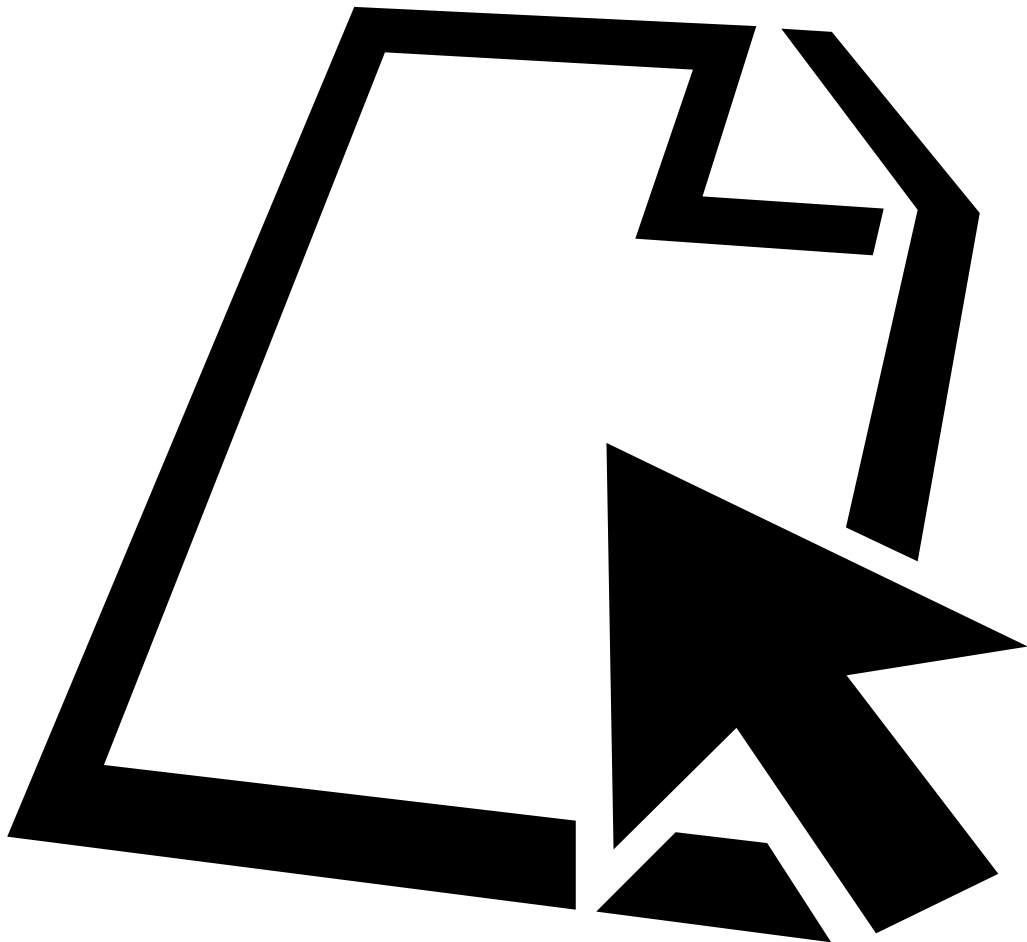


Marc Oliver Orth



Iconymology

Origins and Development of Icons and their Meanings

Hannover • 2006

ICONYMOLOGY

Origins and Development of Icons and their Meanings

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ABSTRACT

Iconymology is concerned with the analysis of the origins and development of *idea pictures* used within the human-computer interface and their meanings. The analysis is done in two stages with a diachronic and a synchronic section, focusing on syntactic, semantic, and pragmatic aspects of the signs. It covers the principles of complex pictorial meaning generation via visual codes and metaphors, the changes in these codes and metaphors, and the mechanisms that lead to these changes. The results are contrasted with regular language change phenomena. This work contributes to pictorial semiotics, human interface design, and literacy as a linguistic research field.

Human-computer interaction has been simplified by the use of pictorial idea signs. All the (inter)action takes place in a complex collage, each part representing an idea. A specific group among these idea pictures are *icons*, which represent objects and are characterized by having intrinsic properties and behavior, and which the user thinks of in concrete terms.

Icons have changed considerably since their commercial introduction in 1981, and as written signs they deserve semiotic and linguistic attention. A closer look at the types, patterns, and mechanisms of change and the search for possible triggers for these changes reveal phenomena resembling language change. More similarities are found in the contrastive analysis of the development of icons on different user interfaces, which reveals distinctive variants of the same sign system (of which all icons are composed), so-called *icon dialects*. The constituents of icons are particularly remarkable, as they represent a kind of pictorial idea writing system with its own visual grammar, independent of the linear syntax of spoken language.

The results of this analysis help to gain insights into meaning-generation via pictorial signs and the emergence of a whole sign set that represents a pictorial writing system at an early stage. This is furthermore of interest for the research field of *New Media literacy*: the semiotic competence required to operate a computer successfully is also increasingly useful in other spheres. Idea pictures are widely used today, because they are an extremely effective and efficient means of conveying a maximum amount of information in a minimal period of time.

KEYWORDS

semiotics • new media literacy • human interface design

ABSTRACT

Iconymology beschäftigt sich mit der Analyse der Ursprünge und Entwicklung von *Ideenbildern*, wie sie in der grafischen Benutzeroberfläche von gängigen Computer-Systemen verwendet werden, sowie deren Bedeutungen. Das Vorgehen ist dabei zweistufig und beinhaltet einen diachronen sowie einen synchronen Teil. Die Arbeit beschäftigt sich mit den Prinzipien der bildlichen Darstellung von Bedeutungen mittels visueller Codes und Metaphern, mit den Veränderungen dieser Codes und Metaphern sowie mit den Mechanismen, die zu diesen Veränderungen führen. Diese Arbeit ist ein Beitrag zur piktorischen Semiotik sowie zur Literacy-Forschung im Bereich der Linguistik, aber auch zum Human Interface Design.

Die Mensch-Computer-Interaktion wurde durch die Verwendung von Ideenbildern maßgeblich vereinfacht. Jede Interaktion erfolgt über eine Collage, deren Teile jeweils einzelne Ideen repräsentieren. Eine besondere Gruppe darunter sind die *Icons*, die konkrete Objekte repräsentieren und durch intrinsische Eigenschaften und Verhalten gekennzeichnet sind, und dadurch, dass der Anwender den Eindruck eines physisch greifbaren Gegenstandes erhält.

Seit ihrer Einführung 1981 haben sich Icons verändert, und als „geschriebene Bildzeichen“ verdienen sie semiotische und auch linguistische Beachtung. Ein Blick auf die Arten, Muster und Mechanismen hinter den Veränderungen sowie die Suche nach Auslösern lässt Phänomene erkennen, die dem Sprachwandel im weitesten Sinne ähneln. Weitere Ähnlichkeiten finden sich in der kontrastiven Analyse dieser Entwicklungen parallel auf verschiedenen Benutzeroberflächen, wobei sich unterschiedliche Varianten desselben Zeichensystems, aus dem alle Icons zusammengesetzt sind, finden lassen; so genannte *Icon-Dialekte*. Die Konstituenten von Icons sind dabei besonders interessant, da es sich bei ihnen um eine Art Bildschrift handelt, mit ihrer eigenen visuellen Grammatik, unabhängig von der linearen Syntax gesprochener Sprache.

Die Ergebnisse der Analysen ermöglichen Einblicke in die Bedeutungsgenerierung mittels Bildzeichen sowie in die Entstehung eines Bildzeichensystems, das Ähnlichkeiten mit einer Bildschrift in einem frühen Entwicklungsstadium aufweist. Dies ist außerdem wichtig für das Forschungsfeld der *New Media Literacy*: die semiotische Kompetenz, die notwendig ist, einen Computer zu bedienen, wird zunehmend auch in anderen Bereichen wichtig.

Ideenbilder finden heutzutage vielfältige Verwendung, da sie eine extrem effektive und effiziente Möglichkeit darstellen, ein Maximum an Information in einem Minimum an Zeit zu transportieren. — KEYWORDS: Semiotik, New Media Literacy, Human Interface Design

ZUSAMMENFASSUNG

Iconymology beschäftigt sich mit der Analyse der Ursprünge und Entwicklung von *Ideenbildern*, wie sie in der grafischen Benutzeroberfläche von gängigen Computer-Systemen verwendet werden, sowie deren Bedeutungen. Das Vorgehen ist dabei zweistufig und beinhaltet einen diachronen sowie einen synchronen Teil. Die Arbeit beschäftigt sich mit den Prinzipien der bildlichen Darstellung von Bedeutungen mittels visueller Codes und Metaphern, mit den Veränderungen dieser Codes und Metaphern sowie mit den Mechanismen, die zu diesen Veränderungen führen. Diese Arbeit ist ein Beitrag zur piktorischen Semiotik sowie zur Literacy-Forschung im Bereich der Linguistik, aber auch zum Human Interface Design.

Die Arbeit gliedert sich in drei Teile. Im ersten Teil werden die theoretischen Grundlagen der Zeichentheorie sowie der Bildanalyse dargestellt. An prototypischen wie auch gesammelten Beispielen werden die Theorien und Ansätze veranschaulicht. Hierbei werden die Grundlagen von Ecos und Peirces Zeichenbegriff in Zusammenhang mit einer Bildanalyse in Form von Baumdiagrammen vereint. Auf diese Weise können Bedeutung und syntaktische Funktion der einzelnen Bildelemente im Zusammenhang untersucht werden.

Im zweiten Teil der Arbeit erfolgt die eigentliche Untersuchung der zusammengetragenen Icons – diachron und synchron. Exemplarische Wandelanalysen oder Gegenüberstellungen zeigen besondere Phänomene.

Im letzten Teil wird ein Ausblick auf die zukünftige Entwicklung gegeben und anhand von aktuellen Trends und Entwicklungen veranschaulicht. Die gesammelten Erkenntnisse über bildliche Bedeutungsgenerierung fließen in diese Zukunftsvision mit ein.

Die Mensch-Computer-Interaktion ist durch die Verwendung bildlicher Darstellungen in den vergangenen 25 Jahren maßgeblich vereinfacht worden. Eine besondere Form dieser graphischen Benutzeroberfläche stellt der *virtuelle Schreibtisch* dar, dessen Elemente in Funktion und Aussehen Bürogeräten nachempfunden sind, aber im Zusammenhang mit dem Computer und dessen Software nicht deren Unzulänglichkeiten unterliegen; so können zum Beispiel verloren geglaubte Akten immer über eine Suchfunktion wiedergefunden werden. Diese Art der Gestaltung mittels einer visuellen Büroschreibtisch-Metapher ermöglicht dem Anwender das Arbeiten mit dem Computer in einer vertrauten Art und Weise, in der aus bisherigen gesammelten Erfahrungen mit den dargestellten Objekten sowie aus allgemeinem Hintergrundwissen über die „reale“ Welt geschöpft werden kann. Jede (Inter-)Aktion findet

dabei in einer Art Bild-Collage statt, in der jedes Element eine Idee repräsentiert. Jedes Bildelement ist in der Regel ein aus mehreren Teilelementen, sogenannten *Semogrammen*, zusammengesetztes komplexes Zeichen mit einer innerhalb eines bestimmten Kontexts eindeutigen Bedeutung. Neben dem Kontext (z.B. benachbarte Bilder) ist die Bedeutung eines komplexen Zeichens auch abhängig von seiner inneren Struktur und den verwendeten visuellen Codes zur Kombination der einzelnen Elemente.

Die innere Struktur eines komplexen Bildzeichens ist nicht nach linearen Aspekten in Anlehnung an die gesprochene Sprache organisiert. Vielmehr bekommt jedes Element, bedingt durch die gleichzeitige Sichtbarkeit aller Elemente, seine besondere Bedeutung innerhalb der Struktur durch seine räumliche Position, relative Größe, Farbgebung, Kontrast, Rahmung und Perspektive. Diese visuellen Codes geben im Zusammenspiel dem einzelnen Semogramm seine Bedeutung. Die Gesamtbedeutung des komplexen Bildzeichens ergibt sich dabei aus der Summe der Teilbedeutungen seiner Elemente im Zusammenspiel und zusätzlich aus dem Kontext, in dem das komplexe Zeichen auftaucht.

Semogramme werden nach Darstellungsart und Interpretationsmodus unterschieden. Während (1) *piktographische Semogramme* durch eine Ähnlichkeitsbeziehung zwischen dem Zeichenvehikel und dem dargestellten Inhalt (Referenten) gekennzeichnet sind, stützt sich die Bedeutungsübertragung bei (2) *ideographischen Semogrammen* auf eine assoziative Verbindung, in der die Bedeutung über die Assoziation mit einem bestimmten, hervorstechenden Merkmal des dargestellten Inhaltes zustande kommt. Da es in der Regel keine ausschließlich piktographischen oder ideographischen Semogramme gibt, werden sie nach Interpretationsmodi unterschieden; innerhalb eines bestimmten Kontexts wird ein Semogramm also entweder eher piktographisch oder ideographisch interpretiert. Den dritten Modus bilden die (3) *Diagramme*. So bezeichnete Semogramme sind in ihrer Darstellung durch einfache geometrische Formen gekennzeichnet, die einen abstrakten und im eigentlichen Sinne nicht abbildbaren Inhalt darstellen (etwa ein pfeilartiges Dreieck mit nach rechts weisender Spitze in der Bedeutung „abspielen“ auf einem DVD-Player).

Die Struktur von komplexen Semogrammen folgt dabei einem immer gleichen Aufbau bestehend aus *Stamm* und *Marker*. Der Stamm wird prinzipiell durch das größte Semogramm einer komplexen Konstruktion gebildet und dient als Überträger der Basisbedeutung (indem er auch die Grundform des Komplexen Zeichens bestimmt). Der Marker determiniert bzw. spezifiziert die in der Regel eher generische Bedeutung des Stammes. Beide zusammen können einen komplexen Stamm bilden, der wiederum von einem weiteren Marker spezifiziert wird. Die Zahl von vier Konstituenten wird bei der Bildung von komplexen Semogrammen, wie Icons, selten überschritten.

Die Verwendung von Bildern war in der ursprünglichen Version der grafischen Benutzeroberfläche, beim Xerox Star im Jahre 1981, begrenzt auf einen besonderen Teil in der Funktionalität der Benutzeroberfläche. Diese besondere Gruppe innerhalb der Ideenbilder stellen die *Icons* dar. Sie sind gekennzeichnet durch einen häufig stark piktographischen Charakter, also primär durch eine aus der Ähnlichkeitsbeziehung zwischen Zeichenvehikel und

Inhalt resultierenden Bedeutung, durch intrinsische Eigenschaften und Verhalten sowie dadurch, dass der Anwender den Eindruck eines physisch greifbaren Gegenstandes erhält. Das bedeutet, dass ein wesentliches Merkmal von Icons eine gewisse Dualität ist: ein Icon ist gewissermaßen Zeichen und bezeichnetes Objekt gleichzeitig.

Über die Jahre sind Bildzeichen auch an anderen Stellen und in anderen Funktionsbereichen der Benutzeroberfläche eingeführt worden, zum Beispiel in sog. Werkzeugleisten. Alle Bildzeichen, die nicht als Icons klassifiziert werden können, werden zur Gruppe der *Glyphen* gezählt. Darunter fallen, neben den Werkzeugleisten-Zeichen, die in ihrem Verhalten eher Schaltern oder Knöpfen ähneln, auch solche mit starkem Signalcharakter, die beispielsweise Textmeldungen des Systems „visuell unterstreichen.“

Icons haben sich seit ihrer kommerziellen Einführung im Jahre 1981 grundlegend verändert, und als geschriebene Zeichen verdienen sie dabei auch ein besonderes semiotisches und linguistisches Augenmerk. Die kontrastive Untersuchung der Icons wird im Hinblick auf die drei Aspekte der Semiotik (Syntaktik, Semantik und Pragmatik) in zwei Teilen durchgeführt: (1) der erste, diachrone Teil setzt sich mit den Veränderungen und der historischen Entwicklung von Icons auseinander; hierbei werden bestimmte Icons im Lauf der Zeit beobachtet und die verschiedenen Entwicklungsstadien miteinander verglichen; (2) im zweiten, synchronen Teil der Arbeit werden die unterschiedlichen Varianten einzelner Icons auf verschiedenen Systemen behandelt; d.h. es werden Icons für vergleichbare Konzepte und Bedeutungen miteinander verglichen, insbesondere im Hinblick auf Metaphern in der Darstellung und innere Struktur.

Ein genauer Blick auf die Arten, Muster und Mechanismen hinter den Wandelerscheinungen sowie die Suche nach möglichen Auslösern fördern Phänomene zutage, die dem Wandel gesprochener Sprache nicht unähnlich sind und an typische Sprachwandel- oder Sprachkontakt-Phänomene wie Lehnwörter, semantische Spezialisierung etc. erinnern. Auffällig ist dabei, dass sich Icons und ihre Konstituenten in entgegengesetzte Richtungen entwickeln: Während Icons im Laufe der Zeit immer spezieller (und morphologisch komplexer) werden, ist bei den Semogrammen eine semantische Generalisierung zu verzeichnen. Sie stellen zunehmend eine Art bildlicher Ideenschrift dar, charakterisiert durch eine eigene Grammatik, unabhängig von der linearen Syntax gesprochener Sprache. Tatsächlich lassen sich Hinweise darauf finden, dass dieses Zeichensystem einer Bildschrift ähnelt – zumindest einer Bildschrift in einer frühen Entstehungsphase. Es gibt einen mehr oder weniger geschlossenen Kern von Bildzeichen, im weitesten Sinne vergleichbar etwa mit den 26 Buchstaben von A bis Z des lateinischen Alphabets. Diesen Kern umgibt eine Peripherie, die gegenüber Veränderungen etwas „anfälliger“ ist. Über diese Peripherie sind unter anderem auch verschiedene „Icon-Dialekte“ gekennzeichnet, die in der Tat unterschiedliche Varianten desselben Bildzeichensystems auf verschiedenen Computersystemen darstellen. Diese Peripherie ist in etwa vergleichbar mit den Sonderzeichen des lateinischen Alphabets, in denen sich sprachliche Besonderheiten widerspiegeln können, wie zum Beispiel Akzente, Umlaute oder Ligaturen, oder anderen Sonderzeichen wie etwa Währungszeichen.

Ein besonderes Gewicht innerhalb der Untersuchungen erhalten die Zeichenvehikel, also die Bildanteile der Zeichen, denn letztendlich sind sie der sichtbare Teil der Zeichen auf dem Bildschirm. Die Motive lassen dabei Prinzipien und Vorstellungen erkennen, die oft tief im soziokulturellen Umfeld verwurzelt sind, innerhalb dessen die Zeichen benutzt werden. Gerade generische, also sehr allgemeine und unmarkierte Konzepte sind stark an die Wahrnehmung innerhalb einer Gesellschaft gebunden, wie etwa Hautfarbe, Rechtshändigkeit, Farben, Werkzeuge, alltägliche Gebrauchsgegenstände etc. Dabei wird der jeweilige innerhalb der Gesellschaft als normal angenommene Zustand (gekennzeichnet durch allgemein häufiges Auftreten) in der bildlichen Darstellung für die unmarkierte Form verwendet. Sonderfälle werden durch eine markierte, von der „Norm abweichende,“ Form dargestellt. Die markierte Form ist damit vom Prinzip her immer semantisch stark spezialisiert. Eine Eigenschaft, die sich im Laufe der Zeit, etwa im Zusammenhang mit Veränderungen im soziokulturellen Umfeld, aber zumindest theoretisch ändern kann. Aus diesem Grund ist die Verwendung von Ideenbildern zwar unter Umständen sprachübergreifend möglich, aber nicht zwischen grundverschiedenen Kulturen. Einzelne Bildzeichen, wie zum Beispiel die in westlichen Kulturen häufig als Sinnbild der Weisheit verwendete Eule, können im asiatischen Raum Missverständnisse hervorrufen, da Eulen dort vollständig anders (nämlich als extrem dumme und gewalttätige Vögel) wahrgenommen werden.

Die Inhalte (Referenten) der Semogramme ändern sich im historischen Verlauf tatsächlich auffallend. Dabei findet eine Verschiebung von anfangs konkreten Inhalten hin zu abstrakteren statt. Denn während die ältesten Semogramme noch sehr greifbare und in der physisch-realen Welt vorkommende Inhalte haben, also tatsächliche Referenten, finden sich in moderneren Semogrammen zunehmend Hinweise auf nicht-physisch existierende Inhalte. Diese Zeichen beziehen sich gewissermaßen auf Bedeutungen, die von ihren Vorläufern etabliert wurden und somit als kulturelle Einheiten im „Ideenschatz“ eines Kulturkreises existieren. Ein Beispiel dafür ist das „Word Dokument“, für das es, wie beispielsweise für das Einhorn, keine physische Entsprechung gibt, das aber dennoch im weitesten Sinne als existierend angenommen wird und für das es ein bestimmtes innerhalb der Kultur typisches Erscheinungsbild gibt.

Im Zusammenhang mit dieser Entwicklung, also der Etablierung kultureller Einheiten über die Bildschrift der graphischen Benutzeroberfläche, kann darüber hinaus beobachtet werden, dass die Zeichen, die ursprünglich ihre Bedeutung aus einem bereits existierenden Kontext bezogen haben, nämlich der konkreten Umgebung eines Büros (vgl. *Desktop Metaphor* „(Büro-) Schreibtisch Metapher“), selbst zu einem Kontext geworden sind, in dem andere Zeichen interpretiert werden.

Eine ähnliche Entwicklung lässt sich bei der Verwendung von Metaphern beobachten. Während die ursprüngliche Benutzeroberfläche die Schreibtisch-Metapher unbedingt benötigte, um den Anwender an das bis dato unbekannte Gerät heranzuführen und eine Benutzung überhaupt erst möglich zu machen, ist die Realität heute eine andere. Durch die enorme Verbreitung von Computern haben immer mehr Menschen im Laufe der Zeit Erfahrung als Anwender im Umgang mit den Geräten gesammelt – sei es unmittelbare, eigene Erfahrung oder

mittelbar über den Bekanntenkreis oder etwa durch Bücher. Der in der heutigen Zeit überhaupt alltäglichere Umgang mit elektronischen Geräten (Videorecorder, DVD-Player, MP3-Player, Mobiltelefone etc.) trägt das seine zu einer höheren Grundkompetenz im Umgang mit Computern bei, also zu einem höheren Grundlevel hinsichtlich der *Computer literacy* des einzelnen Anwenders. Ein weiterer Aspekt ist die Ausdehnung dieser Geräte in den privaten Raum. Computer werden nicht länger vorrangig im beruflichen Kontext verwendet, sondern haben mittlerweile ihren festen Platz in der Freizeitgestaltung von Anwendern (Musiksammlungen zusammenstellen, Urlaubsbilder sortieren, Urlaubsvideos schneiden, im Internet surfen). Dies schlägt sich auch in den heute innerhalb der graphischen Benutzeroberfläche verwendeten Metaphern nieder. Aus der einstmals alleinig vorherrschenden Schreibtisch-Metapher ist ein Konglomerat aus verschiedenen Metaphern geworden, die jeweils in einem eng begrenzten Aufgabenfeld Verwendung finden. Im Bereich Netzwerke und Internet gibt es eine Netzwerkmetapher, im Bereich E-Mail findet sich eine Art Post-Metapher, im Bereich Medien (Film, Musik) wird eine CD/Video-Spieler-Metapher eingesetzt; so kann jeder Anwender die Zeichen sowie den metaphorischen Kontext auf Basis der auch anderweitig gesammelten Erfahrung interpretieren (z.B. vom konkreten DVD-Player oder einer Jukebox). Es gibt also einen Trend weg von einer allumfassenden Metapher hin zu vielen kleinen kontextbezogenen Metaphern. Ferner stellen diese Metaphern nur noch oberflächlich betrachtet einen echten Bezug zur realen und physischen Welt her: es ist gerade bei erfahrenen Anwendern mit höheren *Computer literacy*-Leveln möglich und durchaus wahrscheinlich, dass diese sich bei der Interpretation der Zeichen innerhalb der Metapher gar nicht mehr an der „greifbaren“ Wirklichkeit orientieren, sondern an den innerhalb der Benutzeroberfläche zu einem früheren Zeitpunkt gesammelten Erfahrungen. Das bedeutet, dass ein Rechtspfeil auf einem „Abspielen“-Element gar nicht unbedingt mit Hintergrundwissen über „echte“ CD-Player etc. interpretiert wird, sondern in Kenntnis anderer Software-Anwendungen, in denen dasselbe Semogramm ähnlich gebraucht wird.

