structuralism and post-structuralism, and uses and gratifications theory.

Culture theories include cultural studies, cultivation, and gender studies. Contents in basic textbooks show traditional *gender roles* and gender stereotyping regardless of the major changes that have appeared in public opinion (Hunter and Chick, 2005; Odén, 2005). Incorrect and unfair gender representation and gender stereotyping will impair the credibility of information sets. Whether we are aware of it or not, *visual culture* is found in every arena of public and private life (Lefler, 2014).

Human computer interaction theories comprise research on the design of computer systems that support people so they can carry out their activities and tasks productively and safely.

Media literacy resides within numerous disciplines (Fox, 2005). This field of knowledge includes studies of medium and message, media literacy outcomes, and the agenda-setting theory. A medium is an aid used in the transfer of a message from a sender to a receiver. Each

medium has unique aesthetics, codes and conventions. According to Martens (2010) evaluating and explaining the effectiveness of media literacy education is one of the most overwhelming challenges for current media research.

6 Providing Theory for ID

The group *design disciplines* all deal with the design of *messages*. A number of definitions of the concept *message* may be summarized as: "A message is information content conveyed from a sender to a receiver in a single context on one occasion." This group of design disciplines, *message design*, includes 1) graphic design, 2) information design, 3) instruction design, 4) mass design, and 5) persuasion design. Here the main components are *words*, *visuals* and *forms*. Some representations also have movement and sound.

At present the *providing theory for ID* includes, but is not limited to, the following six fields of knowledge: 1) design concepts, 2) design principles, 3) design processes, 4) design by reduction, 5) modern graphic design, and 6) design theory.

The term *design* refers to the identification of a problem and the intellectual creative effort of an originator, manifesting itself in drawings or plans, which include schemes and specifications to solve the problem (Simlinger, 2007, p. 8). However, the term *design* also represents the outcomes of each specific design process, such as products, processes, services, and systems. Lupton (2009, p. 6) noted: "Design is visible everywhere, yet it is also invisible-unnoticed and unacknowledged."

The term *design theory* has several meanings, related to context, mental visualisation, perception, practice, and supporting sciences. Many authors have offered *design principles* and practical instructions in different areas of design. Some of these design principles are rather broad and general, while others are quite specific. Pettersson (2010) wrote sixteen *design principles* for information design, all based on research. The information designer provides clarity, emphasis, explanations, simplicity, and structure of data. Then it is possible for the intended audience to understand the contents in information materials.

A good *design process* will guarantee required results. It is important to define the *problem* during an introductory analysis and planning phase. To be effective a message must have good legibility and good readability. Private documents may invite the use of ornate and stylish looking fonts. Professional documents, however, require optimum legibility. Good legibility is economically advantageous, whereas poor legibility may be a costly business for all involved. A small mistake early in the design process may prove very costly.

The most fundamental design technique is *reduction* (Mullet & Sano, 1995, p. 38). Wherever possible the designer should remove insignificant elements in layout, pictures, and texts in order for significant design elements to be clearly noticed.

Information Theory for ID

The group *information disciplines* includes fields such as information architecture, information ethics, information literacy, information retrieval, information science, information systems, information technology, and information theory. At present the *information theory for ID* includes, but is not limited to, the following four fields of knowledge: 1) information architecture, 2) information literacy, 3) information science, and 4) information quality.

Information architecture involves the structural design of systems for organization of data to help people to find, navigate, and manage information in complex systems. This emerging discipline is focused on combining principles of architecture and design in order to support usability.

Information literacy is the ability to obtain information from the media and to judge its accuracy (Malmelin, 2010, p. 133). Information literacy is central to all successful learning and by extension to all successful living. It is important to review the information material with respect to credibility, graphic design, structure, style, and terminology before the technical production. When transferred from seller to buyer information remains available to both.

Information science (IS), or *library and information science* (LIS), is a broad and interdisciplinary area of research (Ma, 1999). According to Fidel (2012, p. 56) numerous researchers have borrowed their theories from other fields in order to build theories in library and information science, and studies of information behaviour. Securing *information quality* is one of the *administrative principles* in information design (Pettersson, 2010).

8 Language Theory for ID

The group *language disciplines* includes fields such as drama, lexicology, lexicography, linguistics, literacy, rhetoric, semiotics, terminology, visual literacy, and writing. At present the *language theory for ID* includes, but is not limited to, the following six fields of knowledge: 1) plain language, 2) terminology theory, 3) rhetorical theory, 4) semiotic studies, 5) pattern languages, and 6) visual languages.

In *plain language* the message has a high degree of *readability*. Then the message is easy to understand. In many countries, laws mandate that public agencies use plain language to increase access to programs and services. There are many writing techniques that can achieve plain language.

According to *terminology theory* a concept is an idea of something, a referent. A term is a linguistic representation of the concept. A definition is a linguistic description of the concept. A concept is not bound to any particular language.

Classical *rhetorical theory* was the first of all communication theories. Rhetorical theory is not only used for text, but also for images and pictures. The interplay between text, visuals, and graphic form needs to be studied and tested thoroughly before optimal combinations can be found. Illustrations in textbooks must be relevant to the prose contents. Text, visuals, and graphic form should always work together to fulfil information design objectives.

The development of *semiotics*, at the start of the twentieth century, was consistent with avant-garde art and design efforts to challenge prevailing ideas about the structural relationships between form and meaning (Davis, 2012, p. 131). Based on Peirce's triadic model Amare and Manning (2013) discussed a "unified theory of information design." The three corners in their triangular model of this theory represent the primary categories of visual-communication goals: 1) to evoke *feeling* (decoratives), 2) to provoke *action* (indicatives), and 3) to promote *understanding* (informatives). All kinds of visual artefacts and purposes of communication, including printed/written text, fit in this model. However, in my view this approach is far too narrow to constitute a "unified theory of information design." We need to consider many more aspects than semiotic concepts.

People have used general appearance and *pattern recognition* since ancient times. Nonverbal signs can produce many symbols with different meanings. In any culture people have to agree on the meaning of signs. Colour coding is a good way to show that something is connected, or especially important. Visual messages are superior to verbal messages when content is emotional, holistic, immediate, spatial and visual.

Interpretation and creation in *visual literacy* can be said to parallel reading and writing in print literacy. Usually receivers are capable of interpreting far more content in a given picture than the designer had in mind. Pictures can have a positive, a neutral, and also a negative effect on learning.

Future work

So far established disciplines and professions have contributed to information design with more than one hundred facts, hypotheses, postulates, and also theories. I see this work as a start, and I hope that others will contribute with more hypotheses, and with more theories. I hope that it will be possible to formulate new principles and then new guidelines that will be useful in our practical work designing effective and efficient messages, information sets and learning materials.

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