Diese Erkenntnisse sind in zweierlei Hinsicht interessant. Zum einen ermöglichen Icons in dieser Betrachtungsweise die Beobachtung der Entstehung eines komplexen Zeichensystems mit den besonderen Wandelerscheinungen während dieses Entstehungsprozesses. Zum anderen kann parallel das Entstehen eines „visuellen Vokabulars“ für zugehörige kulturelle Einheiten beobachtet werden. Beides zusammen ist ein Teilaspekt der *New Media Literacy*. Die *Computer literacy* bezieht sich auf Fähigkeiten und Kenntnisse, die ein Anwender benötigt, um mit dem Gerät umzugehen. Dazu gehören die körperlichen Voraussetzungen (Hand-Auge-Koordination, Bewegungen der Finger etc.), technisches Hintergrundwissen (Fachvokabular, Benennung der Teile eines Computers etc.) und das Verständnis der Bildzeichen, d.h. Kenntnis der Bedeutungen (bildliche Metaphern), der inneren Struktur und der involvierten Codes sowie der „Interaktions-Grammatik“, also der Interaktions-Muster, mit denen die Zeichen auf dem Bildschirm manipuliert werden können, um so die gewünschte Anwender-Aktionen umzusetzen.

Interessanterweise entwickelt sich diese *Computer literacy* aber zunehmend zu einem Phänomen, das längst auch andere Geräte, wie etwa Mobiltelefone mit einschließt – hin zu einer Art *Interactive Media literacy*. Das bedeutet, dass die Fähigkeit, Ideenbilder zu lesen, die mittels des hier analysierten Bildzeichensystems konstruiert wurden, tatsächlich auch zur Bedienung einer Vielzahl weiterer Geräte befähigt. Wenn sich dieses System weiter entwickelt und im Gebrauch etabliert, dann bedeutet dies, dass, ähnlich der zunehmenden Alphabetisierung während der Industrialisierung, die zunehmende *New Media literacy* in ein neues Zeitalter führen könnte. Die heutige „Bilderflut“ ist bereits dabei, unsere „Sichtweise“ zu verändern und ein neues Zeitalter der Bildmitteilungen einzuleiten. Die Notwendigkeit, immer mehr Information innerhalb immer kürzerer Zeiträume zu „übertragen“, nimmt stetig zu. Das ist mit linearen, textlichen Mitteilungen kaum noch möglich. Die Parallelität der Information innerhalb eines komplexen Bildes, in dem alles gleichzeitig sichtbar ist, machen sich insbesondere Werbestrategen schon seit längerem zunutze. Durch eine wachsende Zahl „Bild-alphabetisierter“ Personen kann und wird dieses Prinzip der Informationsdarstellung ausgebaut werden.

Icons und Semogramme im allgemeinen sind ein fester Bestandteil des kulturellen Umfelds geworden und jeder von uns verbringt viel Zeit mit ihnen – wenn es uns auch vielfach gar nicht bewusst ist. Sie sind alt und neu zugleich, und gerade darin liegt eine gewisse Ironie. Die Zukunft liegt in einem uralten Konzept: Ideenbilder.

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1. *Introduction and Fundamentals*

Iconymology *n* The study of the origins and history of the form and meaning of icons within the graphical direct manipulation interface; ~ derives its methods from semiotics, especially pictorial semiotics, which is concerned with the study of pictures as particular vehicles of signification, and linguistics, especially semantics.¹

Idea pictures in general are a pretty old idea, and a pretty nifty one at that. They are probably almost as old as mankind. Somehow, little seems to have changed from the ancient cave paintings to modern computer desktop icons (except for the “canvas,” of course), at least at first sight. Apparently, humans have a fairly strong inclination to stick to old traditions.

It was back in the late 1970s when the first human-computer interface based on pictorial illustrations instead of pure text was developed in the Xerox Palo Alto Research Center (PARC). Although it turned out to be a commercial flop, it marked the beginning of a new era. For the first time in the history of human-computer interaction, objects and processes became visible on the screen; everything was transparent and nothing happened behind the user’s back. Computer users no longer had to worry about cryptic commands, which were

¹The term *iconymology* does not exist as a linguistic term. It is a fun formation and a blend of the two terms *icon* and *etymology*. My dictionary-esque definition is based on David Crystal’s definition of the term *etymology*.

hard to remember, but could choose among the operations available by pointing on images on the screen. Filing and editing became a mere breeze.

This new type of interface was characterized by the use of small pictures, and each picture represented an idea. These pictorial representations mimicked real, physical objects in terms of appearance and behavior. The objects shown on-screen resembled regular office items in order to make the transition from the regular to the virtual office even easier for the user. Familiar concepts and objects were depicted, such as documents, folders, drawers, in boxes, out boxes, and printers.

The introduction of this very first so-called *graphical direct manipulation interface* to the amazed public in 1981 was a revolutionary step towards a more user friendly and less impersonal human-computer interaction model. From this revolution a new kind of pictorial idea writing system emerged. From that day on, more and more people would learn the relatively small set of symbols and build up a sort of visual vocabulary in their minds. Once the meaning of each symbol was learned, users just had to remember this meaning the next time they encountered and recognized the sign somewhere on the computer screen. Computers became usable even for ordinary people, not only for engineers or programmers. Never before has it been easier to become *computer-literate*.

It is the small and ordinary things that usually pass by unnoticed. Millions of people all over the world work with computers on a regular basis—at home, in the office, in hotel rooms, or in cafés. They all have become accustomed to the tiny pictures and just take them for granted. A lot of people do actually care about icons: about extraordinary or special icons, about replacements for boring (or even ugly) standard icons, about fun icons, and so on. But what about the standard icons. What do they look like? Why do they look like that? Do they change? Do they look different on different computer operating systems? Why is this the case? Presumably, this is another of the last blank areas on the map; beneath our own feet.

1.1 APPROACHING ICONYMOLOGY

1.1.1 In Theory

Computer icons have been around for roughly a quarter of a century now. Times have changed. Computers have changed. The people who use computers have changed. And so have icons. The development is quite obvious to anyone who has been using computers on a more or less regular basis for two or more years. It is clear, too, (at least to anyone who has ever had a chance to get acquainted with more than one operating system) that icons look different on different operating systems. Anyone will notice the differences between icons on, for instance, the Apple Mac OS and Microsoft Windows desktops.

Is this just arbitrary, or coincidental? Is it a mere matter of the designer's taste, perhaps? If not, there surely must be rules, principles, and mechanisms behind these differences and changes.

The idea behind this analysis is fairly simple: find, collect, and compare as many icons as possible from as many different graphical user interfaces as possible and from as many different "ages" or periods (software versions, that is) as possible, and then look at these collections with a diachronic and a synchronic focus. Although this sounds easy enough so far, following this strategy would surely bring up far too many icons. Consequently, in order to keep the collection manageable, it has to be narrowed down a little. From this point of view it is fortunate that all desktop-based graphical user interfaces are more or less "inspired"² by the very first one (and by some other earlier systems). Consequently, the pictorial idea hoard of each user interface includes a small set of icons which can be found at almost any point in time. These *base icons* are the smallest common denominator of all desktop-based graphical user interfaces and therefore perfect for a proper analysis and comparison.

The analysis of both synchronic differences and diachronic changes, then, is guided by three central questions:

²In some cases, these "inspirations" even led to lawsuits in which software companies tried to protect the look and feel of their user interfaces. For example, Apple Computer sued DRI and Microsoft for copying their look and feel (cf. Wikipedia.org, 2005: *Apple vs Microsoft* or *Graphical Environment Manager*).

- Are the differences between icons and their changes systematic in terms of a linguistic approach, or are they merely triggered by technological development in general?
- Is it possible to identify specific types of changes and describe the mechanisms or processes that are responsible for these?
- Is it possible to identify and categorize differences between icons on different graphical user interfaces and describe the mechanisms and processes that lead to these differences?

There is probably a fourth consideration. It has to do with the question of how to deal with all the constituents of icons. Many icons are complex pictures which can be decomposed into smaller parts. These parts are frequently found in various combinations with each other and are also available on different systems. Presumably, these simple parts of icons form a sort of picture pool of simple ideas from which pictures are taken and combined with each other in order to be able to “write” more complex ideas. The question should be whether or not this pictorial sign pool qualifies as a sort of pictorial writing system—or rather a sort of pictorial *idea* writing system.

1.1.2 In Practice

The underlying theoretical concept is based on the assumption that icons are signs and that as such they have meaning. Signs, as I will show later on, are all things that stand to someone for something. Icons are pictorial representations of ideas (see above).

Pictorial signs are used within the graphical user interface to represent ideas. These ideas can be either objects, concepts, or functions. Each sign is able to represent a range of meanings, but at the same time seems to have a rather specific meaning within a certain context. Combining idea signs to form complex structures representing complex ideas is possible as well.

The terminology used to describe these signs is derived from various disciplines, such as linguistics, semiotics, and Egyptology. The approach to their analysis is mostly about comparing images: it is about comparing their meanings, their internal structures, their constituents, their constituents’

meanings, and of course about comparing their look, that is their overall appearance (which includes stylistic aspects, such as perspective).

Basically, there are four steps:

- Step 1: The definition of the groups of icons which are the focus of interest (base and extended set icons).
- Step 2: The selection of a reasonable number of different desktop-based graphical user interfaces to examine.
- Step 3: The compilation of an icon corpus.
- Step 4: The comparative analysis of icons.

The first step is relatively easy to accomplish, since the early graphical user interfaces are quite well documented. As a matter of fact, there is even more material available for older systems than for contemporary ones. This is presumably due to the former commercial need to make people enthusiastic about the new computer systems and persuade them to buy and use them. Modern documentations already assume a relatively large amount of background knowledge and user experience. On the other hand, modern systems perhaps simply claim to be so “intuitive” and self-explanatory that users are generally able to cope with them without a manual or guide.

The second step is a little more complicated. The choice of which user interface to take into account is dependent on factors such as the availability of documentations and screen shots³, the “importance” of a certain system, and possibly it depends, too, on the personal experience (and preferences) of the author. While most of these criteria are relatively comprehensible, the “importance” of a system is rather hard to define. An important system may, for instance, be one with either a very large user group or a fairly long history. But it may also be a system that turned out to be influential in some way. For example, there may be icons on the particular desktop you are using which have been derived from another desktop that you may never have heard of before.

The icon corpus in step three is not a real corpus and not at all comparable to, for instance, the Helsinki Corpus. It is rather a pool which contains the base

³Photos of the computer screen showing all elements of the graphical user interface, such as icons and windows.

icons (and probably some more) from any of the chosen graphical user interfaces. It is more a sort of picture book (critics might argue I am dealing with “corpus-illustrated” linguistics, here).

In step four, finally, the comparison and analysis of the icons is based on linguistic principles as well as ideas from other domains in which images are used to convey meaning. The analysis is especially concerned with phenomena such as metaphor and metonymy, similarity, and context-dependence of meaning, to name just a few.

1.1.3 Limitations

This research paper is written and intended for people with at least basic knowledge of linguistics or who are interested in either linguistics or semiotics or in human interface design—or in any combination of these subjects. Although computer-related background knowledge is not a must, because this analysis is not about technology or specific computer-related topics, it surely helps to be able to recognize the peculiarities of the signs and signification in the context of human-computer interaction.

The biggest limitation is, of course, the number of icons that are taken into account. It is not possible to examine every single icon in full detail, nor is this at all necessary in order to be able to analyze icon change. In first place, I want to determine if there is such thing as systematic icon change; I do not want to trace the development of every little icon, so this is not going to be a full-blown etymological picture dictionary.

Another important thing to note is the fact that iconymology is not primarily about users and usability. The inclusion of pragmatics is narrowed down to prototypical human-computer interaction models and their syntax. I am aware of the fact that users use computers and that users (possibly even depending on the system they use) may have different skills and background knowledge and, hence, different degrees of computer literacy. There will not be any analysis of which graphical user interface or which icon set is best or most optimized for human-computer interaction. Nor will I look at particular groups of users. A real usability study is not at all possible since many of the interfaces analyzed in

this context have become obsolete and consequently are no longer in use. The pictorial signs on these desktops represent a sort of “dead language” of which only the writing system is reminiscent. Apart from that, the user groups on different systems are usually not comparable to each other, since each system is used within (and possibly even optimized for) a specific domain. Just think of stereotypes and clichés, such as “Mac OS is for designers” and “Windows is for managers.” There is probably at least some truth in them. The skills and degrees of computer literacy of these different groups differ considerably, probably too much to give representative or comparable results.

Furthermore: this is not a user guide or ultimate manual. Iconymology is not about computer technology or programming techniques, nor is it a technical documentation or a user’s manual for computer desktops. The functionality available within a certain user interface (in contrast to others) is only described to the extent needed for a proper linguistic description of icon meanings.

A word on comparability: The icon sets available on a contemporary graphical user interface are a conglomerate of numerous designs and metaphors. Whereas “in the olden days,” as on the Xerox Star or the Apple Lisa, there was only one icon set with one overall design metaphor, the situation is completely different today. Still, often there is a set of system icons, but most icons are bundled with applications, each with its own design. Thus, sometimes there is no central or system-wide design, which makes icons even on one and the same desktop hardly comparable (there are, of course, exceptions to this rule, such as the two Linux desktops GNOME and KDE).

However, there is one positive side effect of this desktop-internal diversity, because if an application is available on two or more operating systems, it is possible to compare these icons directly across various desktops. It may turn out, for instance, that these icons look the same on every desktop, even if this violates the design, that is the system-specific internal syntax of icons, or the overall design metaphor of that desktop.

The use of technical terms is always a bit tricky, and especially in this case. The need for specificity should be accompanied by the desire to keep everything transparent and comprehensible. But particularly in this computer-related context, common naming conventions are too vague by far. Other

authors have sacrificed specificity by establishing a careless use of the term *icon* (*computer icon*) for practically any picture-esque thing on-screen. Thus, a precise definition of what an icon is—of the essence of an icon—is crucial for a proper analysis of icons.

A similar example of a flawed technical term is *ideogram*. There is great disagreement among linguists on how the term should be used. Some have even proposed not using the term at all. Now, to avoid lengthy discussions, I will introduce each term in the following section with a short description of the intended meaning, that is how each term will be used within the context of this analysis.

A final word on the evaluation of findings: it is important to keep in mind that this is not going to be a statistical interpretation of the distribution of certain characteristics in time or across different desktops. I have not counted icons or their constituents. There is no real quantitative analysis involved. It should still be possible to derive quantitative information from the analysis (such as mass ratio; e.g. that the number of similarities between icons on different systems most likely outweighs the number of differences due to co-evolutionary processes in the history of human interface design).

It is not within the scope of this analysis to find and point out overall standards. Each finding is evaluated within its specific context. General conclusions as well as the derivation of general rules will therefore only occur where this is justifiable and where it can be underpinned by further evidence, for instance on the basis of cognitive constants.

The analysis of icons in time and across different desktops is intended to reveal interesting details about meaning generation using comparable pictorial writing systems, and about pictorial meaning generation in general. The analysis will, for example, reveal whether certain strategies of pictorial meaning generation have been there from the first day on or if they come up in evolutionary processes. It will also reveal how pictorial meaning generation changes along with our view of the world—how certain idea pictures become obsolete and are replaced by new pictures.

1.2 A SORT OF GLOSSARY

1.2.1 The Graphical User Interface

The term *human-computer interface* or just *human interface* is generally understood as and used to refer to the standard *graphical user interface* (GUI), with windows, icons, menus, and a pointer (Raskin, 2000: 2). Sometimes, in older software documentations, the term *WIMP interface* is used because this type of interface features Windows, Icons, Menus, and a Pointer. In this context I usually shorten it to *user interface*, *interface*, or simply *desktop*, since this is what the common GUI tends to look like.

The term *graphical* refers to the use of graphics as opposed to text. Earlier text-based interface types relied solely on textual input and output.

The desktop is the virtual space where all the action and interaction takes place. It is designed to resemble a real desktop in many respects. There are documents and folders, file cabinets, and there may even be a wastebasket. Since the user directly manipulates the graphical objects on the desktop, this type of interface is also called *graphical direct manipulation interface*.

Sometimes the term *operating system*, short OS, or *system* may be used in place of *interface*. Although this use of the term is technically incorrect, since the GUI is only a small part of the whole OS (in fact, it is only the surface, a graphical layer on the top of the operating system), it reflects the common user experience.

1.2.2 Point-and-Click and Drag-and-Drop

The *mouse* is most common input device aside from the keyboard. It is a palm-sized pointing device and it is represented on-screen by a small graphical element, which generally looks like an arrow (although it may change its shape under certain circumstances). This arrow is called a *pointer*. It is the digital extension of the user's index finger. Moving the mouse moves the arrow on the computer screen. Pressing one of the buttons on the mouse's back (some mice have only one button, others even more than three) is called *click*. The user points at and clicks on things on the screen.

Like *point-and-click*, *drag-and-drop* is another common human-computer interaction pattern performed via the mouse: the user does not only point at an icon but moves it to another location on the screen, for instance onto another icon, such as the wastebasket, and then drops it. Drag-and-drop replaced an older strategy which involved invoking a specific *move* command via the keyboard.

1.2.3 Document and Folder vs. File and Directory

Human-computer interfaces have always been built primarily to allow users to manage their data. Originally, the desktop-based graphical user interface was designed to meet, in particular, the needs of file clerks in order to facilitate general office tasks.

All data is stored in files and structured hierarchically in folders. Consequently, files and folders are the most common objects to be represented by base icons on every computer desktop. However, they sometimes have different names: the term *directory* is used instead of *folder*; *file* and *document* are used interchangeably. This is what the WhatIs.com database on the Internet says about directories and folders (accessed 2004-10-07):

Directory “[...] **2.** In computer file systems, a directory is a named group of related files that are separated by the naming convention from other groups of files. [...]”

Folder “In the Windows, Macintosh, and some other operating systems, a folder is a named collection of related files that can be retrieved, moved, and otherwise manipulated as one entity. The folder and file terms were chosen to be consistent with the metaphor that the user interface is a desktop. In some other operating systems, such as DOS, z/OS and most Unix-based operating systems, the term directory is used rather than folder.”

And this is what WhatIs.com says about files and documents:

File “[...] **2.** In any computer system but especially in personal computers, a file is an entity of data available to system users

(including the system itself and its application programs) that is capable of being manipulated as an entity (for example, moved from one file directory to another). [...]"

Document “[...] A document is a form of information. A document can be put into an electronic form and stored in a computer as one or more files. Often a single document becomes a single file. An entire document or individual parts may be treated as individual data items. As files or data, a document may be part of a database. Electronic Document Management (EDM) deals with the management of electronically-stored documents. [...]"

In this thesis, the terms are used as follows: (1) the term *folder* is used for the graphical representation on the computer screen, that is the actual icon, whereas *directory* refers to the logical structure on the physical data storage device (e.g. a diskette or a hard disk); (2) while *file* is used as a general term for computer data, *document* is reserved for those files created by the user.

Furthermore, a distinction is made between *data type* and *file type*, based on Horton (1994: 130).

Data type *Kind of information* stored in a file or document; e.g. text, spreadsheet, picture, binary data, etc.

File type *Format* in which the data is stored: e.g. document, template, database, etc.

This distinction is necessary in order to understand and describe some complex document icon constructions and their constituents.

1.2.4 Software Applications

All the following terms describe a similar thing, namely a piece of software that enables users to get their work done: *executable*, *program*, *application*, *tool*, *task*. It is not too important to know the exact differences, since this is not a computer course. But a few examples may help to understand the concepts behind these words.

The typical *application* is, for instance, your favorite word processor. There are so many things you can do with it. The simple text editor, something like a simple image viewer, or a movie player are probably best described with the term *tool*. Just like a hammer or a wrench tools are optimized for equally simple and specific tasks. A *program* can be understood as something that is somehow fixed and does not allow or need any user interaction. Programs usually involve the idea of automated processes. The term *task* often refers to an automatic process and can be part of the functionality of a tool or an application; take, for example, the ability to order prints of your digital photos on the Internet just by clicking on them in your electronic photo album.

All these are *executables*, since they are executed either by the user or by the system itself, in contrast to documents which are just opened or edited.

The truth is, the terms are often used interchangeably on the various systems: what is called *application* on, for instance, Microsoft Windows today was called *tool* on the old Apple Lisa and *program* on Atari TOS/GEM. These naming conventions belong to the specific peculiarities of the different systems and are mentioned as they occur during the analysis.

1.3 DISCLAIMER

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book and I am aware of a trademark claim, the designations have been printed with initial capital letters or all in upper case.

1.4 TYPOGRAPHIC CONVENTIONS

For the sake of being specific it is sometimes necessary to distinguish carefully between the form and meaning of a certain sign. If the use of a term is ambiguous in this respect, the form of the sign is indicated by French guillemets and the meaning by single quotes (inverted commas). Otherwise, the sign name is written in its simple alphabetic form. Therefore, «xxx» looks like xxx and has

the meaning 'yyy.' For example: the pictorial illustration of a car would be referred to as a «car» sign, whereas its meaning could be 'drive,' for instance. If the meaning corresponds to the pictorial content in terms of physical resemblance (such as, a «car» sign with the meaning 'car') the sign name is used without any extra modifiers. Consequently, a «car» 'car' sign is simply referred to as a car sign. Double quotes indicate quotations and in rare cases may be used for ironic expression as well. *Italics* denote the use of a term in a technical sense; in rare cases emphasized words are composed in italics. **Bold** typeface is exclusively for the lemma within a type definition which is set apart from the regular text.

2. *Pictures on the Screen*

Picture *n* A representation in two dimensions of something wearisome in three.

—Ambrose Bierce, *The Devil's Dictionary*

The common desktop-based graphical human-computer interface is characterized by the extensive use of pictures and pictorial signs. This “visual language” seems to be both self-explanatory and familiar, and it makes this type of human-computer interface appear intuitively comprehensible. At least at first sight. As human beings we are used to pictorial signs, and decoding them is apparently one of our innate capabilities. It seems to be so simple. But you might be surprised to find out how much is in fact going on “in the background” during a superficially simple task such as meaning-making.

2.1 SIGNS

Practically anything can be a sign, because a *sign* is anything which to someone stands for something else (Chandler, 2003: 2; cf. Eco, 1977). Signs can be sounds, items, actions, images, and various other things. Just think of how birds heading south indicate the upcoming winter, or how the expensive car in front of your neighbors’ house is symptomatic of their wealth. Regardless of their differences, all signs follow the same simple principle: they stand for something to someone; they have meaning. The discipline concerned with signs

and their meanings is called *semiotics*. Umberto Eco states in his *Theory of Semiotics* that

“[...] *semiotics is in principle the discipline studying everything which can be used in order to lie*. If something cannot be used to lie, conversely it cannot be used to tell the truth; it cannot in fact be used ‘to tell’ at all.” (1977: 7)

The origins of semiotics, basically, date from two scholars, the Swiss linguist Ferdinand de Saussure (1857 – 1913) with his *sémiologie* and the American philosopher Charles Sanders Peirce⁴ (1839 – 1914) with his *semiotic* (Chandler, 2002: 5). The latter borrowed his term from the British philosopher John Locke (1632 – 1704), who first coined the term *semeiotike*. All terms are inspired by the Greek word *sēmēion* meaning ‘mark’ or ‘sign’ (cf. Wikipedia.org, 2005: *semiotics*, and Chandler, 2002). However, nowadays, the term *semiotics* (with the extra s) is used as the general cover term for the whole field (cf. Chandler, 2002: 6).

2.1.1 The Sign

The study of signs and how they convey meaning is nothing new. As stated above, there are two major branches—or traditions—in semiotics. One follows Saussure’s approach, and the other follows Peirce. The two models differ from each other considerably.

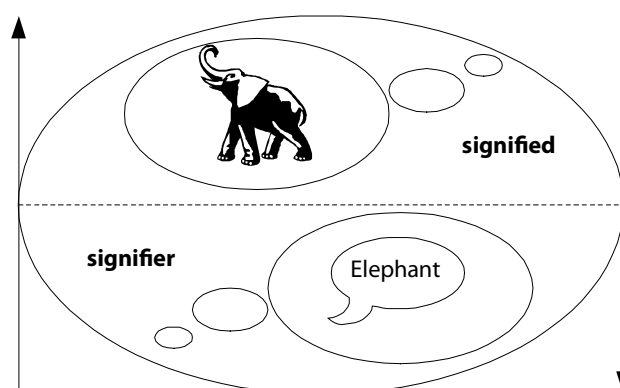


Figure 2-1: Saussure’s two-part view of the linguistic sign illustrated.

Saussure, with his *semiology* as a “science” which “studies the role of signs as part of our social life” (ibid., 5), proposed a dyadic model. His (linguistic) sign consists of two parts: the *signifier* and *signified*. He makes the following

⁴pronounced as a homophone of *purse*

distinction: “The linguistic sign is not a link between a thing and a name, but between a concept and a sound pattern.” (Saussure in Chandler, 2002: 18) The relation between these two aspects of the linguistic sign, which both for Saussure were *form* rather than *substance* (ibid.), is generally regarded as arbitrary, which means that there is no “necessary, intrinsic, direct or inevitable relationship between the signifier and the signified” (ibid., 25/26).

Typical linguistic signs are, for instance, words. The spoken realization of the word *sheep*, that is, the sound pattern of the word in the hearer’s psychological impression, may refer to an actual sheep in the meadow (*extension*) as well as to an imaginary sheep—to the idea or concept of a sheep (*intension*). In either case, there is no similarity between the word and the object it denotes.

Peirce, on the other hand, who regarded his *semiotic* as a “formal doctrine of signs” (ibid., 6), proposed a triadic model of the sign. According to him, a sign has three distinctive aspects, called (a) *representamen*, (b) *interpretant*, and (c) *object*. The first one (a) is the *sign vehicle*, the form which the sign takes. This form is not necessarily material in physical terms. Practically anything can act as a sign vehicle; anything may serve as a means of representation, such as sounds, images, and odors. The *representamen* is similar in meaning to Saussure’s *signifier*. The second part of Peirce’s sign (b), the *interpretant*, is not an “interpreter,” as one might think. It is rather the sense made of the sign, the concept or image in one’s mind. Peirce saw the sign as something that addresses somebody and creates in the mind of that person an equivalent or even more developed sign. The *interpretant* corresponds to Saussure’s *signified*. The *object*, finally, is that “something” to which the sign refers—the referent of the sign (cf. Chandler, 2002: 32 – 34). This referent may, for example, be an object in the real world, such as an elephant (the extension of the sign).

Problems always arise when there is no actual referent for a particular sign vehicle, and no real-world object. Consider the words *mermaid* or *unicorn*. We probably all know what is meant by these terms, although most likely none of us has ever seen either of the two (except in a movie, perhaps). They exist in speech and in our minds, but not elsewhere. They are there and at the same time they are not. To eliminate this problem, Eco (1977) uses the term *content* instead of *referent*. The content exists within a generally accepted “‘cultural’

world which is neither actual nor possible in the ontological sense” and in which mermaids and unicorns are included (ibid., 59 – 62).

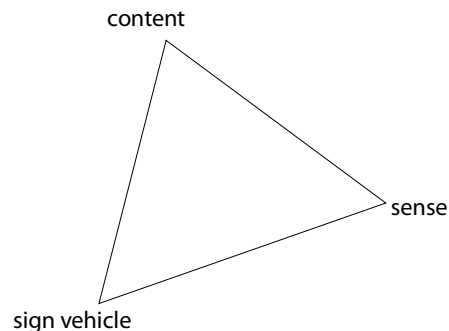


Figure 2-2: The triadic view of the sign based on Eco.

In Eco’s definition the sign is described as “*everything* that, on the grounds of a previously established social convention, can be taken as something *standing for something else*” (ibid., 16).

Frege (1892) nicely illustrates the relation and the difference between sense and content, which in combination make up a *concept*. His famous example *the morning star = the evening star* is remarkable (Way, 1991: 177). Both concepts share the same referent (or *extension*), namely Venus. But while the morning star is the brightest star in the morning, the evening star is the first star to appear in the evening sky. Obviously, they have different senses (or *intension*). Thus, although sign vehicle (a light in the sky) and content (Venus) are the same in both cases, the senses are different; depending on the environment in which the sign appears. Of course, Venus is not even a star but a neighboring planet of the earth; but that concerns astronomy rather than semiotics.

2.1.2 Sign Modes

It is the relation between sign vehicle, content, and sense that determines the “type of sign.” Sebeok (1994) describes six “species” of signs and extends the classical Peircian triad of three sign “types” which distinguishes between *icon*, *index*, and *symbol*.

Signal A sign which triggers some action on the part of the receiver (Sebeok, 1994: 22). Typical signals would be traffic signs (despite the misleading name) or the sound of a doorbell.

Symptom A compulsive, automatic, non-arbitrary sign. The signifier is coupled with the signified in the manner of a “natural link” (ibid., 24). —Just as a rash is a symptom of measles.

Icon Sign with “topological similarity” between a sign vehicle and its referent(s). There are three subclasses, namely *images*, *diagrams*, and *metaphors* (ibid., 28).

Index A sign of which the sign vehicle is contiguous with its referent, or of which it is a sample (ibid., 31). A relatively good example of an index sign is the weather cock, which indicates the direction of the wind.

Symbol A sign without either similarity or contiguity, but only with a conventional link between sign vehicle and referent, and with an intentional class for its designatum (ibid., 33).

Name A sign which has an extensional class for its designatum (ibid., 33).

True signs of one (and only one) type are rare. So apparently they are not necessarily mutually exclusive. This is why the term *type* is not accurate. I prefer to speak of *sign modes*.

A sign can be an icon, an index, or a symbol, or any in combination (cf. Chandler, 2002: 43). The mode of a sign is the mode in which it is interpreted, and this may depend on the point of view. Take a weather cock, for example. If you look at it as an instrument to indicate the direction of the wind, this addresses the sign in *indexical mode*. On the other hand, if you do not know what it is, in which case you might even expect it to crow in the morning like a real rooster, the sign is interpreted in *iconic mode*. Sometimes you encounter the image of a weather cock as the background picture or the logo of a TV weather forecast; in this case the sign is interpreted in *symbolic mode*, as the weather cock is used as a symbol for the weather forecast.

The mode of a sign may also change when used intentionally. The expensive car in front of your neighbor’s house might be a symptom of their wealth. Otherwise, it is probably rather a symbol of their wealth, because it is quite likely they bought the car intentionally in order to make their wealth conspicuous. In any case, the sign does not necessarily tell the truth. If used as a symbol, the expensive car does not tell us whether our neighbors really have or

had the money to buy the car. It is equally possible that they borrowed the money in order to buy this car in order to make us and others believe they had the money. This is why Eco argues that semiotics is concerned with anything which can be used in order to lie (see above).

2.1.3 Understanding Signs

There are signs everywhere: traffic signs, commercial ads, the computer interface, and many more. We understand most of them without consciously noticing their presence, just because they are familiar, at least within our specific cultural context. But every once in a while we encounter a new sign and do not know what it stands for. In such a case we try to find out and learn its meaning, based on our cultural background and the information we can gather from the sign's context. The meaning of a sign is basically learned in three steps:

- When we encounter a new sign we have to *decode* it.
- If we come across that sign more than once, we may *learn* its meaning.
- Once we have learned the meaning of a sign, we *recognize* that sign again and *remember* the meaning we have learned.

The trickiest part is the semiotic process involved in the first step. Decoding basically means making sense of something new. If we do not recognize the complex sign, we try to recognize parts of it. We try to decompose the complex sign. If we still do not recognize a part, we try to divide this part into even smaller pieces—until we are finally able to make sense of the individual parts. Complex signs are always decomposed into smaller and simpler parts that are familiar. Later, the meanings of the parts are combined again and thus we try to gather the meaning of the whole sign (Horton, 1994: 18).

In such a process, the context of a sign is extremely important. Quite frequently, the whole is more than the sum of its parts. This *more* is inferred from the context. Without this context, the meaning of a sign usually remains a mystery. Signs simply are not meaningful in isolation. Only when they are interpreted in relation to each other are we able to make sense of them. In other words: no sign without a context.

2.1.4 No Sign without a Context

Decoding a sign without a proper context is virtually impossible because the meaning of a sign is closely related to other signs and dependent on the context. Thus, one and the same sign may have a different meaning depending on the context in which it appears. The context may be neighboring signs, or an overall design metaphor, such as on the desktop-based graphical user interface. The context or environment of the sign provides the information needed to understand the meaning of a certain sign. Remember the morning star – evening star example: the same point of light is interpreted differently depending on the time of day. The following illustration is quite well known and it reveals this strong bond between a sign and its context perfectly.



Figure 2-3: The context of a sign affects its interpretation.

In this figure, the same sign is used in two different contexts. Most people will read the top line as “eleven, twelve, thirteen, fourteen, fifteen” and the one below as the word “TABLE” without hesitation, and most likely without noticing that the number “13” is identical to the capital letter “B” (cf. Horton, 1994: 23, and Misanchuk, 2000). Obviously, we interpret the sign as “13” or “B” depending on whether the neighboring signs are numbers or letters.

Thus, to understand the meaning of a sign, the interpreter must be able to understand its code, which is connected to the context in which a sign is embedded. The context is generally the whole situation in which the sign appears, its environment, and in which we view the sign. It consists of the sign and of all the other things that are visible (e.g. on the computer screen). Everything near the sign in focus may add to its meaning or interfere with it. This may also include the viewer’s cultural background as well as the specific background knowledge and personal expectations of the viewer.

2.2 SEMOGRAMS

2.2.1 Idea Pictures

Since a sign can be and mean anything, the term *sign* lacks the specificity needed in this context. Linguistic signs, such as words, for example, do not only represent semantic meaning. Their spelling may also contain additional information needed in order to pronounce the word. Thus, they have semantic and phonetic meaning at the same time. Additionally, *sign* does not say anything about whether the thing in question is pictorial or not. Even written signs are not necessarily pictorial. In alphabetic writing systems, such as that used to write the text you are reading at the moment, words usually do not have any pictorial value; or do they? More on the many possible “readings” of, for example, the “o” later.

The signs used within the environment of the graphical user interface, however, are mostly pictorial. As stated above, they somehow represent a kind of visual vocabulary or pictorial writing system. Their biggest difference to linguistic signs in general is their usually non-arbitrary relation between signifier and signified. Additionally, the signs on the graphical computer desktop do not have a fixed representation in spoken language. They merely represent ideas, which may sometimes be rather fuzzy and generic. The small pictures used on-screen, especially earlier ones with their black outlines and simplistic appearance, resemble neolithic cave drawings or ancient hieroglyphs quite closely. The resemblance between some of the pictorial signs on the computer screen and Maya hieroglyphs, in particular, tends to be striking at times. Consider the amazing similarities between a Maya hieroglyph and an old Macintosh desktop icon, in the following Figure 2-4.



Maya *ch'am* hieroglyph



MacPaint application icon

Figure 2-4: Ancient hieroglyph vs. modern icon.

The Maya hieroglyph *ch'am*⁵ represents an outstretched human hand holding something. The meaning is ‘to receive,’ ‘to harvest,’ or ‘harvest’ (cf. FAMSI,

⁵Taken from the FAMSI Maya Hieroglyph Dictionary.

2004). The MacPaint application icon⁶ is constructed in a similar manner. The hand is holding a brush and painting something on a piece of canvas. The meaning of the icon could be read as either 'to paint' or 'painting tool.' Both icon and hieroglyph resemble each other in three crucial ways:

- In both pictures stylized and simplified shapes of objects are used, of which only the outlines are drawn.
- In both pictures the image of a hand is used to denote a human participant in the action, and the action is illustrated by a hand gesture.
- And both are pictorial signs which can be interpreted either as a verb (action) or as a noun (object).

Yet there is an important difference between the two pictures. While there is a syntax for the combination of Maya hieroglyphs which is related to speech, there is no such feature for pictures on the computer desktop. Of course, the signs on the desktop can be arranged to form complex constructions, yet without a fixed syntax. Apart from that, there is not necessarily a fixed expression in speech for a computer desktop icon.



Cave painting

Figure 2-5: Ancient cave painting.

Considering this, such a thing as the MacPaint icon, for instance, has a lot in common with an ancient cave painting. Apart from that, both pictures are part of a larger set of pictures, each with a specific meaning within a certain context. Jensen (1969) describes pictorial signs of this type as *Ideenschrift* 'idea script'. Each sign stands for a concept—an idea—which is expressed, for example, through similarity between sign vehicle and content (referent). The most noticeable feature of an *Ideenschrift* is the absence of a fixed grammar. The internal structure of idea pictures as well as the rules of their combinations are based on cognitive aspects and cultural traditions. Simple pictures express simple ideas; complex pictures express complex ideas. Consider Figure 2-5. The

⁶ Apple Macintosh System 1.

fairly simple cave painting of a human hand lacks a specific translation into speech. Without background information or a proper context, the sign could mean anything from 'hand' to 'human being' to 'I was here.'

Summing up, hieroglyphs, ancient pictographic scripts, and the small pictures on the computer desktop have the following in common:

- They imply semantic meaning (rather than e.g. pronunciation information).
- They do not necessarily have one fixed representation in spoken language.
- They may be complex constructions with multiple constituents.
- They express ideas through the combination of their constituents' meanings.
- They have a meaning that depends on the context in which the sign appears.
- They are based on pictorial illustrations and rarely contain abstract symbols.

But there is also a difference: A script is typically related to a specific language, of which it often carries the name (cf. *Chinese script*). The pictorial signs on the computer screen, on the other hand, are not language-bound. If they are related to a language at all, then it is most likely English; the language of their original creators.

Since the signs in question are painted semantic meanings, I suggest calling them *semograms*. This term is derived from the domain of Egyptology in which it is used to refer to a sign in script which implies (semantic) meaning rather than sound (apart from *semogram*, sometimes the term *semograph* is used as well).

2.2.2 Pictorial Considerations

If a semogram is a written sign with semantic meaning (e.g. a glyph in a complex writing system), does this necessarily make it a pictorial sign? Now, most of the glyphs of the ancient Egyptian hieroglyphic writing system, for which the term was originally used, are pictorial illustrations. Each glyph is the (simplified) picture of a human being, an animal, or a thing (cf. Ager, 2005, and

Wikipedia.org, 2005: *hieroglyph*). The meaning is obviously conveyed by and through the relation between the semogram and the depicted object, a relation which is characterized by resemblance—either with the depicted object or with salient features of it. In a way, semograms are simply pictures with a meaning based on their content. Consequently, it may be worth taking a closer look at pictures in general, which are by far not as simple as they may seem.

What is a picture? This is an old question, and a hard one to answer. Today, the term *picture* is commonly used to refer to two-dimensional representations of “things,” such as paintings, drawings, or photographs (see also introductory quote of this chapter). The default answer is usually based on general and rather superficial assumptions about a certain picture: *x is a picture of y*, *x represents y*, or *x represents y as z* (cf. Scholz, 2004: 13 – 15).

Pictures may act as signs and stand for something (in the case of Modern Art at least to a small enlightened circle of people). Scholz even claims that something can only be a picture if it is also a sign (*ibid.*, 28). Since, as signs, pictures are not universal but only meaningful within a certain system or environment (framework), the problem of context-sensitivity arises. A very simple configuration may serve as a good example: *o o* (cf. *ibid.*, 103). These two circles can be interpreted as a picture of for instance eyes, balls, or wheels. Of course, they can be interpreted as an alphabetic sign, too, namely the letter *o* as the 15th letter of our alphabet. The same pair of circles may furthermore have cartographic value and probably indicate two neighboring villages on a map. In terms of music notation, the circles will surely be interpreted as symbols for two semibreves (whole notes). Consequently, something is identified as a picture not only depending on the character or the qualities of the thing itself but also on the framework used for the interpretation—because pictures as signs follow the same rules as any other sign. In other words, signs and pictures share a strange type of system-dependent (and this includes the socio-cultural environment) polysemy: they do not necessarily have several meanings within one and the same system, but may represent different meanings in different systems.

It is often argued that a picture relies on a kind of natural relation of resemblance. In contrast to, for instance, linguistic signs or other conventional symbols, which have to be acquired in a cumbersome process, the meanings of

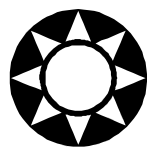
pictures are said to be “immediately available” (cf. *ibid.*, 19). Now, this assumption is rather wishful thinking. It is generally accepted by semioticians that pictures involve a lot of code which has to be learned before the picture can become transparent (cf. Chandler, 2002: 161 – 166; 183 – 188). Consider a simple photograph, for example. It is the two-dimensional representation of something three-dimensional. Apart from that, the photograph is only a small clipping of the actual scene. Furthermore, the photograph may differ from the actual thing in terms of color, saturation, brightness, and contrast.—And all these codes have to be learned.

The framework for this analysis is the graphical direct manipulation user interface. Within this environment semograms are usually identified by their pictorial character. A semogram in this context commonly either means what it looks like or what can be associated with the thing depicted. The picture of a magnifying glass may, for instance, just mean ‘magnifying glass’ as a utility used to magnify something. Additionally, the same «magnifying glass» picture can be used to express a meaning such as ‘search’ or ‘look for;’ a motivation which can be associated with the use of a magnifying glass. This relation between the depicted thing and the related meaning is called *semographic mode*.

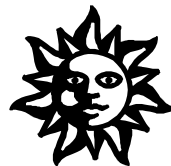
The definition of the semogram as used in this context relies heavily on resemblance (although not on “naturalness”). But resemblance is something that can be extremely tricky to handle sometimes, because it is often carelessly interpreted and misunderstood as a synonym for similarity or identity. Sometimes, resemblance may not be obvious at all at first sight. Consider the relation between a mathematical function and its graph, which is a perfect example of “hidden” resemblance. The graph resembles the function as it represents its values within a co-ordinate system. A graph is a kind of map to a particular function. Thus, even similarity depends on a particular framework. Whether two things are similar or not basically depends on the criteria used for their comparison. Two cars may be similar, for example, with respect to their color, motorization, speed, acceleration, security standards, for instance. Consider the following three pictures of the sun.

Which of the three suns depicted in Figure 2-6 resembles the actual sun most closely? Is each picture equally similar to the actual sun? Each picture reveals a

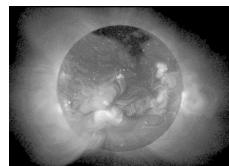
particular point of view. The first one (on the left) may be interpreted as ‘the sun’ because of three features: (1) the circular shape in the middle with (2) the ray-like triangular elements around it in combination with the fact that (3) all shapes are white on a black background, which associates a light-casting quality of the thing depicted. The second illustration (the one in the middle) reminds me of a 16th century drawing. The sun is depicted with wavy rays and a human face, which possibly denotes the importance of this orb for humankind. The resemblance is basically created by the use of rays around a circular face. The rays are not indicated by simple triangles with straight lines. Instead, curved lines are used, possibly to express another salient feature of the sun: namely warmth or rather heat. The first two pictures use rays to indicate a salient and distinct feature of the sun (as opposed to the moon, for instance, which is never depicted with rays). Somehow, this is odd because the sun as we can see it in the sky actually does not have these rays. So how can we see the similarity? Because the content of the sign, the cultural unit *sun* has rays; a sun with rays is part of our cultural image of the sun.



the sun



the sun



the sun

Figure 2-6: *Pictures of the sun.*

The last picture (on the right) shows the sun as seen with an X-ray telescope. The funny thing is that although this picture is actually a photograph taken of the sun, many observers (especially non-astronomers) will probably consider it least similar to the actual sun. There are no rays visible in this picture (although the sun eruptions may easily be misinterpreted as such).

Whether we recognize something as being similar to something else largely depends on our focus and, of course, the system in which we interpret a certain picture. Within this frame of reference, which is related to a specific socio-cultural background, we can even find similarities between a picture (pictorial illustration) and something that does not even exist in the physical but only in the cultural world (cf. Eco, 1977: 59 – 62), such as a unicorn or a mermaid, for instance. The introduction of visual codes (such as color, certain shapes,

perspective) contributes to the perceived resemblance. And codes may even create similarities: although we actually do not see the rays of a sun, *sun-ness* can be added to any circular shape by drawing triangles or lines around it. We tend to believe we inherently know how to “read” a picture because we already know the codes. The feeling of naturalness, after all, is the result of long exposure to these codes. We became accustomed to these codes in a process of “cultural habituation” (Chandler, 2002: 162). Accordingly, the ability to find similarities and spot resemblance is mostly about tradition (cultural background), background knowledge (e.g. about codes), and experience. Thus, understanding pictures and signs relies on conventions and rules established within a certain socio-cultural environment (cf. Scholz, 2004, and Chandler, 2002).

Our knowledge of the world around us (the cultural world as well as the physical world), that is the knowledge of cultural units, enables us to identify images and eventually make sense of them. This forms the basis for the use of pictorial signs within the graphical user interface.

2.2.3 Semographic Modes

The semograms used within the graphical user interface are mostly pictorial. Like other pictorial signs, semograms can be identified on the basis of the relation between form and meaning, or more precisely sign vehicle, content, and sense. Interestingly enough, the relation between form and meaning even of a pictorial sign may be arbitrary and solely based on convention. We therefore actually need to distinguish three semographic modes: namely *pictogram*, *ideogram*, and *diagram*. The term *mode* is preferred to *type*, because, like signs in general, semograms are rarely “pure.”



Figure 2-7: Three semographic modes.

Consider Figure 2-7. Although the first two «sun» semograms appear to be identical twins, they represent two different semographic modes. The one on

the left has the meaning 'sun.' The meaning of this semogram is based on the similarity of its sign vehicle to its content, namely the sun as the actual referent. Therefore it is a *pictogram* or *pictographic semogram*.

The sign in the middle looks like the actual sun, too. But the meaning of this «sun» semogram is 'brightness.' Brightness is commonly associated with the sun, as it is one of its distinct features. Sense is made of this sign not on the basis of similarity with its content, but association with a specific aspect or attribute of its content. The meaning of this *ideogram* is derived from the existence of something that is linked with the content depicted. Thus, rather than on resemblance, the meaning is based on association or on ideas connected with the depicted object. Other possible meanings of this *ideographic semogram* are 'day' (as opposed to 'night'), 'heat,' 'sunshine,' or 'nice weather,' depending on the context in which the sign appears.

Finally, there is the «triangle» sign, a sort of simplified arrow which points to the right. Similar signs can be found on any tape recorder, audio CD or DVD player. Its meaning is commonly interpreted as 'play.' In contrast to the other semograms, this one is abstract in form and meaning. The shape is not the depiction of something of which 'play' is an attribute, which can be (re-)played, or with which 'play' can be associated. It is merely a triangular shape, like an arrowhead. This semogram perhaps comes closest to Saussure's linguistic sign because the relation between form and meaning is arbitrary and solely based on convention. This means that the viewer has to learn the meaning since it is not possible to deduce it from similarity or association. There is no resemblance involved; and as far as association is concerned, if there is any, it is likely to be dependent on our perception and the knowledge of the figurative meaning of spatial position in Western art. In our culture, left-to-right movement is generally associated with moving forwards. The use of abstract geometric shapes in order to represent abstract concepts which are otherwise undepictable is typical of *diagrams* or *diagraphic semograms* (cf. Dürscheid, 2002).⁷

The term *logogram* (or *logograph*) has not been mentioned in this context for various reasons. Although, as it by definition does not resemble that for which

⁷It should be mentioned, nonetheless, that the semiotized arrow is a particularly tricky instance of a diagram. Since the beginning of the history of the arrow sign roughly 40,000 years B.C. (Storrer & Wyss, 2003: 161), its meanings have always been connected to movement and direction. See Storrer & Wyss for more details of the semiotization of the arrow.

it stands and therefore is considered an arbitrary sign just like the *diagram*, it does not seem to be appropriate in terms of semograms and icons because a logogram is not usually pictorial. Typical examples of logograms are numbers, the ampersand &, or the copyright © sign, but other punctuation marks as well. Logograms are sometimes referred to as “word signs” since they usually represent whole words in spoken language (cf. Wikipedia.org, 2005: *logogram*). The ampersand is, for instance, a ligature of the letters *e* and *t*, representing the Latin word *et* ‘and.’ In contrast to the diagram (or other semographic modes) there is usually a fixed expression for a certain logogram within a language. Consider the number sign 7, which represents German *sieben* and French *sept* as well as English *seven*. Consequently, the logogram is not an *idea picture* and therefore not a semographic mode.

The three semographic modes are not congruent with the Peircian sign triad of icon, index, and symbol. But they are related. Whereas pictogram and diagram come close to Peirce’s icon and symbol, the ideogram is a mixture of all three sign types. The interpretation of a semogram in ideographic mode is governed by a number of aspects concerning resemblance, indexical information, and conventional rule systems. The ‘brightness’ semogram, for instance, is interpreted on the basis of (i) knowledge of the conventionalized use of the «sun» semogram in this sense on monitors and TVs, (ii) the causal relation between sunshine and brightness, and of course, the semogram is identified on the basis of its (iii) resemblance to the sun.

2.3 ICONS

The term *icon* is remarkable for its polysemy and the resulting multitude of possible and actual applications. It is widely, and quite frequently even carelessly, used in a number of domains, such as philosophy, linguistics, semiotics, religion, and pop culture. The concept of *iconicity* is fairly complex and tends to be a bit fuzzy as well. Are, for instance, onomatopoeic expressions iconic or not? Some might say they are, since they represent phonetic imitations of a specific sound or noise; just consider words such as *cuckoo*, *growl*, or *click*. On the other hand, I agree with Keller who is most likely right to argue that the

interpretation of the word *cuckoo*, for instance, is rather based on common background knowledge than on the similarities between the sounds of the word and that of an actual cuckoo—in which case the sign would not be iconic but symbolic, with a merely conventional link between form and meaning of the sign.

Real iconicity is sometimes found in unexpected places. Recall the example given earlier of the mathematical graph which is an icon for the corresponding function.

Even in terms of the human-computer interface there are opposing views about when and where the term should be used and to what it actually refers. It is true that the meaning of the word *icon* has widened to refer to any graphical object on the computer screen (Horton, 1994: 3). While this semantic generalization of the term is commonly accepted by designers, users, developers and the like, the resulting use is still not precise, and it is certainly much too vague to be acceptable within a linguistic analysis. In this study, the term *icon* is therefore used solely in its original sense to refer to a specific group of graphical elements on the desktop.

2.3.1 Icons and Glyphs

Originally, when the first icon-based GUI came up, namely that of the Xerox Star, the term *icon* was reserved for a small and specific group of pictorial signs on the computer desktop. In fact, there were no pictorial signs other than icons on this early Xerox Star desktop. These pictorial signs were, and still are, part of a specific concept of human-computer interaction called *direct manipulation*. The Wikipedia describes direct manipulation as a

“human-computer interaction style [...] which involves continuous representation of objects of interest, and rapid, reversible, incremental actions and feedback. The intention is to allow a user to directly manipulate objects presented to them, using actions that correspond at least loosely to the physical world. Having real-world metaphors for objects and actions can make it easier for a user to learn and use an interface (some might say that the interface is more natural or intuitive) [...]”
(Wikipedia.org, 2005: *direct manipulation*)

What is meant by correspondence to the physical world should become clear with a quick look at the following screen shot of the Xerox Star desktop. Figure 2-8 shows the first commercial GUI in 1981: the *Xerox 8010 Star Information System* (Wichary, 2005). What you see on this screen shot is the virtual workspace of the user. It resembles the surface of an ordinary office desk at that time quite closely. All the framed elements on this screen shot are icons in the original sense. They are designed to look like those real world objects which can be found in any office, such as sheets of paper, folders, drawers, post boxes, and printers. Not only do they look like their material counterparts, they also have similar properties and similar behavior (although they are not restricted in the same ways). The user is able to work with them in much the same way as with “real” objects.

The icons [...] are visible, concrete embodiments of the corresponding physical objects. [...] [U]sers are encouraged to think of the objects on the Desktop in physical terms. (Curbow, 1989: 13)

This is what makes icons in the original sense so very different from all the other pictorial signs we can find on computer desktops these days. Consider the Apple Mac OS X screen shot (Figure 2-9). There are a number of pictorial signs in various places on the desktop. Although these types of semogram resemble icons quite closely, they are not icons.

Now, how can you tell icons from non-icons? In this context we only need to distinguish between two types of (complex) semogram used on the computer screen: *icons* and *glyphs*. The term *icon* is applied to all those pictures on the screen which adhere to the principles of direct manipulation, that is, which behave like physical objects. Icons can be moved around, they can be duplicated, opened, or deleted. Or as the slogan on one of the NeXT development team T-shirts once put it: “Drag me, drop me, treat me like an object.”

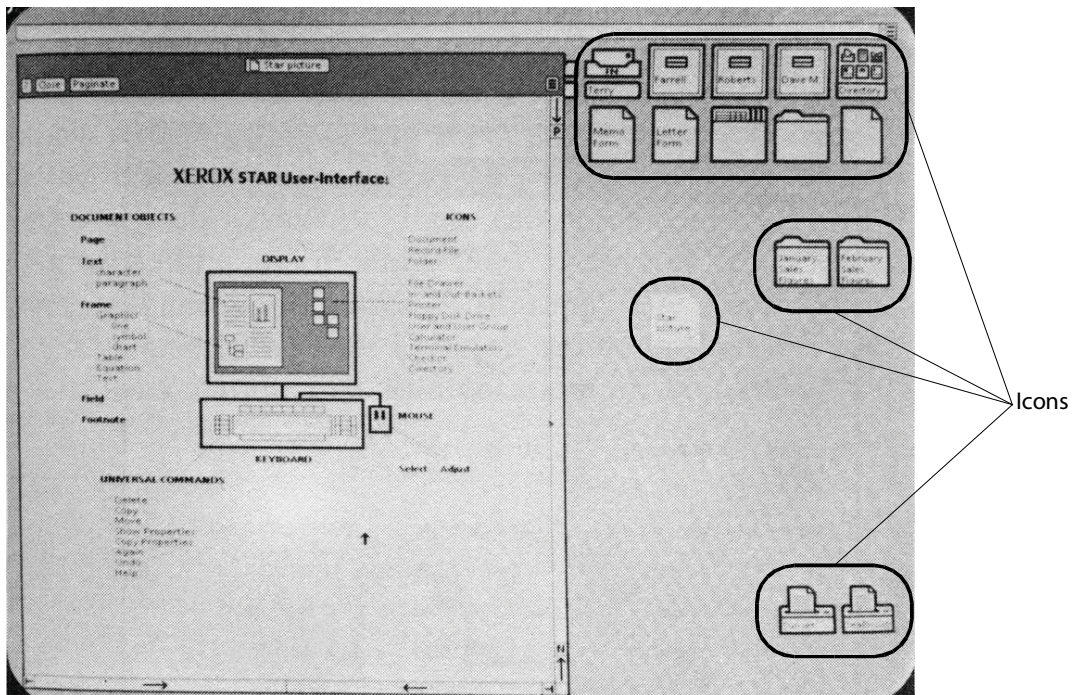


Figure 2-8: The Xerox Star desktop with windows, menus, and icons.

For all the other complex icon-lookalike semograms the term *glyph* is used. A *glyph* may, for example, represent a single function, such as “open a document.” Such a glyph works in much the same way a button and it is operated by the user rather than manipulated. Glyphs may also serve solely informational purposes; glyphs tend to accompany the system’s alert or error messages (they place visual emphasis on the accompanying text).

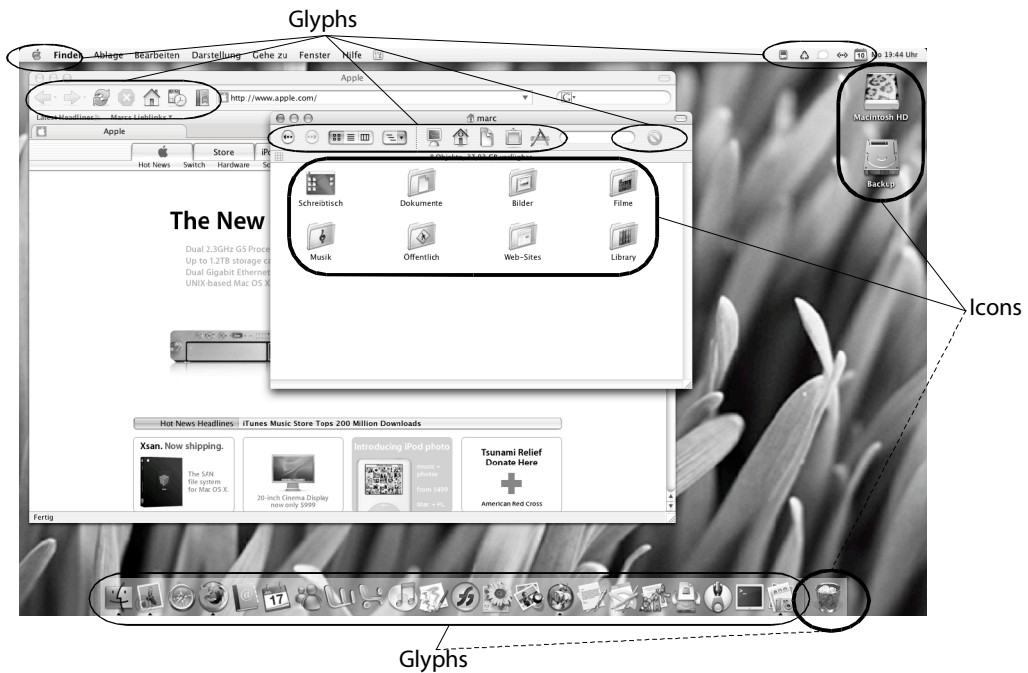


Figure 2-9: Icons and glyphs on the Apple Mac OS X desktop.

As a matter of fact, the Mac OS X trash can icon, for example, is a sort of hybrid icon. It cannot be moved around and manipulated like other icons, but it is far more powerful than an ordinary glyph and allows manipulation (which is especially true for its contents) to some extent. And there are more examples. Modern tool bar glyphs are frequently endowed with a functionality and behavior that comes quite close to icons. Apparently, on modern desktops, the border between icons and glyphs has become blurred a bit.

2.3.2 Two Icons Classes

In order to make things a little more complicated, a distinction also has to be made between two classes of icons, namely *data* and *function icons*. This classification is based on that of the original Star desktop environment.

Data icons represent objects “on which actions are performed” (Wichary, 2005). All icons of this class behave like real-world objects and can be manipulated directly, that is they can be moved, copied, deleted, mailed, opened, closed, and so on. Typical data icons are, for example, the document icon and the folder icon. These two base icons are available on any desktop. As a general rule, data icons represent those objects created by the user—such as letters, calculations, and pictures. In terms of semographic mode, data icons are usually pictograms with some ideographic tendencies as far as their range of applicable manipulations is concerned.

Function icons, on the other hand, represent objects that perform actions; actually, most function icons will operate on any data icon (Wichary, 2005). Typical examples of function icons are printer icons and drive or volume icons. The wastebasket or trash icon available on most contemporary desktops is another good example. There are usually many kinds of function icon, with more being added as the systems evolves. With the aid of function icons, computer users are able to organize and handle their data, as well as to store them on physical storage media. Although function icons are pictographic, too, they are mainly interpreted in ideographic mode—on the basis of attributes and associated functionality of the depicted objects. But a function icon does not underly the same restrictions as the depicted object. A «file cabinet» icon, for

instance, combines the file storing quality of a “real” file cabinet with the power of whole-text search and dynamic sorting according to multiple criteria (such as creation date, name, or size).

2.4 THE CONTEXT

Metaphors generally come in handy when something new has to be said, or semantic “tension” has to be created in order to emphasize the meaning. Often, metaphor is said to be figurative language as opposed to literal language. But even so-called literal language is full of metaphor (though dead metaphor): consider *running water* or *the leaf of a book*. Lakoff even claims that all language is metaphorical as it only “stands for” actual entities through “metaphorical reflection” (in Way, 1991: 16/17). I will not even attempt to provide a general definition of metaphor. Instead, I will focus on design metaphors, which play an extremely important role in the history of graphical user interfaces.

2.4.1 The Benefits of Metaphoric Design

The term *design metaphor* is generally used to refer to the actual design of a human-computer interface: to the visual appearance and arrangement of individual elements within the interface in order to communicate ideas. It is the design metaphor of the graphical direct manipulation human-computer interface that enables the user to cope with the computer’s capabilities without having to worry about all the technical details. The amount of required computer-specific background knowledge is radically reduced by the use of design metaphors.

Metaphors generally allow existing knowledge to be applied to a new situation because they are based on the underlying analogy *A is to B as C is to D* (Way, 1991: 35). Through this “elliptical analogy” metaphor can “generate new knowledge and insight by changing relationships between the things designated” (ibid., 133). Somehow, metaphors generate analogies where they are not usually expected. Mac Cormac (1985: 24) describes metaphor as

“analogy expressed through semantic anomaly.” The difference between an analogy and a metaphor depends on the degree of difference between the two referents (ibid., 24). Only if the referents differ substantially can they be called metaphors, so it is not really the analogy that is doing the work in a metaphor; “it is the metaphor [...] which generates the analogy” (ibid. 158).

To say something like *the sun is a star* would be a simple analogy since the sun actually *is* a star (in terms of astronomy). A *simile* is an explicit comparison, as for instance *the sun is like an oven*. In this example, similar features of the sun and an oven are emphasized (namely that both can be hot, or that both are able to burn you). Now a metaphor would be something like *the big orange in the sky*. Of course, the sun is not an orange, nor is an orange like the sun. Yet both have in common the same color; an analogy created or emphasized by the metaphor. Again, this is a good example of something that has been mentioned before, namely that similarities between two things rather depend on the criteria used for their comparison.

Any metaphor consists of two parts. The *tenor* represents the underlying idea of the metaphor, the meaning which is not transmitted via the literal meaning of word or the syntactic construction. The second part is called the *vehicle*. It is what is attributed, or used metaphorically. The vehicle is the familiar concept used to convey the underlying idea by elliptical analogy. Something new can be transmitted via something that is already known. Or as Black (in Way, 1991) puts it: metaphor can “generate new knowledge and insight by *changing* relationships between the things designated” (ibid, 133).

From a semiotic point of view, a metaphor is realized by one signified acting as a signifier for a quite different signified. Since there is no denotative resemblance involved, metaphors can be seen to be symbolic as well as iconic. “Metaphoric signifiers tend to foreground the signifier rather than the signified” (Chandler, 2002: 233).

To sum up in simple words: Metaphors transmit something unfamiliar or just-not-yet-known via something familiar. This explains why design metaphors have been considered to be extremely user-friendly when implemented in the graphical user interface. When introduced at the beginning of the 1980s, the graphical user interface provided a completely new approach to human-

computer interaction. A special *desktop metaphor* helps users to understand what is going on inside a computer by using a familiar vehicle, namely the traditional office environment. Before this revolutionary step, the use of computers was confined to engineers or developers.

Apart from making the process of accommodation easier for the user, a proper design metaphor helps to create a context which is needed to interpret the semograms on the computer desktop and interpret their meaning. It provides the framework in which icons and glyphs make sense.

“Metaphors in the computer interface suggest a use for something, but that use doesn’t necessarily define or limit the implementation of the metaphor. The Trash, for example, doesn’t have to limit its contents to the number of items an actual wastebasket could contain.” (ADC, 2004: 28)

“Metaphors are the building blocks in the user’s mental model of a task.” (ADC, 2005: 31)

The common design metaphor of computer desktops is the *desktop metaphor*. It is possible to imagine other metaphors, but the desktop metaphor was the first one to hit the market and turned out to be the most influential one.

2.4.2 The Desktop Metaphor

The desktop metaphor is so called because it brings the regular office desk to the computer screen. The similarities between the icons on the screen and the related physical objects arouse certain expectations on the part of the user, which is desired, of course. As mentioned above, a metaphor allows existing knowledge to be applied to a new situation. In this situation, namely in front of the computer, users are immediately able to find their way around the environment, since all the objects on the screen are familiar. Almost every item which can be found in an office is present on the screen. Although this analogy provides a convenient familiarity, it does not limit the user to the known capabilities of the real office items. Instead, the virtual objects on the screen provide the user with enough power to cope with the increasing complexity of their information. Just think of the computer’s ability to do a whole-text search.

Such a search function for its electronic files and file drawers provides a sort of electronic assistance, helping to solve the problem of lost files (Wichary, 2005).

In the introduction to the IBM *Pictureworld* research report (Shild et al., 1981: 1), the need for an appropriate design as well as the general advantage of the desktop metaphor is described as follows:

“The anticipated widespread use of electronic systems to support the work of office principals will bring a very large group of non-programmers into frequent close interaction with information processing systems.

Because the users will not be highly motivated to develop their programming skills, the design of principal support systems poses some special problems. [...]

The office environment already provides support devices that aid principals in stereotyped, narrow, inflexible and also non-integrated ways.”

Who knows what the common graphical user interface would look like if it had not been originally designed for file clerks and other office workers, if a different design metaphor had been chosen.

The major reason for this particular interface design metaphor lies in the fact that computers originated from information processing units and that these units were used in offices by office workers. Considering the multi-purpose machines of today, the desktop metaphor seems to be outdated. And indeed, nowadays a number of different design metaphors are used on-screen (such as a media metaphor or Internet metaphor). Nonetheless, even the latest desktop-based user interface still features pictorial semograms that belong to the original desktop metaphor. People are used to these symbols, and the more regularly they appear within the interface the less likely it is they will change; frequency is probably the keyword here (cf. Bybee & Hopper, 2001): if some icons do not seem to fit or seem to be irregular, they may still remain resistant to change, just because they have been used so frequently for a long time.

In any case, the desktop metaphor is not the only metaphor used on the computer screen. A closer look reveals that a especially a modern computer desktop inhabits a conglomerate of metaphors. A type of “tape recorder” or media metaphor can be found in places where the user deals with the playback

of music and movies; a type of post office metaphor helps the user to make sense of the icons used in e-mail applications; the Internet metaphor is the very heart of every browser, and so on. But however different these design metaphors may be, their purpose is still the same as that of the original desktop metaphor: to make new knowledge accessible via familiar concepts.

2.4.3 Reality

Within the desktop-based graphical user interface, the concept of *direct manipulation* facilitates human-computer interaction; it “allows people to feel that they are controlling the objects represented by the computer” (ADC, 2004: 28). The desktop metaphor creates a meaningful and transparent environment, in which everything is literally visible on the screen, and in which users are able to rely on their recognition (rather than on their ability to remember things). The icons are embedded in this design metaphor and adhere to the aforementioned principles of direct manipulation. Everything on the screen can be manipulated by the user. In such an environment, the pictures on the screen are more than pictorial representations of objects. They acquire the properties and behavior of real, physical objects; and as the user interacts with these objects on the computer desktop, the whole desktop becomes reality.

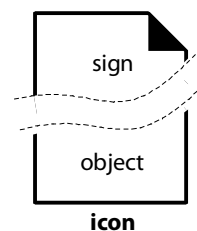


Figure 2-10: The duality of the icon: Sign and object appear to be identical.

The icon is no longer a simple pictorial sign the only purpose of which it is to stand for something else; it is not a button which is pushed by the user. Since every manipulation of this sign affects sign vehicle and referent, the icon loses its pure sign character and becomes an object as well.

It is this identity of sign and object that makes icons so special, makes them *real* in the user experience. But the notion of reality is not restricted to icons, as one of the Xerox Star designers wrote (Curbow, 1989):

“When everything in a computer system is visible on the screen, the display becomes reality. Objects and actions can be understood purely in terms of their effects upon the display.”

Since nothing happens “behind the user’s back,” the user is able to learn and understand what is going on by inspection—just like in the real world outside the “window(s).”

2.5 SIGNS AND HUMAN-COMPUTER INTERACTION

The processes that take place between a computer and the human user have little to do with communication in the stricter sense. The signs on the computer screen are misleading in this respect and are often misinterpreted as a means of human-computer communication. But, in fact, neither the computer nor the user actually use the signs on the screen to communicate.

2.5.1 Signification plus Interaction vs. Communication

Communication is generally a “slippery” concept and, like the term *icon*, is widely used but hard to define. Probably, *communication* is best paraphrased by saying that “someone passes some information to someone else to achieve some effect.” Indeed, most communication models assume a sender, a message, sometimes a channel (or medium), and a receiver (cf. Wikipedia.org, 2005: *communication theory*).

The sender encodes the messages. The message is then sent to the receiver through a medium (or channel) in which it might become altered or disturbed. The receiver finally decodes the message and, if possible, makes sense of it. The success of such a communication act can be measured according to the feedback given by the receiver. Only if sender and receiver have overlapping “fields of experience,” that is if they share a similar cultural environment with similar codes and cultural units will they be able to understand each other.

The processes that take place between a computer and the human user are frequently referred to as communication, but there is a significant difference. Strictly speaking, the computer is never a sender because it does not encode or

send any message to the user. It is rather a medium, or a channel through which the messages are passed. The original creator of the messages is the human interface designer, in co-operation with the software developer. The former encodes the meanings into signs, and the latter implements the signs as well as the rules for the presentation of the messages on the computer screen. As a general rule, this is only done once. All the possible messages and signs are already there when the user turns on the computer for the first time (in fact, all the possible messages are already there when the user buys the computer).

The processes between the computer and the user are of a different kind, as the following Figure 2-11 attempts to illustrate. The graphical user interface (GUI) is where all the (inter)action takes place. The interface, as the term suggests, is a layer between the computer and the user. Signs or messages are presented within this interface. The computer displays the pre-encoded messages on the screen according to the implemented rules (e.g. user interaction patterns). This process is called *signification*.

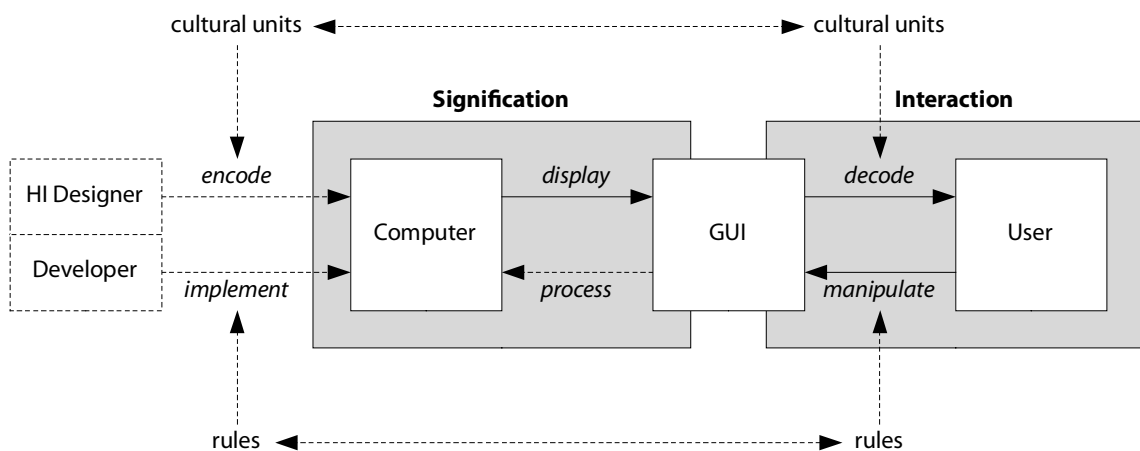


Figure 2-11: A human-computer interaction model.

The user decodes the messages and signs and may eventually learn and probably remember their meanings in the future. But it is not the user and computer who share a common cultural environment. It is actually the user and the human interface designer (HI designer) who need to have overlapping fields of experience. Furthermore, the user needs to learn the rules (the grammar) of the human-computer interaction (as originally implemented by the developer), such as point-and-click or drag-and-drop, in order to interact with the signs on the screen. This *manipulation* of signs on-screen also has very little to do with communication. The user does not really pass information to

the computer in order to achieve some result. It is more like working with a tool. You do not communicate with your typewriter or hair dryer either; you press keys or push buttons.⁸—This process of decoding and manipulating is called *interaction*.

The computer or, more precisely, the software behind the user interface processes the manipulations of the user. And, as in a classic communication model, the computer was programmed to provide so-called *feedback* in return by displaying signs and messages on the computer screen. It is clear that the original creator and sender of all the signs and messages is not part of the signification-interaction process going on between the computer and the human user.

This leads to another crucial point as far as icons and glyphs are concerned. They are not a means of communication between the computer and the user. They are a part of the interface, just as the power-on button is a part of the hair dryer. Neither the computer nor the user actually “utter” semograms to pass information to each other. The computer displays and the user manipulates. If the user passes information to the computer at all, this is done basically by moves with the mouse (or other similar input devices, such as track balls or tablets) or keyboard input (textual input or directional input via the cursor keys).

Let me use a metaphor to make this instance of non-communication a little clearer. The computer is an interactive book. Everything is already written when you begin to read. It is just there. You may decide whether to start at page one or take a look at page 42 first. But the book itself does not communicate. It does not tell you the story. It is rather the medium through which the story is passed. And it is furthermore not the book that uses the letters of the alphabet to encode the message. It just displays them for you to read. Whether you as the reader are able to decode and understand the story or not depends on how much your field of experience and that of the author overlap. If you are both used to the same codes and the same cultural units, the communication act between you and the author is likely to be successful.

⁸I agree that this may depend on the individual point of view. That is why the Chapter 4 includes a short section on grammatical mood in the context of human-computer interaction.

It is interesting that in both cases—in the book example as well as in the actual human-computer interaction—the “story” is not told by the original sender of the message (the “author” or the human interface designer). The story unfolds or is actualized in the mind of the reader during the process of reading. This effect can also be explained by the triadic model of the sign (based on Peirce and Eco): the text as a sign vehicle has a certain content; additionally, the sign vehicle creates a new, more developed sign in the viewer’s (or reader’s) mind (interpretant or sense). The literary inclined might like to take a closer look at the works of Hans Robert Strauß and Wolfgang Iser on *Rezeptionsästhetik* ‘aesthetics of reception,’ because this aspect, despite the fact that it is radiating fascination, is beyond the scope of this work.

In this context it may be also appropriate to mention another term, which has become increasingly important lately, especially in New Media-related discussions: *interactivity* refers to the degree of responsiveness of a certain system. A system which does not respond to any kind of input is non-interactive (like watching traditional TV, for instance). A system which simply reacts to input (in which a message is only related to the previous message) is called reactive. In an interactive environment, last but not least, a message is not only related to the previous message but to a number of previous messages and to the relations between them. A conversation between two human beings can be called interactive.

The graphical direct manipulation user interface—the desktop—is typically a fairly interactive environment. This type of interface is highly responsive and provides the user with a number of ways to interact with the computer. The computer, or rather its operating system, reacts to user input, but in a fairly complex manner, taking into account previous user actions, too. In other words, the interactivity of the common desktop represents the *feel* part of the *look and feel* of such a human-computer interface. The look and feel is characterized by (i) the visual appearance of the interface and its elements and by (ii) the functionality and the way this functionality can be accessed by the human user.

The New Media academic Vincent Maher (2006) defines interactivity as “[...] the relation constituted by a symbolic interface between its referential objective,

functionality and the subject,"⁹ in which functionality is understood as the relation between an object and its function.—And the debates about the true meaning of the word and the concept behind interactivity are most likely continuing on in this very moment.

⁹Posted 2006-02-07 at <http://nml.ru.ac.za/maher/?p=7> (accessed 2006-02-22)

3. *Icons: Visual Language or Pictorial Script?*

Doing with images makes symbols.

—Alan Kay

The identity of sign and object makes icons both meaningful and powerful. The object dimension of the icon is responsible for the physical real object feel. An icon *is* what it looks like, actually even more so, considering the combination of physical features with the power of electronic processing. The sign dimension, on the other hand, generates meaning and eventually makes the icon an integral part of the “visual language” or the “pictorial script” of the graphical user interface.

3.1 VISUAL LANGUAGE VS. PICTORIAL WRITING SYSTEM

3.1.1 Visual Language

To use the term *language* in a context like this is a bit tricky since this raises the question whether or not a distinct language is used in human-computer interaction, and whether or not this language is represented by the pictorial signs on the computer screen. In other words: does the “language” used during human-computer interaction processes differ from the native language of the user?

Crystal mentions that at “its most specific level” the term may refer to “the concrete act of speaking, writing or signing [...] in a given situation” with the notion of performance (1997: 213).

Now, as stated earlier, there is no such thing as communication between the user and the computer. The computer does not speak. It does not talk to its user via the icons or glyphs on the screen. Nor does the user make use of icons and glyphs as a means of communication. Signification processes, such as the display of error or confirmation messages as well as any other type of visual information on the screen have nothing to do with speech acts. These messages are not created by the computer itself. They are only displayed according to rules previously programmed by a software engineer in order to provide feedback for the user. It is not the choice of the computer to keep the user informed.

In a more Saussurean approach, semograms and icons seem to come closer to a kind of “visual language.” Consider the brief definition quoted in Sebeok (1994: 107) according to which “a language is a system of signs expressing ideas.” The semograms used within the desktop environment and of which all icons and glyphs are composed are indeed a system of signs, and they are definitely signs expressing ideas. But they are not intended to refer to speech directly. Semograms are not spoken. On the contrary: talking about semograms (or icons and glyphs) to others, or writing about them may actually pose considerable problems. It is often difficult to figure out what to call them, because there is no fixed expression in speech. Thus, when comparing icons as a system of signs to Saussure’s *langue*, the lack of communication between computer and user still remains a problem, simply because there is no speech of the individual (the *parole*) user or computer related to those signs. Semograms are all about *writing* ideas, without the necessity to be realized in speech acts.

If simple semograms or complex semograms, such as icons and glyphs, are anything like language in any sense, they are probably a kind of sign language used by software engineers to represent their ideas in a way that is easy to learn and easy to remember for non-software engineer users. As stated earlier, the original aim was to make the abstract concepts of computer data and functionality visible, transparent, concrete, and—most of all—easier to

remember. Considering this, Crystal's comment on *sign language* and *sign system* gets quite close to the situation on the computer screen. He refers to the "system of manual communication" used by a certain group as an "alternative to oral communication" and gives the traffic control gestures of policemen or television studio directors as examples (ibid., 350). Although I do not think of icons as a sign system used by programmers as an alternative to oral communication, the "sign languages" mentioned by Crystal and icons have one thing in common: they are only used within a very restricted environment and context.

Still, there is one significant difference. According to Sebeok's "species of signs," or sign modes, the signs used in the sign systems mentioned above, such as traffic control or director's signs, are all *signals*: their specific purpose is to trigger some action on the part of the receiver of the sign (Sebeok, 1994: 22). The situation is different with semograms on the computer screen. The user is not forced or especially "strongly encouraged" to make use of them. Instead, icons and glyphs, which represent tool buttons or switches, are operated when needed. Signals are used in the graphical user interface only to provide immediate feedback, as in error messages, for example. Thus, the alert semogram in a critical error message is a signal intended to attract the user's attention.

For a number reasons, to speak of a visual language poses problems because the signs on the screen represent ideas which are not connected to the individual user's language, nor to a specific human interface language. Additionally, these pictorial signs represent written ideas without the information on how to realize them in speech.

3.1.2 Pictorial Writing System

Semograms, as stated above, are signs with semantic meaning, which are used to represent ideas, and which do not necessarily reflect the grammar of spoken language. They resemble and are somehow comparable to ancient cave or rock paintings (*petroglyphs*). There are similarities to early complex scripts, such as Maya or Egyptian hieroglyphs, too. According to Schlobinsky, any script consists of semograms, especially pictograms, at an early stage (2001:

141). To refer to the semograms on the computer desktop as a kind of writing system—as an idea writing system—therefore seems to suggest itself.

Gelb gives a definition of writing, which, in its earliest forms, resembles today's use of semograms to represent ideas or meanings on the virtual computer desktop. He claims that the "relationship between writing and speech in the early stages of writing was very loose;" that is, the written message "did not correspond to exact forms of speech." Although a certain message had only one meaning, and could only be interpreted by a reader in that one way, it was possible to put it into words "in many different ways and even in many different languages" (1969: 11). It was only very much later, by the systematic application of what Gelb calls "phonetization," that writing "gradually lost its character as an independent mode of expressing ideas"; it became a tool of speech in which forms correspond to "exact categories of speech" (ibid., 12).

The use of semograms on the computer desktop is characterized by a rather loose relationship between the pictorial signs and language. A semogram is able to represent an object or an idea independent of any language. The folder icon, for example, is the same regardless of the fact that the object it represents is called *folder* in English, *Ordner* in German, or *dossier* in French—but even so, speakers of any of those languages seem to be able to recognize the idea.

This situation is reminiscent of a myth commonly associated with the Chinese morphosyllabic¹⁰ writing system, namely that of universality. This myth assumes that all Chinese people regardless of their own dialect are seamlessly able to understand written texts of any other dialect or even ancient texts (cf. DeFrancis, 1986). Although this is not completely false, it is also not completely true. In fact, something similar is also possible with alphabetic writing; consider the term *national*, which occurs with the same spelling and similar meanings in French, English, and German. The written form is language-independent, just like the semograms on the screen. But while semograms may work extremely well with different languages, such as English, German, or French, they seem to fail immediately when it comes to different

¹⁰Frequently, the Chinese writing system is wrongly referred to as being ideographic, which is (if at all), however, only true for very early stages in the development of the system. In the very beginnings, the characters were pictorial representations of animals, people, plants and all sorts of other things. But through the centuries they have become increasingly stylized and no longer resemble the things they represent. Today, the signs of the Chinese script are referred to as being morphosyllabic (cf. Schlobinski, 2001).

cultures. An ideographic «owl» semogram, for instance, which could be and actually is used frequently in our western culture to represent ‘wisdom,’ would most likely produce misunderstandings in southeastern Asia, where the owl is considered to be “a particularly brutal and stupid bird” (Horton, 1994: 247). In the same way, the use of semograms incorporating crosses or six-pointed stars on the desktop can offend Arab users (*ibid.*, 246). For this reason, even pictographic semograms can be problematic. Take a look at the folder icon for example.



Figure 3-1: Assorted folder icons.

All the icons in Figure 3-1 represent the regular folder—or at least the regular American folder. On a German system the same icon is called *Ordner*, which can be a bit misleading for the computer novice or computer-illiterate person. The icon actually looks more like something that is called *Hefter* or *Hängehefter* rather than *Ordner* in German. The French might stumble across dissimilarities as well. Yet without the misleading name tag, the semogram is easily recognizable at least as a sort of document container, as something to collect sheets of paper in.

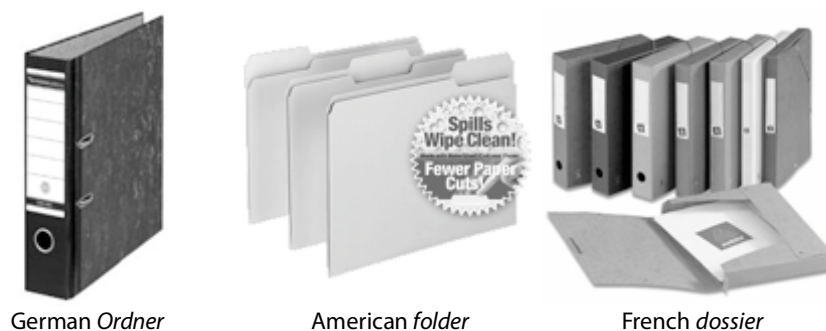


Figure 3-2: Cultural differences.

So there is one pictographic semogram to represent an object that may look different from one country (cultural background) to another. Apparently, cultural differences may make the interpretation of semograms hard and sometimes even virtually impossible.

Another downside of a such a writing system is the lack of transparent concepts to represent abstract ideas without ambiguity. Pictograms may be well-suited to represent objects. Ideograms are predestined to express concepts—even fairly abstract ones, like time, for instance—associated with certain objects or their attributes (a semogram with the pictographic representation of a clock may serve as an ideographic semogram for the concept of time). The more abstract the idea, the more ambiguous is the semogram used to represent it. A writing system such as the set of semograms used in the computer desktop environment heavily relies on

- a certain cultural background, or rather a cultural environment in which similar signs are connected with similar cultural units;
- a considerable amount of background knowledge or experience, because users are only able to identify those semograms which depict familiar ideas (ie. semograms with familiar referents);
- the context in which a particular sign appears, that is the overall design metaphor as well as neighboring signs.

All of this is necessary for the user to be able to recognize and understand icons and glyphs on the computer screen: from the macro-cosmic cultural background of the individual computer user to the micro-cosmic environment in which a certain semogram appears. There is no meaningful sign without a proper context of some kind. Consequently, Raskin is right to note that it is a misnomer to call this type of human-computer interface “intuitive.” Rather than on intuition, the whole interface relies on *familiarity* (2000: 149) and therefore on our knowledge of the world.

The pictorial semograms or idea pictures are a system of signs used within the graphical user interface more or less consistently to express ideas. Like the letters of the Roman alphabet or ancient hieroglyphs, they can be combined to make complex forms. A complex semogram, such as an icon or a glyph, is able to represent a complex idea or a very specific one: you could, for instance “write” two «car» semograms in order to form the complex plural ‘cars.’

Like in any other writing system, writing is guided by a set of rules. However, in the case of our semograms, these rules do not follow the rules of

spoken language. Instead, the syntax of complex structures is based on cognitive aspects and cultural circumstances (such as the figurative meaning of spatial position in Western art and culture or the direction of writing, e.g. left-to-right or right-to-left).

The major difference between this specific kind of pictorial script and other modern or more developed scripts is basically that there is no set of clearly defined base elements (*characters* or *graphemes*). There is no fixed alphabet. Although there is a set of base semograms, namely the one originally developed for the Xerox Star desktop, this set is not closed. It is possible, and actually done, to include new semograms to express ideas.

Apart from that, it is not possible using the rules available for the combination of semograms to form complex constructions to assign arbitrary meanings to any of the base semograms. Depending on the internal structure of a complex semographic construction, the meaning of the individual semogram may be altered, but not arbitrarily. The sense of a certain semogram will always remain closely related to the content depicted by the sign vehicle.

3.2 NO BEST SOLUTION

Unfortunately, both approaches to semograms, icons, and glyphs have their strengths and their weaknesses. Semograms may be all about writing ideas, yet they cannot be referred to as a pictorial writing system without a hassle. Regarding them as a visual language creates other problems.

In this context I will try to find a happy medium, incorporating the best of both worlds. I assume a certain duality of the semogram which results in either a language or script character, depending on the way you look at it. And, as a matter of fact, doing with the *written* symbols on the screen and learning their meanings creates a kind of *visual vocabulary* in the user's mind.

The analysis of icons in this work relies on this duality. Accordingly, the methods applied are taken from both a language-as-writing and a language-as-speech approach. The former can be found in all parts concerning the decomposition of signs and the analysis of their internal structure; the latter is found in the analysis of change processes (e.g. language change).

4. *Semiotic Aspects*

Myriorama *n* a picture made of a number of different parts which can be arranged in many ways so as to form different scenes. From Greek roots meaning ‘countless’ and ‘view’. One of the citations avers that with sixteen cards, 20,922,789,888,000 different views can be made.

—AskOxford.com, *Word of the Day*

Most semograms used within the graphical direct manipulation interface are complex constructions with two or more constituents. Each constituent may represent an idea on its own, which in combination and interaction with each other produce a complex meaning. Very similar to those ancient cave paintings found in places like Lascaux in France, icons “tell stories”—though on a different type of canvas. There is no fixed representation for those idea pictures in spoken language and no fixed syntax for their combination which follows the rules of speech. Yet their meaning composition, that is their internal structure, follows certain rules. The three divisions of semiotics can be applied to semograms:

Syntactics describes the morphology or internal syntax of complex semograms.

Semantics refers to semograms and their meanings.

Pragmatics applies to human-computer interaction patterns based on the direction manipulation of (complex) semograms.

Syntactics describes the internal structure or syntax of complex semograms, the formal relations between signs. *Semantics* is about the meanings of semograms. It describes meaning composition and the situation or context in which a semogram becomes meaningful. *Pragmatics* refers to the relation between semograms and their users; it is concerned with human-computer interaction via complex semograms, such as icons and glyphs. All these three divisions are closely related to each other and may overlap in some cases. Semantics and syntactics, in particular, tend to be hard to distinguish sometimes, as you will see below.

4.1 SYNTACTICS

The term *syntactics* refers to the branch of semiotics that deals with the formal relations between signs. Since, as you will soon see, icons and other complex semograms are constructed similarly to words, the term *morphology* is used instead. Morphology is about the structure or forms of words (cf. Crystal, 1997: 249). A morpheme is the minimal unit in a language that carries some meaning. As a matter of fact, all words are composed of at least one morpheme. The morphology of semograms within the graphical human-computer interface is quite similar, only instead of words we have complex semograms, such as icons and glyphs, and their pictorial constituents. Each semogram within the whole set of semograms may either represent a whole icon (or glyph) or a part of one. Some semograms can only be found as constituents of larger constructions; others may stand alone as icons (cf. proto-icons¹¹ illustrated below in Figure 4-1).

However, there is a considerable difference between *word formation* and *icon formation*. As far as words are concerned, there is a large number of different types of morphemes—free and bound morphemes, derivational and inflectional morphemes—and equally many processes for their combination, such as suffixing, prefixing, infixing, and compounding. Compared to this, the range of

¹¹Note: the example icons in this chapter are prototypical models of real existing icons. Their purpose is to illustrate and allow the application of principles without having to worry about designs and styles.

different types of constituent is rather limited, speaking of icons and the like. Terms like *prefix* or *suffix* reveal the orientation on a horizontal scale, a linear construction. Pictures are not linear. The position of an element within a picture is governed by different rules.

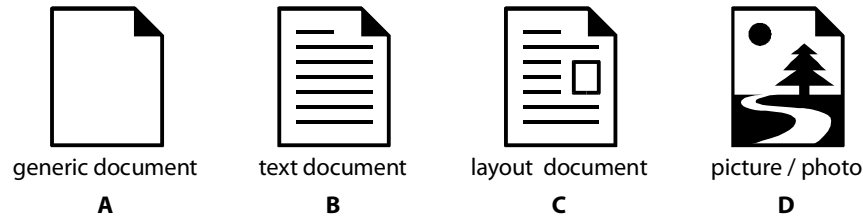


Figure 4-1: Simple and complex icons.

This directly leads to another crucial difference between written words and pictorial representations: the spatial organization. While in both cases the terms *morphology* and *internal syntax* can still be used as synonyms, they refer to different concepts. As far as language in general is concerned, the organization of writing is governed by the logic of time in the same way as speech. A sequence of elements is a temporally governed arrangement. Thus, *Tim and Toby are friends* is not the same as *Toby and Tim are friends*. The organization of a picture, on the other hand, is governed by the logic of space. Every picture is a spatially organized arrangement in which all elements exist simultaneously (Kress, 2004: 1/2), so in a picture or complex semogram there is no before or after. Everything is visible at the same time. It is the position within the internal structure that contributes to the meaning. If something appears in the center of the picture, it is most likely central to the overall meaning.

4.1.1 Spatial Analogy

The internal syntax of complex images, such as icons, is guided by a Western tradition in which the position of each part of the whole composition has a figurative meaning attached to it.

Figure 4-2 illustrates these figurative meanings associated with certain spatial positions (cf. Horton, 1994: 52, and Kress & Leeuwen, 2001: 188/193). Apparently, these position-meaning connections are consistent throughout Western art and literature. (Horton, 1994: 51/2).

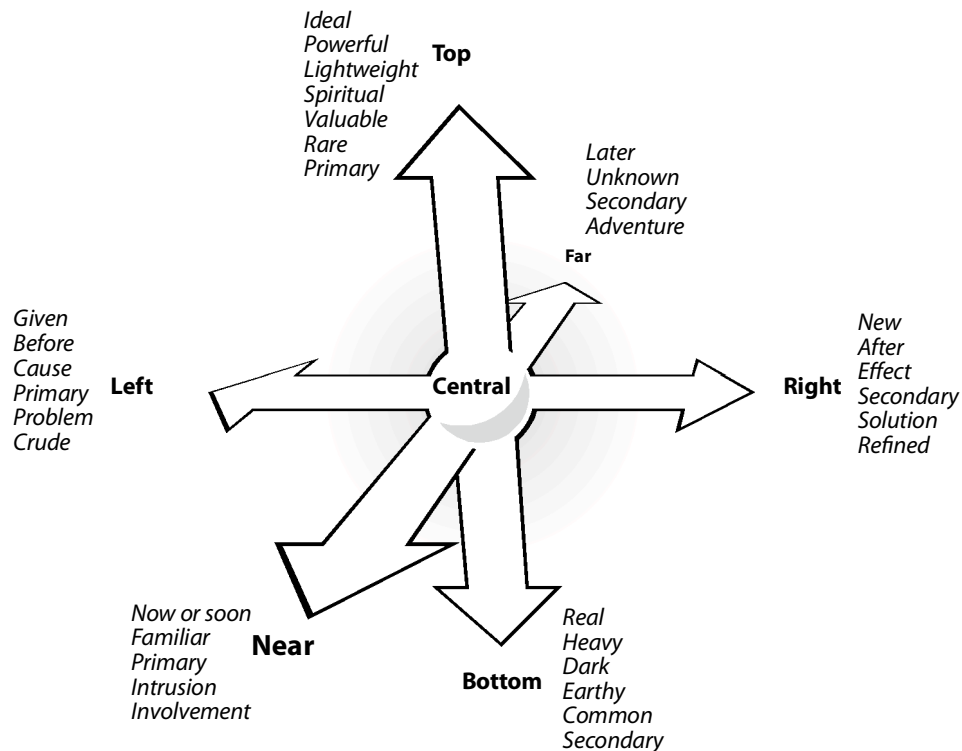


Figure 4-2: Spatial analogy: the figurative meaning of position.

The meaning of vertical position is almost universal (Horton, 1994: 52). Everything in life is organized on a vertical scale. In English, as well as in a number of other languages, common expressions reflect this: there are the ups and downs in life, software updates, the down-to-earth guy, and the high-minded person who feels down sometimes, to mention just a few of them. The horizontal position indicates movement. Left-to-right generally implies forward movement, whereas right-to-left is generally accepted as referring to backwards movement (consider play, fast forward, or rewind buttons on a tape recorder; position and direction play a major role in arrow signs in general). Information on the left hand side of a painting or a visual arrangement is commonly understood as given or already known, whereas everything on the right hand side is considered to be new. Something that appears in a central position within the picture is most likely also central to the overall meaning.

Obviously, morphology and syntax overlap. It is generally hard to separate the two of them clearly. Morphology is actually a part of syntax. And one can even be the evolutionary consequence of the other; or as Talmy Givon puts it: "Today's morphology is yesterday's syntax."

Within a complex semogram syntax and morphology are somewhat different, since everything exists at the same time, only in different positions. The constituents of a visual arrangement are therefore described along with and on the basis of their spatial positions.

4.1.2 The Constituents of Icons

In fact, there are only two different types of constituent: *stem* and *marker*. The *stem* is usually a generic, unmarked semogram with a general meaning; it is the biggest constituent (in terms of size) of the icon as well and is therefore responsible for the overall shape of the icon. Interestingly enough, not all semograms may actually occur as stems and are as such meaningful as an icon on their own without further markers. Some semograms can only be found as attributive markers (sometimes even within only a certain semographic environment).

A *marker* is a semogram which is attached to the stem or other markers in order to contribute to the overall meaning of the complex construction. It may, for instance, specify the general meaning of a generic stem.

Of course, it would be possible to set up even more individual elements, based on the contexts in which they appear. Yet the reason for my twofold set-up is simple: the function of each element can be narrowed down to either of the two aspects (stem/marker). A certain semogram may either contribute, as a stem, the generic base meaning of a complex construction, or attribute to it, that is specify a certain base meaning as a marker. The resulting complex construction, again, may either act as a generic stem, or as a specifying marker. This iterative system allows us to create clear structure diagrams of idea pictures. Additionally, it reflects the common cognitive process of image decomposition into smaller, meaningful parts (cf. Horton, 1994: 18).

As a matter of fact, the situation is somehow comparable to Chinese written characters, or *sinographs*. A complex sinograph can be analyzed and decomposed into smaller parts, so-called *subgraphs* (cf. Schlobinski: 124ff). Consider the following sinograph: 酒 ‘wine, alcoholic drinks;’ it consists of a 氵 ‘water’ character (short form of 水) and a 酉 ‘wine jug’ character (ibid., 127). The

sinograph and its meaning are a result of different sub-signs in combination. In a way, the internal structure, that is the meaning generation via combination of signs in a spatial arrangement, is clearly reminiscent of a complex semogram on the computer screen (or rather the other way round).—Similarities between computer icons and Maya hieroglyphs are pointed out by Honeywill (2000 [1]).

In the following illustration (Figure 4-3), two proto-icons are analyzed. The relations between their constituents are drawn as tree diagrams. The diagrams start at the top with the complex form. Branches lead to simpler forms. At the bottom of the diagram, the individual constituents of the icons are organized from left to right, from generic to more specific semograms.

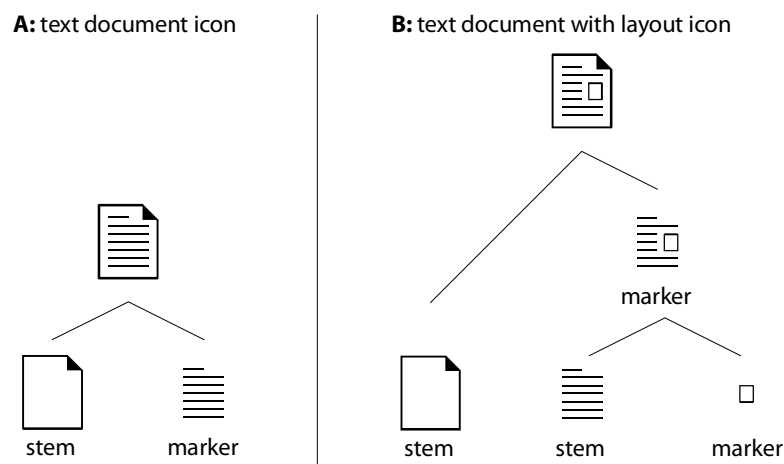


Figure 4-3: Tree diagrams of icons (complex semograms).

The text document icon *A* is the simpler one of the two. It is composed of two semograms: a «document» stem semogram, which represents the generic ‘document’ meaning and a ‘text’ marker, which specifies the general meaning. Compared to this, the structure of the text document with layout icon *B* is more complex. The relations between its constituents are analyzed in two steps: (1) there is a generic ‘document’ stem semogram and a complex ‘text with layout’ marker; (2) this complex marker is composed of a generic ‘text’ stem and a ‘picture’ marker, which together represent the meaning ‘text with pictures’ or ‘text with layout.’

Now you might ask why the little rectangular shape is considered to be a part of a complex marker and not the marker of a complex stem. It is certainly possible to draw a tree diagram in which the rectangle specifies a complex ‘text document’ stem, but this is not really reasonable. Of all three constituents, the

«rectangle» semogram is most generic one. A rectangular shape can mean anything. Only in combination with the 'text' semogram it conveys its specific meaning, namely that of a picture embedded in a text. This makes it a kind of bound morpheme; in contrast to the 'text' semogram, which can be frequently found on its own as a tool bar glyph. Additionally, the 'text' semogram specifies the data type of the document. The resulting icon is the icon of a file type *document* of data type *text*. Therefore, it seems to be logical to draw a tree diagram like the one in Figure 4-3.B, in which the data type marker is complex and the stem is simple.

But not only the rectangular shape is a bound morpheme; the whole complex marker is a bound morpheme as well, and it can only be found as a part of text-related document icons. In this use, the complex 'text with layout' marker is reminiscent of an affix.

Crystal refers to affixes as a type of bound morpheme which, in a morphological process called affixation, adds grammatical or lexical information to a stem (Crystal, 1997: 12). Traditional affixes, such as prefix, suffix, infix, etc., are organized in a linear manner, and they appear, as their names suggest, in front of a stem, at its end, or somewhere in the middle. Their usage reflects the linearity of spoken language. And this is also why, if you consider English, for instance, they typically do not overlap.

The semograms within a complex pictorial sign, on the other hand, are part of a spatial arrangement. So the position of the individual element is defined by at least two coordinates (within the two dimensions of the picture). Additionally, in overlapping constructions, visual codes (e.g. framing, perspective, or relative size) may be used to introduce a third dimension. In order to be able to transfer the concept of the affix to this spatial organization, in a discussion, Schlobinski proposed the introduction of the *adfix* as a term and a concept. The adfix does not come with the desire for a certain position; it just adds lexical information to a stem semogram.

The composition of icons using a stem and a marker does not only work with document icons. Consider Figure 4-4. The internal structure of this prototypical folder icon is the same as in the document icon examples above. The generic 'folder' stem is specified by the 'document' type marker. It is fairly interesting

that the ‘document’ semogram, which appeared as a stem in the former examples, this time takes the place of a marker. Similar icons are used on Linux, Mac OS, and Windows desktops to indicate the folder where users can store their documents.

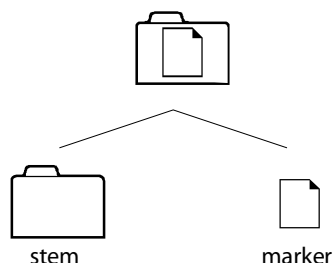


Figure 4-4: *The Documents folder.*

While generic or default icons may only be mono-morphemic, the average desktop icon is a complex construction with two or three constituents. According to Honeywill, however, even complex icons rarely exceed four constituents (2000 [2]: 9).

Drawing tree diagrams for regular icons is fairly simple. The relations between their constituents are often transparent and a sort of *from-generic-to-specific* rule can be applied easily. But icons sometimes do contain elements that are irregular and do not fit readily into the standard classification.

4.1.3 Irregular Constituents

Although only two types of constituent are distinguished, it may be hard at times to draw a proper tree diagram. This is the case, when an icon contains elements that do not seem to be semograms in a narrower sense.

Take a look at Figure 4-5. There it is, again, a text document icon, similar to those in the previous examples. But does it look irregular? It seems to be an ordinary icon, except for that small badge which contains the letters RTF (short for *Rich Text Format*¹²). Such small badges or tags, which provide extra information on the data type, are actually quite popular, being a design technique that seems to be used particularly with icons representing document types which are available on and interchanged between different operating

¹²“RTF (usually referred to as such) stands for *Rich Text Format*, a document file format developed by Microsoft at least as early as 1987 for cross-platform document interchange that most text processing programs are able to read and write.” (cf. Wikipedia.org, 2005: *RTF*)

systems, such as pictures, texts, and documents containing both. Common badges are, for instance, JPG (or JPEG), GIF, PDF, MOV, and MP3. As a matter of fact, this should be of no interest to the average computer user. The data type information goes beyond what is needed in terms of the desktop metaphor. Users, in general, only need to distinguish between different types of document, such as, for instance, pictures, music, spreadsheets, and text. Obviously, the designers are aware of this fact, so the badge is set apart visually from the rest of the icon. It looks as if it was pinned on later. The question is which role this item plays in the creation of the overall icon meaning.

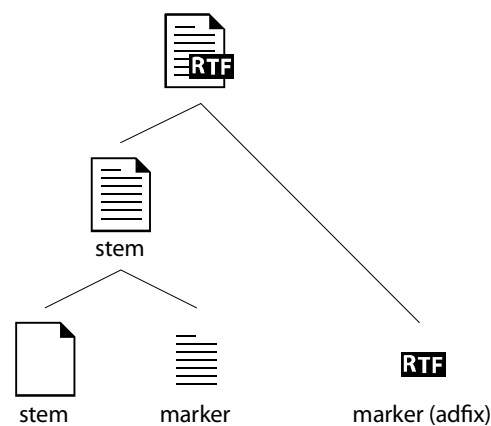


Figure 4-5: Drawing a tree diagram for an irregular icon.

In the example given in Figure 4-5, the icon is analyzed as follows: the complex ‘text document’ stem, which is composed of a generic file type ‘document’ stem and a data type ‘text’ marker, is marked as a ‘text document of RTF data type’ by the badge. Analyzing the icon as a generic stem with a complex marker would not make very much sense, since the RTF badge refers to a specific file data format rather than to text. Thus, it does not specify the ‘text’ semogram but the whole document icon and describes the data type of the corresponding document.

This badge has its origins in the pre-GUI way of naming files on a computer. Each filename had—and often still has—a filename suffix or extension. This extra set of characters “is appended to the end of a filename to allow computer users (as well as various pieces of software on the computer system) to quickly determine the type of data stored in the file” (cf. Wikipedia.org, 2005: *filename extension*).

Aside from those computer-related technical details, the badge causes another semiotic problem: it is not a typical semogram; and if it is one at all, it totally lacks *idea picture-ness*. It even introduces a new mode to the icon, because it is not pictorial (pictographic or ideographic mode, for instance), but, as a simple abbreviation, plain written text (text mode). Somehow, the thing seems to have nothing to do with the rest of the icon. But that is not true. The RTF badge, for example, can only be found on text-related document icons, not on pictures and the like. It is therefore bound to a certain context. Each badge requires, and only makes sense on, a specific type of document icon. In the same way as the RTF badge is only found on certain text document icons, the JPG badge only appears on pictures document icons, for example. So there is and there is not a connection between the icon and the badge. It rather belongs to the filename. Although it appears to be a part of the icon, a constituent of the complex semogram, it remains the same old filename suffix; and a perfect adfix.

Another equally irregular and familiar constituent of document icons is probably the *application identifier*. It can be commonly found in the top left area of the icon. The most typical examples of document icons of this structure are icons of Microsoft Office documents, such as Word documents, Excel spreadsheets, and PowerPoint presentations.

The application identifier represents the miniaturized icon of the respective application. Accordingly, it depends on the application's icon whether the identifier is textual or pictorial. Similar to the data type marker, it is set apart from the rest of the icon by framing.

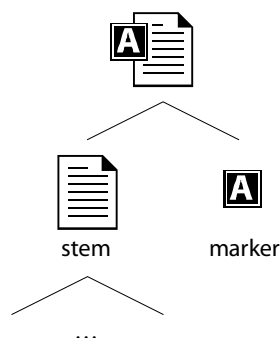


Figure 4-6: The application identifier as marker of causal relation.

The interesting thing about this marker is that it establishes a causal relation between the document and the application. Added to a complex stem it

attributes additional information on the application that was used to create this particular document; for example: an ‘A text document’ or a ‘text document made with A.’

In contrast to the document type marker (adfix), the application identifier is not a bound semogram. Consider the following example taken from Microsoft Word (Figure 4-7).



Figure 4-7: Application icon and application identifier.

Typically, the application identifier is a (causal) marker which is derived from the icon of the corresponding software application.

4.1.4 A Special Type of Marker

The *stem + type marker* construction makes it possible to create visual variations on a theme, like a sort of *document paradigm*, for example, with a variety of different types of document icon, such as text, picture, and music. However, some icons, such as application icons, are often unique on the desktop and are not part of a group of icons which (are intended to) resemble each other.



Figure 4-8: Apple Macintosh based application icon designs (System 7 to OS 9).

The two proto-icons shown in Figure 4-8 represent application icons. Both are based on regular designs of classic Mac OS application icons. The icons are composed of a rectangular shape as a stem and “something else.” The rectangular shape represents a sheet of paper, a document (yet without the otherwise typical dog-ear) in both icons. Although this looks like the same *stem + type marker* construction we have met in earlier examples, these icons do not represent specific types of document. Instead, they represent something which can be used to *create* documents.

There are three semograms in the complex construction illustrated in Figure 4-9. Two of them are familiar, namely the ‘document’ semogram and the ‘text’

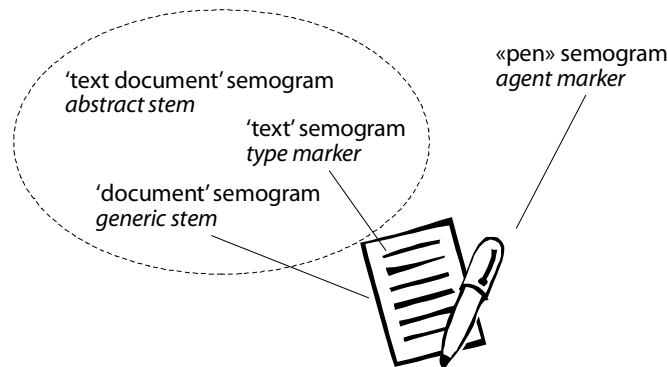


Figure 4-9: The constituents of the Text Editor application icon.

semogram. Although the 'text' semogram works as a type marker for the 'document' semogram, the situation is a little bit different this time. The resulting complex 'text document' semogram does not represent a concrete thing, such as a text document, as the icons in previous examples did. The meaning is more abstract. The semogram has to be read rather ideographically, as it represents the idea of a text document which the user might want to create or edit, using the application represented by this icon. It is a symbol (in the Peircian sense) for the intention of the user. The complex semogram is a sort of *abstract stem*. It does not refer to an actual document (in which case it would have to be interpreted in pictographic mode) but to all possible documents, and to the idea of a document to be created or edited with this application (ideographic mode). The aspect of creation (or editing) by the user is visualized through the «pen» semogram, another rather ideographic semogram. Similar to the agent nominal suffix *-er* in current English, this semogram works as an *agent marker*. It adds the meaning 'creator' or 'editor' to the abstract, ideographic 'text document' stem.

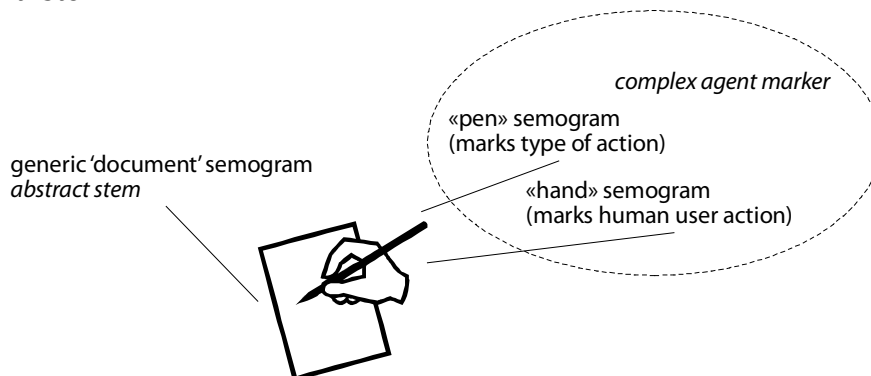


Figure 4-10: The constituents of the Generic Application icon.

The design of the generic application icon (Figure 4-10) follows a similar design strategy, only instead of using a simple «pen» semogram as agent

marker, a complex semogram, composed of a pen and a human hand holding the pen, is used as an agent marker. The «hand» semogram, which metonymically represents the human user, marks the agent. The semogram is a typical *synecdoche*: a form of metonymy in which a part of something stands for the whole (such as, for instance, “hand” for “sailor” as in “all hands on deck,” or “crown” for “monarch”). The «pen» may mark the type of action, such as writing or painting, usually in combination with the abstract stem. Within the complex agent marker, the hand seems to play a more important role: it appears larger than the pen; furthermore, the pen is stylized to a degree where almost no details are recognizable, which makes it rather generic, without a specific function (the same semogram might be used to represent a drawing application as well as a text editor). You can, in fact, only surmise that it is a pen or pencil from the way the hand is holding it. Apart from that, since the stem is generic, that is unmarked, in this case, the pen indicates a generic or prototypical user action. That is probably why a simple pen is used in this semogram. A pen is less marked than, for instance, a brush.

Let me mention one more thing about this complex agent semogram. Take another look at the «hand» semogram. There is something about it that is quite noticeable. The depicted hand is a right hand, and therefore actually that of a right-handed person since a left-handed person would in all likelihood hold the pen (or brush or whatever) in the left hand. Furthermore, the hand is white. In a monochrome drawing like this, white was probably chosen for reasons of contrast and legibility, but you will see later that skin color may play a role.

Now, try to imagine the same proto-icon with a left-handed complex agent marker. The resulting icon would surely seem to be more marked than the one displayed in Figure 4-10. Consider the following two icons from the Macintosh System 7.5 desktop in Figure 4-11.



Figure 4-11: A left-handed icon on the Macintosh System 7.5 desktop.

Obviously, the designer of the *Generic desk accessory*¹³ icon felt that a left-handed semogram is more marked, as well. Consequently, the left-handed agent marker marks a very specific type of application conforming to a particular programming model (cf. Wikipedia.org, 2005: *desk accessory*). The reason why the left-handed icon is commonly perceived as special or unusual is fairly obvious. As a matter of fact, left-handed people represent a minority, as opposed to the majority of people who are right-handed. As a rule, representations of exceptional concepts or objects are marked. The reverse conclusion surely is that a generic and unmarked semogram must represent something that is commonly accepted as general or at least highly “mainstream compatible.”

Interestingly enough, there is a second interpretation of the left-handed icon in Figure 4-11. Typical desk accessories include, for instance, calculators and calendars (see footnote). All of these are usually operated on the side, while primarily working with, for example, something like a spread sheet. Imagine a right-handed person doing calculations. While the figures are written down on the paper using the right hand, the equations are typed on the calculator using the free left hand.

Apparently, the left-handed agent marker does not only mark the generic desk accessory icon as a special type of application icon, but also as one representing a minor application which can be operated on the side, or as a sort of supporting tool.

From a morphological point of view, both types of agent marker—simple as well as complex—are bound morphemes. While the simple «pen» semogram can be found as part of a document icon, without the notion of an agent marker, as well, the complex «hand holding a pen» semogram does only appear in the function of an agent marker and may as such be regarded as a kind of agent adfix.

¹³On the old Macintosh operating systems (up to system 7.5), *desk accessories* are very small helper-type applications which could be run concurrently with any other application on the system. This provided a small degree of multitasking on a system that initially did not have any multitasking ability at all. Typical desk accessories include calculators, alarm clocks, and calendars. (see Wikipedia.org, 2005: *desk accessory*)

4.1.5 A Very Small Marker

A characteristic feature of document icons and of the generic document semogram itself is the dog ear. While its origins are unclear, it reflects the common practice to dog-ear pages in books, magazines, and the like in order to make it easier to find these marked pages later. The position of the dog ear varies. Most document icons are tagged on the top right, and sometimes the dog ear can be found in the bottom right corner. But document icons without a dog ear are very rare. These rare cases include for example the NeXTstep document *miniwindows* and all Apple Lisa document icons (cf. Lineback, 2002, and NeXT Computer, 1991).

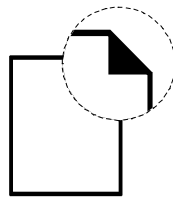


Figure 4-12: *The dog ear.*

Apart from that, a plain rectangle, especially if in black and white, would be hard to recognize as a sheet of paper. Without further details, such a rectangular shape could be practically anything (at least anything that is rectangular, that is). Apparently, the dog ear has some advantages over other types of marker, such as topic-specific stamps, for example. It is more general and there is probably less cognitive activity needed, such as for categorization.

The question is, of course, whether this semographic feature is pictographic or ideographic. In a way, it is both. Actually, the «dog ear» semogram represents a dog ear and also has the meaning 'dog ear.' Yet, since it works as a marker, it partly has ideographic character as well. It marks a rectangle as a sheet of paper. Still, the dog ear is not drawn as a separate branch in the tree diagrams, because it is a fixed component of the document semogram; it cannot exist in isolation or on anything other than a document icon.

4.2 SEMANTICS

Semantics is the branch of semiotics and linguistics devoted to the study of meaning. But meaning is an extremely complex phenomenon, because

it depends on a considerable number of factors inside and outside a certain sign. Eco describes meaning as a “cultural unit,” which can also be recognized as an “intercultural unit” (1977: 67). Such an intercultural unit remains constant or invariable regardless of the linguistic sign with which it is signified. In Eco’s example, the word (morpheme) *dog* does not denote a physical object but a certain cultural unit which remains the same if the word is translated into German *Hund* or French *chien* (ibid., 67).

This is an interesting aspect and it can be applied quite nicely to the use of semograms on the virtual computer desktop as well. All semograms and icons actually represent cultural units rather than certain physical objects.

It has been mentioned a number of times that semograms, because they are signs, have meaning. The meaning of a complex semogram, such as an icon, has basically two dimensions: (1) the internal structure and (2) the external context.

The internal structure or syntax (or morphology) of a complex semogram, such as an icon or a glyph, is the combination of its constituents. It is defined by how the constituents are combined, as well as the spatial position, size, color, etc. of each constituent. The external context is provided by the whole desktop, by everything present on the screen. This involves design metaphors (e.g. the desktop metaphor) as well as neighboring glyphs or other icons, for instance. Finally, it is the interaction between internal structure and external context that creates the meaning—in the mind of the user. As a general rule, a semogram, whether complex or simple, has a specific meaning within a certain context, because its meaning is interpreted within and dependent on this particular context (recall Figure 2-3).

4.2.1 The Context

While the base meaning of a semogram is *encoded* in its internal structure, a larger context is needed, however, to interpret and decode this meaning (cf. Figure 4-13). As far as the graphical user interface is concerned, this context is created by the use of metaphors—so-called design metaphors—which create a meaningful environment for semograms.

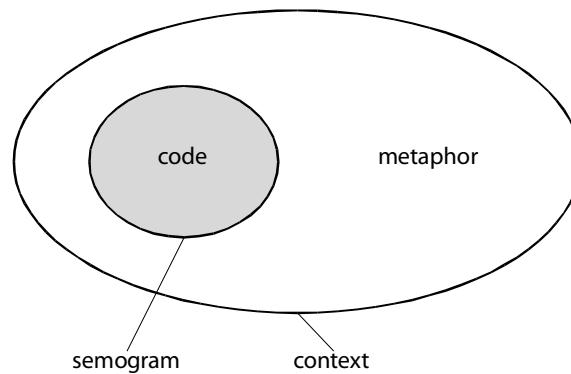


Figure 4-13: Code and metaphor.

The metaphor, as described above, is the general framework within which the individual semogram acquires its specific sense. It provides the key needed to decode the semogram and understand its meaning. But what is this metaphorical context? Take another look at Figure 2-3, where the same sign represents the number “13” in one context and the letter “B” in another. The following example illustrates how the interpretation of a simple geometric shape is altered by different contexts.

It is the same circular shape—same size, same color—in each of the four images in Figure 4-14. Depending on the neighboring shape(s), the round object is interpreted differently. The environment of a sign seems to affect content and sense of the sign vehicle. Of course, this geometric figure is not a real semogram. But the same is true of semograms as well. Imagine encountering the «ice cream» semogram on your computer desktop. Presuming you were able to recognize and identify it as an «ice cream» semogram, you would surely consider rather out of place among all those office items.

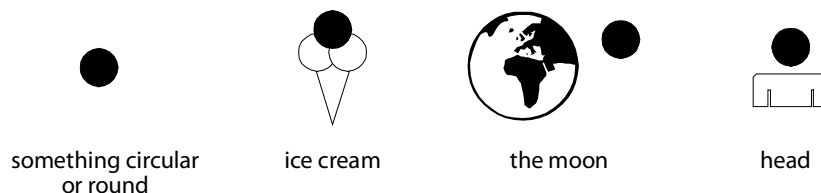


Figure 4-14: The context creates specific meaning.

Apparently, a human observer is likely to expect a certain object within a certain environment or in the neighborhood of other similar objects. “Expect” is the keyword, here. Contextual metaphors trigger expectations on the part of the user; the visual vehicle of the metaphor seems to require certain signs in order to work and vice versa (this is true of the whole desktop, as well as for each

complex semogram). Something unexpected is likely to be misleading or even unintelligible; at least it is perceived as being odd. Obviously, the context metaphor determines the semogram paradigm. It is a little bit like an Odd One Out game: some semograms simply do not belong in a certain context. If they appear in a complex construction anyway, this construction is considered to be ill-formed. The desktop metaphor, for example, requires icons that resemble those items commonly found on the average desktop or in the average office. Consider the following three semograms: «document», «folder», and «shoe box». Which one of these three does not belong? Of course, it is the «shoe box» semogram, because it violates the desktop metaphor, there being no shoe boxes on a desktop. It therefore appears to be odd and misleading as well. A regular user would surely wonder about its meaning. Now consider a kind of personal photos metaphor, and again with three semograms: «album», «camera», and «shoe box». Within this context, the shoe box makes sense, because a lot of people collect unsorted photos in a shoe box before sorting them and sticking them in an album. Within this context metaphor, the shoe box acquires a fairly specific meaning as a ‘container for unsorted photos’ as opposed to the album, which represents the ‘container for sorted photos.’

4.2.2 The Internal Code

While much of the meaning is context-dependent, or at least context-sensitive, a great deal of the meaning generation takes place inside a complex semogram. There are a number of strategies to place its constituents in meaningful relations to each other. The structure of a complex semogram, such as an icon, does not necessarily imitate reality; it is a conventional visual arrangement, based on visual codes. According to Kress, all visual communication is coded, and it “*seems* transparent only because we know the code already, at least passively” (2001: 32). In Eco’s theory, codes “insofar as they are accepted by a society, set up a ‘cultural’ world” (1977: 59 – 62). The code establishes the correlation of the expression with a certain content and in this way produces the rule to generate a token, an instance of a sign in a communicative process (*ibid.*, 50). The internal meaning of a picture or pictorial

semogram is encoded with respect to three aspects of individual elements within the composition (see Kress & Leeuwen, 2001: 183).

- The *information value* of elements results from their placement and the specific informational values attached to the various zones of the image (cf. Figure 4-2 on spatial analogy).
- *Saliency*. Individual elements are made to attract the viewer's attention to different degrees, as realized by such factors as placement in the foreground or background, relative size, contrast in tonal value or color, differences in sharpness of form, etc.
- The presence or absence of *framing* devices disconnects or connects individual elements of the image, signifying that they belong or do not belong together in some way.

Thus, the *relevance* (for the overall meaning) of individual constituents within a complex construction depends on their position and saliency as well as of possible framing devices around them. The meaning of a specific constituent, on the other hand, can be derived from its appearance and mode (pictographic or ideographic) as well as from neighboring constituents because these neighboring constituents form a kind of internal context in which the individual part acquires a specific meaning.

Consequently, the internal code of a complex semographic construction is generated by (1) the composition and design rules used to assign a certain relevance to the individual constituent and (2) the internal context created by the individual neighboring parts, and, finally, by (3) the choice of sign vehicles with their contents (cultural units).

Most codes are so familiar that we do not even recognize them as codes. All the proto-icons given in the morphology section are highly coded images. Each of them involves a number of codes, such as simplification, use of geometric forms to indicate certain meanings, etc. But we have become used to simplified images, in which, for instance, vertical lines may indicate text and a triangle may represent a folded paper corner.

Apart from that, codes are used even in places where we probably would not expect them. Even the perspective in which something is drawn involves code.

The linear perspective, nowadays commonly called “vanishing point,” was invented in the 15th century by Filippo Brunelleschi (Chandler, 2002: 183). It represents a “geometrical technique for the representation of objects in space” (ibid.). Linear perspective is an important historical invention. Nothing like it can be found in earlier drawings, a fact from which Romanyshyn (in Chandler, 2002) concludes that “men and women in earlier ages simply did not see in this fashion” (ibid.). As a “style of vision,” linear perspective is a convention for the pictorial representation of space in a “natural” way. We are so accustomed to this form of representation that we are not usually conscious of the code at all. Yet particularly the Renaissance code of central, one-point linear perspective reveals something very special. It is not only a technique for achieving the illusion of depth in a two-dimensional drawing; it is “a pictorial code reflecting the growing humanism of the period, presenting images from a single, subjective, individual and unique visual point of view” (ibid., 185).

Although the key for the code is delivered via the context, still a great deal of background knowledge is required to understand the meaning. However, in daily contact with coded images we see and learn new images all the time and this expands our background knowledge step by step and consequently increases our degree of picture literacy.

4.2.3 Meaning Emerges from Structure

It was stated earlier that pictures in general do not follow the same temporal linearity as written text. Yet it is possible to depict temporal or causal relations. A small marker which instantiates a causal relation between a document and its application (application identifier) has already been introduced. And there are even more complex examples. But since there is generally little need for icons to indicate temporal or causal relations, such a complex semographic construction as the following example is rare. The ‘copy’ glyph in Figure 4-15 is taken from the CD/DVD burning software Roxio Toast 6 Titanium.

The ‘copy’ glyph is a complex construction which consists of three semograms. The base shape is created by the two «CD» semograms. They both

appear to be connected by an «arrow» semogram. The spatial position of each constituent contributes to its meaning.

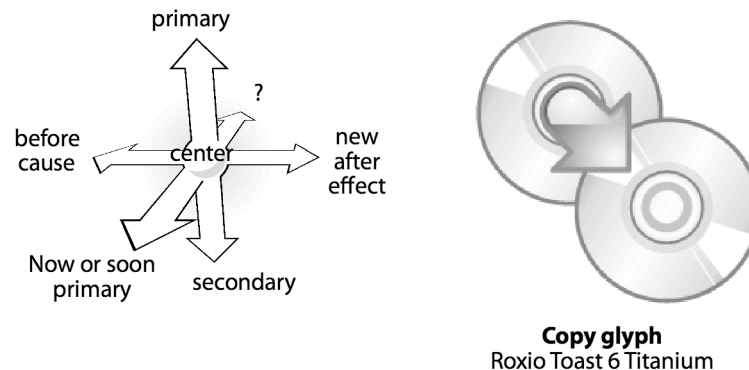


Figure 4-15: A glyph showing causal and temporal relations.

Let's start with the diagraphic «arrow» semogram. It appears top left of the center of the whole construction. And it is central to the construction, since it is basically the carrier of the 'copy' meaning. The arrow depicts the movement of data or "information" from one CD to another.

The two «CD» semograms are pictographic representations of CDs or CD-ROMs. But there is an ideographic mode involved as well: one of the semograms represents the information stored on the CD, and which is to be copied onto a new CD, and the other semogram represents a blank CD, onto which the data is to be written. One of the two «CD» semograms appears in front of, or above, the other one. Because of the spatial position and the arrow pointing to this CD we can assume that the uppermost CD is more important. The most important element in this construction is, however, the arrow. Its semantic dominance is reflected by its spatial position: its central and on top. Yet the CD in the background is important, too. After all, it represents the source of information. This importance is reflected on the horizontal as well as on the vertical axis.

The 'copy' glyph relies on two reading orders that are typical of Western culture, namely left-to-right and top-down. The purely temporal aspect is arranged on the vertical axis: the CD which contains the data or information comes first. The lower «CD» semogram represents the second step, that is the blank CD, onto which the data is copied.

The cause and effect relation is realized in the horizontal dimension of this construction. The new CD is the result of the copy process. Consequently, it is

depicted on the right. Whereas the “old” CD, which was there before and which contains the data is depicted on the left.

Thus, even though everything in a picture takes place at the same time, it is possible to depict ideas that are based on processes with a beginning and an ending.

4.3 PRAGMATICS

Pragmatics is the branch of semiotics which deals with the relation between signs and their users. In this context it refers to human-computer interaction via icons and glyphs within the graphical direct manipulation interface.

Now, as already stated above, there is no communication between the human user and a computer. Neither the human user nor the computer *communicates* via icons or glyphs; there are no semographic “utterances.” The computer merely presents pre-defined messages, such as any kind of textual, visual, and acoustic feedback, to keep the user informed; to make everything visible on-screen. The human user, on the other hand, just works with the graphical symbols on the screen.

4.3.1 Interaction Patterns

Icons (and to some extent even glyphs) are designed to resemble and behave like “real things.” Users are encouraged to think of icons, in particular, in physical terms, as of objects with properties and behavior. Hence, typical interaction patterns follow familiar concepts derived from the real or, rather, physical world beyond the computer desktop. The desktop metaphor transfers traditional (familiar, vehicle) object manipulation methods from the concrete world to that of abstract software data (unfamiliar, tenor).

In Apple’s *Lisa Office System* user manual (1984), a whole chapter is devoted to “Working with Icons.” Typical human-computer interaction patterns, that is user interface pragmatics, are described. And most of them are still up-to-date and valid for any other major operating system, such as, Apple Mac OS or

Microsoft Windows. As far as human-computer interaction via the computer desktop is concerned, there are always two basic steps (*ibid.*, 52):

- *First you select.*
- *Then you do something.*

Selection is followed by the process of manipulation; this pattern is always the same, regardless of the complexity of the user action. Complex actions are performed by iteration, that is, the small pattern is repeated. In other words, the essence of the user action is: point at what you are interested in and do what you want with it.

In linguistic terms, the *object*¹⁴ (the icon) comes first; it precedes the *verb*, namely the user action. This OV interaction pattern is fairly transparent. It works because everything is visible on-screen at all times and users can point at what they see. There is hardly any need to remember anything.

This interaction pattern contrasts with that of older text-based command line interfaces. Within a command line environment, the user had to decide what to do first, remember the appropriate command, and eventually type the whole command line with parameters on the screen. The resulting VO structure (the command as verb, followed by parameters as objects) is opaque—as is the whole type of interface. Nothing is visible and users have to recall sequences of commands and parameters.

Opening, for instance, a text document in order to edit its contents is as easy as point-and-double-click¹⁵ on a modern computer desktop. The user spots the icon on the screen (object) and double-clicks it to select and open (verb or action) it into a window. Now the contents, in this case the text, are visible on the screen and can be edited. All the human user has to do is remember that a double-click means ‘open.’

Within a command line environment the situation is completely different. Since everything is invisible, the user has to remember the name of the text document, the place where the text document is stored on the computer, and also the command needed to open the document. The resulting command line

¹⁴Some authors use the term *noun*. But, since this type of interface is generally referred to as object-oriented and since icons have object qualities, I prefer to use *object* instead of *noun*.

¹⁵Double-click means ‘to click/press a mouse button (usually the left one, if there are two or more) twice, quickly;’ a double-click opens the contents of the icon into a window.

would be something similar to the following construction (a command followed by two arguments, namely object and location):

Verb:edit Arg₁Obj:my-text-document Arg₂Loc:the-place-where-my-text-document-is-stored

This approach is not at all transparent and requires the ability to remember things and places absolutely accurately (otherwise such a command will result in an error message). Just think of your favorite café. Although you might be able to find it in your sleep, maybe even on a city map after a quick look, you will probably fail to recall street and house number. But this is exactly what the user is required to do in this VO pattern-oriented input method.

This example is pretty simple, but it marks the fundamental difference between both user action patterns. Consider a more complex situation, where an icon is moved to another place. On the modern computer desktop, all the user has to do is select the icon, hold down the mouse button, drag the icon to the new location, and finally drop it (release the mouse button). Another instance of the simple OV pattern. A textual, VO-based *move* command requires at least two parameters (objects): namely the place where the document is stored on the computer (source), along with the name of that document, and the new location (destination).

The OV pattern has some other advantages over the VO pattern and is usually recommended in most interface guidelines (see Raskin, 2000: 59/60).

- It is more transparent and therefore reduces the number of possible errors. With OV structure, the manipulation (command) is “executed when issued and the locus of attention is the command” (ibid., 59).
- It is faster because there is no need to shift the attention away from the content to the command and then back to the content (ibid., 59).
- It is easily reversible. Whereas if the verb (command) comes first, there needs to be an “escape or cancel feature associated with the command,” because the system expects users to make a selection, even if they changed their minds. The OV pattern allows you to simply select another object instead (ibid.).

All desktop-based systems considered in this work support this OV pattern as their primary user interaction pattern. It reflects the simple cognitive process of seeing and pointing at things *before* doing something with them.

Although the object-verb (or noun-verb) model illustrated above is frequently used in human interface-related literature, there is another, probably even more suitable approach to the description of the grammar of human-computer interaction patterns: the topic-comment model. *Topic* and *comment* are terms used in semantics and grammar as a “binary characterization of sentence structure” (as an alternative to *theme* and *rheme*; Crystal, 1997: 391). This model eliminates some problems, such as the possible confusion of linguistic and “physical” objects, and simplifies the analysis, because it can be easily applied to visual cognition and the human-computer interaction environment on the screen.

The topic is the entity (the person, object, concept, etc.) in a construction about which something is said; the statement about this entity is the comment (*ibid.*). Consider the following sentence in which the topic is emphasized *like this*:

- *The sheep-shaped cloud* saw the cloud-shaped sheep.
- *The cloud-shaped sheep* was seen by the sheep-shaped cloud.
- It was the cloud-shaped sheep *that the sheep-shaped cloud saw*.

Depending on the construction, the topic may appear in any position. Crystal mentions that the topic is “sometimes referred to as the ‘psychological subject’” (*ibid.*).

It is no big deal to apply this concept to the grammar of human-computer interaction patterns. Once applied, this model illustrates the major difference between the two interface types described above (command line vs. desktop environment). Remember the two different structures:

- desktop: icon selection followed by user action
- command line: command followed by parameters

On the desktop, the particular icon selected by the user (logical object) is the topic in every construction. It is the central part of every user action. In this construction, the topic comes first and the comment follows after. This structure

remains the same, regardless of the forthcoming user action (the comment)—throughout the whole interaction process, and even if more comments are added. Just imagine a situation in which the user copies, renames, and finally opens and edits a certain document. The same document is the topic in every interaction pattern and always appears in initial position.

The situation is somewhat different—and more complicated—in the context of a command line interface. In this environment the command is the critical element around everything else is centered. The user has to focus on the command first and then think of additional parameters. The command is the topic of the typical user action. Other elements, such as parameters and flags, work as a mere comment, as they say something about the command and its execution. The comment may include elements that are found in the topic of desktop-based interaction patterns: for example a certain document. Accordingly, a chain of user actions, as described in the above mentioned example, results in numerous topic changes, since different commands are required to perform all those actions while the comment may stay the same.

And this is the major reason, why user errors are more likely to occur in a command line interface than within a desktop environment: human user and interaction patterns have different topics! For the user, a particular content (a logical object, such as e.g. a document) is in the focus of interest. But this user-focused topic is a part of the comment in the interaction pattern. The user is forced to shift the attention away from the content in order to think of and type in a command and then back to the content. In case of an erroneous selection the situation gets even worse. Within a command line interface, once the command is executed with a wrong parameter, the user first needs to escape the sequence (cf. advantages of the OV pattern described above). On the desktop, on the other hand, where both user and interaction pattern share the same topic, the user only has to choose a new topic, that is another object on the screen.

Since the topic is usually in the focus of the user's attention, the topic-comment model as realized on the desktop reflects human cognition and behavior—which makes the desktop a fairly humane type of human-computer interface.

4.3.2 Mood

The concept of *grammatical mood* describes the relation of the verb to reality or intent in speaking. Although human-computer interaction is generally about modes rather than mood, the following may be important in order to understand how the typical user action pattern is perceived by the user.

As shown above, the standard interaction pattern is fairly simple, namely object – verb. The reason why this pattern lacks a subject or agent is simple: the human user is the doer of all the action. Or not? At this point, the grammatical mood comes in.

The mood of the interaction patterns depends on the user's point of view. Basically, there are two possible points of view: *indicative* and *imperative*. In the case of the indicative mood, the user thinks of him- or herself as the agent of the action. The imperative mood, on the other hand, implies that the computer does what the user commands. The difference between the two may appear subtle at first glance. Does it really matter whether it is the user or the computer that moves the object from A to B? Yes, it really does. Because, if users consider themselves as the doers of all the action and as the ones working with the objects on the screen, the whole interface becomes reality. It is like a real office or desktop. There is no filter between the user and the items to work with. Additionally, the user feels responsible for every single action, because the user is the subject in the interaction pattern.

It is different, however, if the user has the feeling of giving the computer instructions. This impression may be justified in the case of the command line interface; within a graphical, icon-based interface it tends to be displaced. The user-as-commander does not accept the computer desktop as a reality and consequently does not have the feeling of direct manipulation. Most of the time, this will not make much difference to the user. But since in the case of an incorrect or unexpected result of a certain user action the user does not feel responsible, he or she may not understand the feedback (error message)—or its absence.

4.4 LITERACY

The term *literacy* has already been mentioned a couple of times. Basically, literacy is the ability to read and write. In a modern context, this sense is often extended to include all sorts of media used for communication.

4.4.1 Literacy in the Information Age

Literacy as a research field has become increasingly important in linguistics. The modern approach goes far beyond the mere ability to read and write. Literacy in the Information Age refers to written communication as well as to pictures and all possible combinations thereof, embedded in a socio-cultural context; for example:

- Comics
- Illustrated texts
- Commercial advertisements
- Internet hypertext pages

Kress argues that it is “no longer possible to think of literacy in isolation from a vast array of social, technological and economic factors” (2004: 1). The concept of literacy has changed, as have reading and writing. The image has become dominant as a means of communication, especially on the new dominant medium: the screen. Kress claims that while *language-as-speech* will probably remain the “major mode of communication” *language-as-writing* “will increasingly be displaced by image in many domains of public communication” (ibid.).

4.4.2 Computer Literacy

The term *literacy* is frequently used to refer to a person’s ability to operate something, too. A person who knows how to use a computer may therefore be called a computer-literate person. Being computer literate means being able to operate a computer at least to some extent. There are different levels or degrees imaginable, such as “rookie,” “experienced user,” or “ace.” Apart from that, the users and their degrees of literacy are characterized by

their biases. The knowledge about computers and how to deal with them may differ significantly between a graphics artist and a software developer, even if both are, for instance, “ace” users.

Computer literacy basically covers five aspects.

(1) *Technology-related background knowledge*. In order to work with a computer, the user has to know about and understand certain “jargon” terms. For example: *mouse, function keys, cursor keys, monitor, hard disk, or floppy disk drive*, to name but a few. Thus, this aspect involves a certain computer-related vocabulary.

(2) *Physical ability*. Being computer literate also implies knowing how and being able to turn a computer on or use its input devices. This requires a certain physical ability. While the first computers were practically inaccessible for people with disabilities, this has changed and is typically no longer much of a problem.

(3) *Morphology*. This aspect refers to the knowledge of the internal syntax of complex idea signs. In other words: the user must be able to “read images.” Although this may seem trivial at first glance, it certainly is not. It involves cognitive processes as well as specific socio-cultural knowledge (cf. figurative meanings of spatial position).

(4) *Semantics*. In order to work with a computer, a certain knowledge of the codes and metaphors used within the human-computer interface is required. The user has to know about the depicted cultural units in order to be able to identify the contents of sign vehicles on the screen; and the user has to know, as well, about the codes used to encode the meanings into those pictorial signs.

(5) *Pragmatics*. This aspect is all about the user’s knowledge of the grammar of human-computer interaction. In order to be able to work with a computer successfully, the user has to know and understand the syntax of interaction patterns.

Nowadays, it is fairly easy to obtain an average degree of computer literacy, regardless of one’s personal background and aims. Of course, this is due to the fact that computers have become a part of our life; they are just as common as TV. Consequently, aspect (1) is not much of a problem any more. Many computer-related terms are widely used and have almost become a part of the

regular vocabulary. Technological progress has also lowered the barrier implicit in aspect (2), as it allows the creation of devices which are highly accessible even to disabled people (e.g. speech controlled computers).

But there is something more behind this general facilitation. Today, many people are computer-literate even if they have never used a computer. Since the design of modern human-computer interfaces mimics reality quite convincingly, it is possible for a user to draw from his or her general knowledge of reality. The codes, metaphors, and structures of pictorial signs are taken from the regular world around us. We are already familiar with the concepts used for information representation on the screen, because we have to deal with them every day. We know them from commercial ads, from pictorial signs used in books or product manuals, symbols on remote controls, etc.

Finally, the grammar of human-computer interaction is rather universal, if I dare say so. The OV order is fairly transparent and, again, even inexperienced users are able to apply existing knowledge of the world around them. After all, everything within the human-computer interface is based on the simple rule of cause and effect.

Computer technology has probably initiated drastic changes in terms of written communication; and it has additionally made possible the extensive use of image for communication.

Text, hypertext, pictures, sounds—many modes have become merged and mixed through computer technology. The technology has influenced or affected all other media, such as TV or print media, as well. In a way, the literacy required to “read” a contemporary life style magazine is quite similar to that required to operate a computer. We have all become computer-literate, more or less.

5. *Analyzing Icon Change & Differences*

Analysis always involves selection.

—Gunther Kress, *Reading Images*

Welcome to the comparative analysis of icons in time and across different graphical desktops. This two-part analysis is intended to reveal interesting details of icon changes and differences and may give insight into the processes involved in the changes of semograms in general. In the diachronic section, icons on the same desktop at different points of time are compared to each other. Afterwards, in the synchronic section, icons on different desktops at the same time are compared to each other. This chapter covers some of the guidelines for the following analysis.



Xerox Star, 1981



Apple Mac OS X, 2001

Figure 5-1: *The generic document icon then and now.*

Take a look at the two generic document icons in Figure 5-1. The one on the left is the “great-grandfather” of all document icons. It can be found on the very first commercial graphical, direct manipulation interface featuring the desktop

metaphor; the Xerox Star Information System, 1981. The icon on the right is taken from the first version of Apple's latest computer desktop, *Aqua* (Mac OS X, 2001). Apart from the stylistic differences, both icons resemble each other closely: their shape imitates that of a blank sheet of paper, in both cases with the dog ear in the top right-hand corner. At the same time, there are considerable differences between the two icons: whereas the Star document icon is rather simplified and only consists of contours, and somehow rather resembles a traffic sign in its simplicity, the Mac OS X icon looks like the photograph of a real sheet of paper. It looks realistic. Thus, although their meaning and morphology are the same, their style (or character) is not.

5.1 ON COMPARING ICONS

Comparing icons means comparing different aspects of comparable icons (based on the three aspects of semiotics). Icons are comparable only if they are icons. It is not very helpful to compare icons to glyphs, for instance, since they are used in different contexts within the graphical user interface and may consequently even adhere to totally different interaction patterns. It is, however, possible to compare the constituents of icons and glyphs, namely the semograms, since they are the same and, at last, the parts of the pictorial writing system with which all icons and glyphs are "written."

I have come across a number "icon comparisons" in quite a number of places all over the Internet as well as in papers and books. In many of them the term icon is used without an exact definition of what an icon is. In some others, not even a clear distinction is made between the form and meaning of the various signs on the desktop. Frequently, the context is not or only inadequately included in the analysis. As a result, all sorts of different types of graphical user interface elements are compared to each other, regardless of their types (icons, glyphs), modes (text, picture, mixed), origins, the environment in which they appear, and even across different operating systems or different versions thereof, sometimes quite unsystematically.

In the *Icons R Icons* article by Barr et al. (2002), for example, you will find icons and glyphs mixed up in various figures. The major problem of such an

approach is that similarities are assumed where they do not necessarily exist; despite similar looks, their meanings might differ considerably. When it comes to an analysis of the effectiveness of icons (in general or of particular ones) or of individual semograms, this approach furthermore carries the risk of overlooking the fact that users are confronted with icons and glyphs in different situations: A certain semogram may be perfect as an icon and still inadequate as a tool bar glyph, for example.

It has already been pointed out that there is a variety of different opinions on the definition of the term *icon* in the context of the graphical user interface. In this comparative analysis only those complex semograms are compared to each other which are icons according to the definition used in this thesis. Furthermore, only icons of the same class are compared to each other (data and function icons). As far as the synchronic analysis is concerned, mainly the base data and function icons (document, folder, program, hard disk, etc.) are compared. In the diachronic section, preferably those icons are taken into account which can be traced for a longer period of time.

After all, the actual comparison of two icons is a fairly simple process. It merely involves the comparison of their distinct features and similarities according to the three semiotic aspects described earlier, namely *morphology*, *semantics*, and *pragmatics* (including *style* or *character*). Despite the superficial simplicity of this task, the amount of information gathered in such a comparison can be enormous.

5.1.1 Morphology and Semantics

Morphology and semantics are closely related and in the course of this comparative analysis often analyzed in combination with each other. The choice of semograms to form a complex construction as well as design metaphors play a major role in this context. The meaning of a complex semogram, such as an icon, is generally dependent on its environment (design metaphor and neighboring signs), its constituents, its internal structure, and the codes used in this structure. Different structures may result in different meanings. Otherwise, similar meanings, for instance, may be represented by different semograms or

different morphological structures as well. Even if two complex semograms are metaphorically as well as morphologically similar, their meanings may still vary and, of course, change over the years.

There are three distinct types of meaning change. The sense of a sign that undergoes (1) *generalization* is expanded in order to include more referents. (2) *Specialization* describes the case in which the sense of a sign is contracted in order to include fewer referents. Finally, we talk about (3) *transfer* if the sense of a sign suddenly includes different referents.

Let me give an exemplary comparison of the morphology and semantics of complex semograms. Consider the ideographic representation of the abstract meaning ‘find’ or ‘search for.’ Glyphs with this meaning are available on any desktop.

The four semograms illustrated in Figure 5-2 represent different attempts to realize the same idea pictorially: namely the rather abstract idea of ‘searching’ or ‘wish to find’ something. The semograms marked with an asterisk (A and D) represent imaginable constructions which do not occur within the standard graphical user interface and its regular software applications. The other two semograms (B and C) are actual glyphs that can be found in a number of places all through the various desktop-based graphical user interfaces.

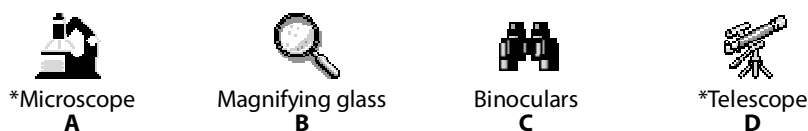


Figure 5-2: Actual and possible ‘search’ semograms.

An idea such as ‘find’ or ‘search’ is particularly hard to depict, because it is abstract in every respect. First of all, the idea is not necessarily linked to a certain object that can be depicted and used as a semogram. The whole concept as such is quite abstract. Secondly, the user’s intention to invoke a search function is hard to grasp. The need to find something (e.g. a certain document or folder) might come up spontaneously. Consequently, the semogram should be the pictorial representation of something extremely familiar that can be recognized and decoded fast and without ambiguity. How to depict volition? Maybe, it is necessary to find a pictorial representation of something positive which expresses the user’s wish, rather than implying obligation or necessity.

Hence, the common strategy is to choose a means of searching which is as unmarked as possible; a familiar tool that usually enables someone to find something or which facilitates the process of finding in general.

Four possible tools are illustrated in Figure 5-2, arranged according to the size and distance of things that can be found using these tools. The set starts with a microscope, which is absolutely perfect for finding really small things within a really close distance, and it ends with the telescope, which is extremely suitable for discovering really big things at a very great distance. Between these two extremes there are the magnifying glass and the binoculars. The magnifying glass is the right tool for everything within arm's length in distance and the size of a pinhead upwards. It is suitable for looking at something small as well as for the inspection of small details of something big. The binoculars, on the other hand, are commonly used to observe not-so-small objects at a distance just outside the ordinary range of vision (such as wild animals, or your neighbor's privacy)—especially, if the "observer" wishes to remain undetected.

It is pretty interesting, though not surprising, that of all these four tools only the rather mediocre ones (*B* and *C*), as far as size and distance of things that can be detected with them are concerned, occur as actual glyphs on the desktop. Those tools which represent extremes in terms of size and distance of the objects they are used on do not occur in the graphical user interface. This has something to do with markedness. As mentioned before, pictorial representations of something special result in marked semograms with very specific meaning, while representations of common or familiar objects and concepts make for generic semograms. Both the microscope and the telescope are marked as special scientific instruments; they are commonly associated with the disciplines in which they are regularly used, namely biology or chemistry (microscope) and astronomy (telescope). Accordingly, as an ideographic semogram they would rather be decoded as representing a very special meaning, probably in a more specific context (e.g. a chemical analysis software application).

The magnifying glass and the binoculars, on the other hand, are unmarked. Both are actually used even by people without a specific interest in science and are consequently more suitable to be used as ideograms with a more generic

meaning. The depicted objects are extremely familiar and belong to a class of tools that can be—and often are—carried around (which you certainly would not do with a microscope or a telescope). Furthermore, both tools can be used on all sorts of objects, so their scope is not limited in any way (as opposed to the microscope and the telescope).

Now, both tools (B and C) are suitable ideograms for the representation of the concepts ‘search’ or ‘find’ and are actually both used in that sense. It seems that the two semograms can be used interchangeably, although this does not necessarily imply that they are semantically identical, since they both have considerably different connotations (just imagine Sherlock Holmes with binoculars). While binoculars are associated with ‘observe,’ ‘hunt,’ or ‘track down,’ the magnifying glass is usually associated with ‘inspect,’ ‘examine,’ ‘look closely.’

Apart from that, since we are dealing with the desktop metaphor, the use of a «magnifying glass» semogram seems to suggest itself. It fits perfectly even in a conservative or old-fashioned office, where it can be used, for instance, to find a certain word on a typed page. However, the reality is not as simple as this theoretical model.



Search tool bar glyph
Windows XP – Windows Explorer

Figure 5-3: The typical Windows XP «magnifying glass» ‘search’ semogram.

The «magnifying glass» semogram has been a part of the Windows Explorer application icon since its first official appearance on the Windows 95 desktop. In later versions, such as on Windows 2000, it represented (in combination with a «globe» semogram) the search function. Now, on the Windows XP Explorer tool bar, there is this mono-morphemic ‘search’ glyph with the surprisingly left-handed¹⁶ «magnifying glass» semogram—and it looks like the prototypical ‘search’ glyph. Yet, as it turns out, it does not represent a “global standard.” A

¹⁶Which is rather strange, as you saw earlier that the right-handed mode is generally considered to be unmarked. Otherwise, a right-handed person might take a magnifying glass in the left hand to keep the right hand free for “manipulations” of the focused object.

true «magnifying glass» ‘search’ semogram is apparently far less common than one would like to think.

To complicate matters, there are other instances of «magnifying glass» semograms within the common graphical user interface with two more different meanings, namely ‘zoom’ or ‘magnify’ and ‘preview.’ This ‘magnify’ «magnifying glass» semogram, though rather ideographic too, is far more concrete as it directly refers to an attribute which is immediately connected to a magnifying glass. The same is true of the ‘preview’ «magnifying glass» semogram, since a magnifying glass is suitable for the close inspection of things, too. Now, consider the following screen shots of file option tool bars taken from some major applications that are available for a number of operating systems (Figure 5-4). These tool bars regularly contain basic file manipulation options, such as saving, opening, printing, or searching for documents.

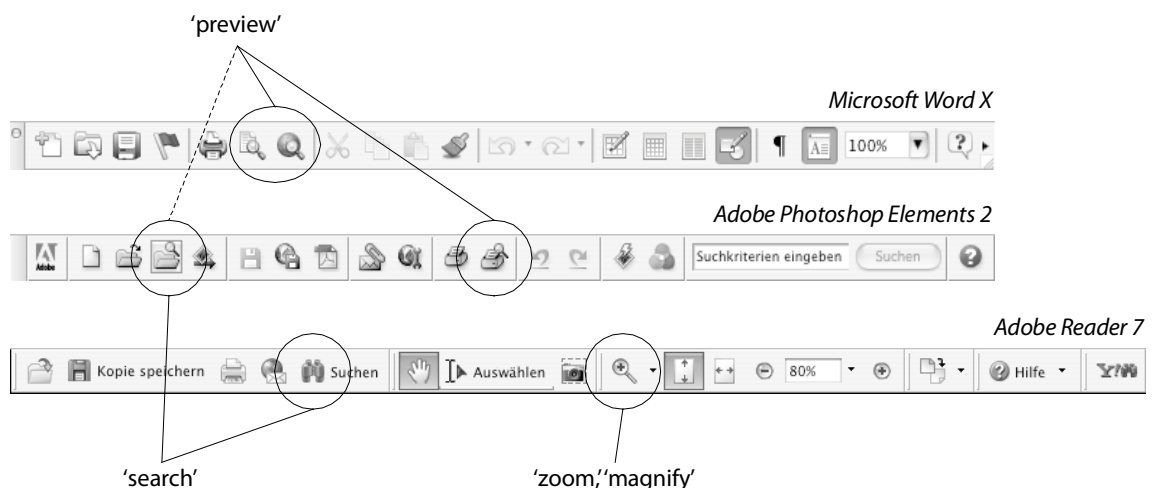


Figure 5-4: Different meanings of the «magnifying glass» semogram.

As you can see, there are five instances of «magnifying glass» semograms, but only one of them actually comes close to the meaning ‘search.’ Two of them represent a meaning such as ‘preview’ or ‘inspect.’ One «magnifying glass» semogram is used to represent the meaning ‘zoom’ or ‘magnify.’ Of two available ‘search’ glyphs only one is realized by a «magnifying glass» semogram. The other one, on the Adobe Reader 7 tool bar, is realized by a «binoculars» semogram.—Are these uses and variations of «magnifying glass» semograms governed by certain rules?

On the Adobe Reader 7 tool bar, the «binoculars» semogram represents the meaning ‘search’ while the «magnifying glass» semogram (with an additional

«+» sign) is used to represent the meaning 'zoom' or 'magnify.' A possible rule that can be inferred from this particular context could be that two different meanings are not realized by the same semogram within one context in order to avoid ambiguity. If it is a rule, designers unfortunately do not seem to conform to it very accurately.

On the Adobe Photoshop Elements 2 tool bar, the «magnifying glass» semogram appears in two different complex glyphs, each with a different meaning (in fact, there is another «magnifying glass» 'magnify' semogram simultaneously visible on another tool bar, yet in the different context of image manipulation tools). A click on the 'search' glyph (or rather 'search through' or 'browse' glyph) opens up a file dialog in which the user is presented "thumbnails" of all images inside a certain folder. In a way, there is a notion of 'preview' implicit in this 'search' glyph. The second instance of a «magnifying glass» semogram within the context of this tool bar is a 'printing preview' glyph. A click on this glyph opens up a preview of the printed page. So, in both glyphs, the meaning of the «magnifying glass» semogram seems to imply a notion 'looking at something.' The meaning 'search' is not realized by the «magnifying glass» semogram in this case. It is rather paraphrased by a complex construction (the «magnifying glass» in combination with a «folder» semogram) with the meaning 'look at the contents of this folder (and search through it).'

Finally, on the Word X tool bar, there is no 'search' «magnifying glass» semogram at all. All icons that include a «magnifying glass» semogram come with a 'preview' meaning (page preview, web browser preview).

What does this mean?

It means, in the first place, that it is apparently hard to distinguish between the meanings 'look for something' and 'look at something' in terms of pictorial idea signs. Searching for something surely implies looking at something. It also means that the «magnifying glass» semogram is apparently less marked than the «binoculars» semogram. The latter is rather monosemic (it is in most contexts exclusively used to represent the meaning 'search') as opposed to the polysemic «magnifying glass» semogram, which comes with a whole bunch of meanings and meaning nuances.

Still, of course, the «magnifying glass» semogram is used in a number of places to represent the ‘search’ idea. Let me give two more examples of extremely common uses of the magnifying glass on the Macintosh desktop (Figure 5-5).

The «magnifying glass» semogram in the text search field represents different search modes or areas. Clicking on the glyph pops up a menu or a list in which the user may specify where to search (e.g. in names, e-mail addresses, attachments, subjects).



Figure 5-5: Common uses of the «magnifying glass» semogram on Mac OS X.

A click on the color picker «magnifying glass» glyph, on the other hand, brings up a large magnifying glass which magnifies the screen area below it. This enables the user to pick the color of a certain pixel (point) on-screen. This use of the «magnifying glass» semogram is very pictographic probably comes closest to the use of a real magnifying glass.

I could go on like this for hours. But the intention of this digression into the nature of pictorial ‘search’ semogram variants and distinctive variations of the «magnifying glass» semogram was intended to illustrate what has to be kept in mind while carrying out a comparative analysis of icons—and of pictures in general: things are not necessarily as simple as they may seem at first glance.

5.1.2 Pragmatics

Of course, varying interaction patterns at different points in time or on different desktops are imaginable; for example, an icon may respond differently to a double-click or may not be drag-able. However, it will only be possible to compare the pragmatic aspects of icons if they are known. This means that they either have to be documented in manuals and guidelines or that it must be possible to test the patterns on a running system (perhaps within an emulation software). Apart from that, and quite fortunately for this analysis, the pragmatic aspect of icons is not usually something that changes considerably. Just imagine the double-click behavior of a certain icon being altered from one version of a

certain desktop to another. This change would be a source of countless unpredictable and most likely erroneous user action results.

In fact, there has been only one major change in icon pragmatics. This shift took place between 1981 and 1983. On the Xerox Star there was no drag-and-drop; icons had to be moved using a specific *move* command. With the Apple Lisa, the common drag-and-drop behavior was introduced which is still used today.

On some desktops, new patterns have been introduced. The Windows desktop, for example, allows an extra drag-and-drop action which is performed using the right mouse button instead of the left one (in order to create a copy of or a shortcut to a certain document on the fly). Quite similar to this is the Mac OS-typical option-drag-and-drop action: holding down the Option key on the keyboard while performing a drag-and-drop action results in copying a certain document in the new location; holding down Option and Command keys simultaneously creates a shortcut (called Alias on the Mac) of the dragged document.

The most common interaction patterns, however, have remained stable over the years.

5.1.3 Style or Character

Style or *character* is the most easily recognizable feature of any icon, even for the untutored observer. Both terms refer to the design and the overall “visual appearance” of the icon. This appearance can be described—or rather paraphrased—by a few antonyms, or more precisely by the range of stylistic nuances between them:

- monochrome < ... > colored
- flat < ... > perspective (“vanishing point”, “isometric projection”)
- simplified < ... > photographic

The *monochrome/colored* pair simply refers to the use of color within the icon. Icons may be just black and white or colored. However, there are two types of color icons: type one is *color coded*, which means that the use of color represents

meaning (such as, for instance, a salience marker to highlight crucial details); in type two color icons, color is used to approximate reality (natural coloring).

The second aspect refers to the visual representation of perspective. Although perspective in semograms often merely serves aesthetics purposes, it has already been mentioned that perspective in general is a visual code. Apart from that, adding a virtual third dimension may make it easier for the user to identify the depicted object.

The *simplified/photographic* range is all about code as well. The more photographic an icon is the less code is involved, since the photograph as an analogon to reality can be regarded as a message without code (cf. Kress & Leeuwen, 2001). For the sake of fair balance it should be noted, however, that Peirce referred to signs in photographic media as being *indexical* or *iconic*, which means that “the signifiers did not simply ‘resemble’ their signifieds but were mechanical recordings or reproductions of them (within the limitations of the medium)” (Chandler, 2002: 163). However, photography does not involve rule governed transformation as is the case with conventional visual arrangements (ibid.). Simplified images, on the other hand, such as illustrations in children’s books, are pure coded images, because their structure does not imitate reality; it is a conventional visual arrangement, based on visual code (Kress & Leeuwen, 2001: 22/3). I will return to this particular subject later.

In fact, these style descriptors are all linked to each other. A photographic icon is most likely to be also colored (although not necessarily intentionally color coded). Simplified icons, on the other hand, may make use of color primarily as a salience marker. Thus, a colored icon is not necessarily photographic.

6. *Diachronic Section: Icons through the Ages*

Originally rejected for reasons of inefficiency, we later resurrected the iconic desktop We believe that by adding direct manipulation to an attractive graphical representation of the familiar desktop, the icons and controls shown on the screen became, in some sense, real and the interface began to disappear.

—Roderick Perkins, Dan Smith Keller & Frank Ludolph, *Inventing the Lisa User Interface* (1997)

The first commercial desktop-based user interface came on the market in 1981. It was the Xerox Star Office System with its black and white icons, which came quite close to the concept of idea pictures according to Jensen (1969): pictorial, simple in shape, drawn as outlines, and without a fixed representation in spoken language. Although the computer itself turned out to be a commercial flop, its graphical user interface—the virtual desktop—was highly influential and paved the way for other desktop-based systems. The virtual desktop became the standard human-computer interface.

Much has changed since those early days, and icons have become colorful and more detailed. They are no longer just simple contours. Some even look photographic. But, as it turns out, icon change is more than the shift from black and white to colored idea pictures.

6.1 ICON CHANGE

You can tell that an icon has changed by looking at an icon at different points of time, and by looking at the differences between these states. Of course, what you see is not change, but rather the effect of the changes that took place. It is not possible to observe change itself; only the results (and intermediate results) of change processes can be analyzed, for example by means of a comparison. Doing so assumes and also relies on a certain stability, that is on things or aspects of the icon that have not changed. Keller argues, that

“[i]n order to say that *a thing* has changed, something about it must have remained stable, to guarantee the identity of that thing which one claims has changed.” (1994: 95)

Change is transient. The term describes the gradual shift from *before* to *after*. Only when both states are known and visible can the results of change processes be observed. What exactly has happened in between can only be deduced from the apparent change effects. Accordingly, icon change is merely the general cover term for a number of areas in which changes may take place: namely *morphology*, *semantics*, *pragmatics*, and *style* (or *character*). These aspects may be affected either individually or in combinations.

Although change is not predictable—or maybe only to a very limited extent, as far as the general direction of the changes is concerned—there seem to be certain “global” trends. Apparently, some types of change are more likely to occur than others and also more likely to occur within certain contexts rather than in others (e.g. in combination with or as a result of a certain change effect in some other aspect). At least as far as language change is concerned, this opinion seems to be generally accepted by linguists. Wilhelm von Humboldt (1767 – 1835) and Georg von der Gabelentz (1840 – 1893) already proposed such as an evolutionary development of language¹⁷ with different stages and two basic (rather generalized) directions: (1) the meaning of a word is likely to shift from concrete (spatial) concepts towards increasing abstractness (*Kronasser’s Law*); (2) structural aspects seem to shift from opaque rules (e.g. irregular verbs in English) towards more transparency (cf. Lightfoot’s *Transparency Principle* in

¹⁷For further information see Paul Hopper & Elizabeth C. Traugott, 1993, *Grammaticalization*, Cambridge: Cambridge University Press, Chapter 2.2.

McMahon, 1996). Of course, there are exceptions to these rules. In particular, some extremely irregular verbs, such as *to be* or *to go*, violate these theoretical principles. Yet, they prove the frequency hypothesis, which assumes that frequently used constructions are less likely to change than other less often used ones (Bybee & Hopper, 2001).

6.1.1 Icons

The icons compared in this diachronic section are mostly base data and function icons which have always been available on almost every computer desktop. A few exceptional icons are taken into account, too, in order to show specific phenomena or especially remarkable changes. One particularly interesting example is the Network Environment icon, which can be found on Microsoft Windows desktops since Windows 95 (including early beta¹⁸ versions).

6.1.2 Desktops

Of course, not all icons are subject to change over the years; some of them just stay the same. Therefore, only those system versions or desktop revisions are considered which feature recognizable changes at least in the visual appearance of icons.

Of special interest are those desktops that can be traced over a longer period of time, of course. The two best documented desktops (and most long-lived as well) are the Apple Macintosh system and Microsoft Windows, simply because they are so commonly used. We will also have a look at some “minor” desktops, such as the Amiga OS Workbench and the Linux GNOME desktop, because they have some remarkable icons and metaphoric peculiarities.

¹⁸The term *beta* denotes a pre-release software version (the second stage in the whole development cycle, in fact), which “represents the first feature complete version of a computer program or other product, likely to be unstable but useful for internal demonstrations and previews to select customers.” (cf. Wikipedia.org, 2005: *beta version*).

6.2 THE BASE DATA ICONS

The document and the folder icons are probably the most typical desktop icons of all. These two icons are present on every desktop-based graphical direct manipulation user interface, yet sometimes under different names. They are the ones with the most concrete meanings, as well.

Equally common on most desktops, yet far less concrete as far as its meaning is concerned, is the generic application icon—which has the most multifaceted change stories on any system.

6.2.1 The Origins: The Xerox Star Desktop

The first-ever document icon appeared on the desktop of the Xerox 8010 Star Information system; and so did the first folder icon. Both designs—or rather the choice of semograms—turned out to be highly influential. Especially their distinct features, that is the dog ear on the document icon and the tab on the folder icon, can be found on almost every descendant of these “ancestors” of all icons.



Figure 6-1: *The Xerox Star base data icons of 1981.*

Figure 6-1 shows the set of original base data icons of the Xerox Star desktop with one exception (hence it is marked with an asterisk): the program icon—included to complete the system of three base data icons—is taken from Daniel C. Halbert’s SmallStar (1993), as the original Star does not have a program icon. SmallStar is a working simulation of the Xerox Star Information System, developed by Halbert from 1980 to 1984 as part of his doctoral research on “programming by demonstration” (Halbert, 1993). Thus, the icon originated around the same time as the other icons of the Star.

I have included the program icon despite its non-existence on the original Star, because it uses a very special, in fact unique, and pretty interesting representation of the concept ‘program’ as a piece of software. The SmallStar

program icon is basically a square outline which contains a part of a simplified flowchart, a flowchart being a schematic representation of a process. Historically, in computer science, flowcharts were used to represent algorithms in the form of a “decision tree” (cf. Wikipedia.org, 2005: *flowchart*).

Because of its distinct design, the SmallStar program icon is far more abstract than any other application icon. The icon neither represents a certain functionality nor does the design refer to the possible importance of the program for the computer user. Instead, a schematic visualization of what is going on *inside* the program is given.

It is rather noteworthy that captions (ie. file names, such as “Blank Document”) are placed within the icon. This is fairly unique among user interface icons. In most cases, the caption is placed right below the icon; in special views it may be placed on the right. Consequently, in these icons, the caption should probably be analyzed as a part of the construction, as a specific type of alphanumeric marker. But in this context all icons are analyzed without their captions. In contrast to other glyphs, such as tool bar elements, the meaning of an icon is not specified by its caption. For example, the folder icon is always a folder icon, regardless of its caption. The caption only marks the particular icon as a certain *token*, as one particular instance of the sign on the screen. On modern desktops, sometimes icons with special possessive captions can be found, such as “My Documents” or “My Pictures.” Typically these icons are unique on the desktop; there is only one My Documents folder, for instance. Accordingly, such an icon does not look like an ordinary folder icon. Instead, a more complex icon, with an extra semogram is used (remember, for instance, the construction illustrated in Figure 4-4). Consequently, the caption merely repeats the meaning of the icon; it neither specifies nor alters the meaning of the icon. The caption only represents an additional mode (text) to communicate the concept to the user.

The icons of the Xerox Star are also remarkably different from later icons in terms of pragmatics. Drag-and-drop had not been invented at that time. Instead, icons had to be moved via a *move* command (Smith et al., 1982: 268, and Curbow, 1989). If the user wanted to move a certain icon, the *move* key on the Xerox Star keyboard had to be pressed. This technique became obsolete when

drag and drop was implemented on newer desktops. Since then, moving icons is done with the mouse, without the need for a special *move* command.

6.2.2 Base Data Icons on the Apple Lisa and Mac OS

The Apple Mac OS originated in 1984 and took over a lot of ideas and functionality from the Apple Lisa desktop, which came out 1983. When Apple decided to discontinue the Lisa computer, it was enabled to emulate¹⁹ a Macintosh computer and then renamed Macintosh XL. This is why the Lisa desktop is mentioned in line with the Macintosh desktop.

The Document Icon

The document icon is one of the two most basic icons on the Macintosh and Lisa desktop as well as on any other desktop. It has changed very little, which is particularly amazing if you consider the long time it has been around. In the document icon time line illustrated in Figure 6-2, only two icons stand out: the Lisa document icon with its strange stem semogram, and the Mac OS X document icon because of its unusual size.

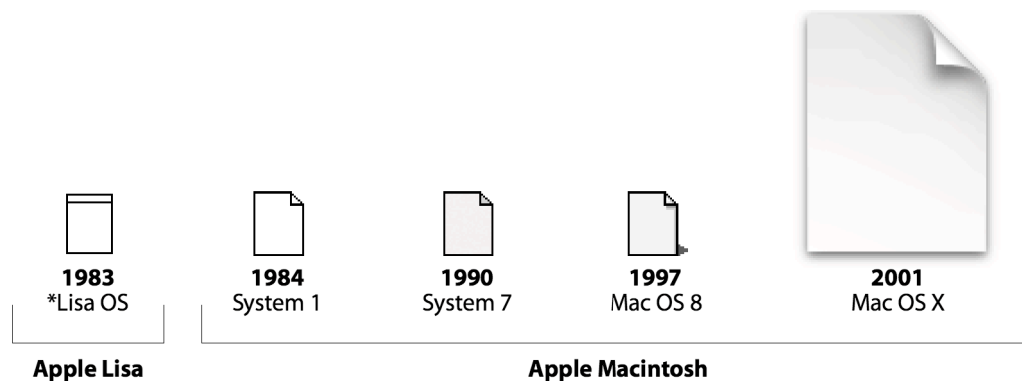


Figure 6-2: *The Apple Lisa/Macintosh generic document icon.*

On the Macintosh desktop, the *generic document icon* is used for any document data type the computer is unable to handle; which means that there is no tool available to open the document and edit its contents. The icon represents the basic and unmarked form of the document icon. Since unmarked

¹⁹The Apple Lisa computer was “taught” to pretend it is a Macintosh, accomplished by a hilarious piece of software called MacWorks.

icons do not exist on the Lisa's desktop, the marker of the respective icon in Figure 6-2 has been removed in order to retain comparability.

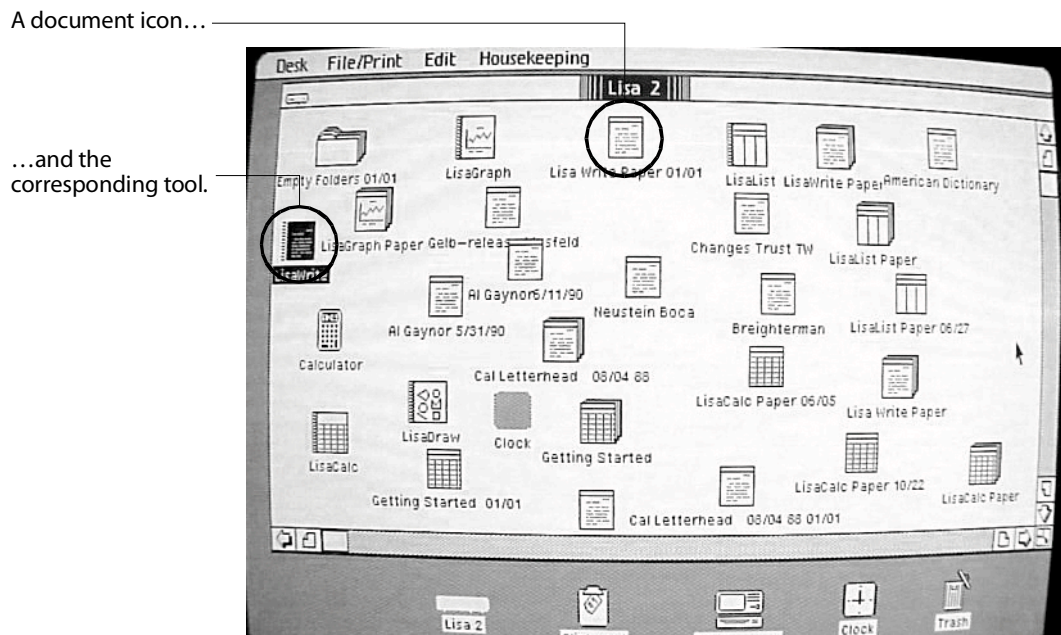


Figure 6-3: The Lisa desktop.

On the Lisa desktop there is no such thing as a generic icon; each document and data type is associated with a software application, called *tool*. The base semogram is always the same. A type marker determines the data type of the respective document (cf. Figure 6-3, Lineback, 2002). While the type markers actually look fairly familiar, the base semogram does not. The absence of a dog ear is probably the first thing that comes to mind in comparison with the later Macintosh document icons. Furthermore, there is a horizontal line, right under the top horizontal border. In a way, the whole icon is more like a miniaturized application window than a sheet of paper. Consider the “Lisa 2” labeled window in Figure 6-3. The screen shot shows the Apple Lisa desktop with menus, icons, a window, and the pointer. There really is some resemblance between the design of the window and that of the document icons. While this design may appear unusual at first sight, it represents a simple fact: in the case of a double-click (or the use of the *open* command from the drop down menu at the top of the screen) imposed on such an icon, the contents of the document are displayed on-screen in a window. This particular icon design surely contributes to the impression that the icon is “enlarged” in order to make its contents visible. So apparently the Lisa ‘document’ icon is realized by a «miniature

window» or «iconified window» semogram: a very peculiar approach, and something similar can only be found on the NeXTstep desktop (cf. *miniwindows*, NeXT, 1991).

On later Macintosh desktops, the document icons all look like blank sheets of paper with a folded top right corner, a dog ear. At all four stages of the development, the icons are morphologically identical—or at least their stems are, since both the Mac OS 8 document icon and the Mac OS X document icon cast a shadow. Particularly in the case of the Mac OS 8 document icon, there seems to be an extra ‘shadow’ semogram attached to the stem; a small triangular shape which is used as a perspective marker (visual code). The meaning of the icon, namely ‘document’ in the sense of a ‘user-created data file,’ is realized by a pictographic «document» or «blank sheet of paper» stem semogram.

The pragmatic aspect of the document icon has remained almost unchanged over the years. The exception is, again, the Lisa document icon, or rather the Lisa desktop in general, as it features its own implementation of the drag-and-drop user action. In fact, the Lisa desktop is the first one to actually feature true drag-and-drop without the necessity for a special *move* command (as on the Xerox Star desktop, two years earlier). While the syntax is basically the same, the behavior of the icons, that is the results of such a drag-and-drop action, differs from the “modern” drag-and-drop behavior. Whereas on the Macintosh desktop a certain document is *copied* (ie. duplicated at the destination) when the destination of the drag-and-drop action is a different disk (e.g. if the document is moved from the local computer to a floppy disk), on the Lisa, the document is always *moved*, and consequently removed from the original position (Craig, 2000: 18). Although the Lisa icon behavior represents the highest possible degree of consistency (something otherwise extremely desirable for any human interface designer) it was changed on the Macintosh. This was done simply because the Lisa’s consistency leads to “difficult to correct errors” when an item is, for instance, dragged from the hard disk to a diskette and the diskette is physically taken to another location—since the Lisa removes the item from the hard disk (*ibid.*, 18). Users have to duplicate the icon first and then move the copy to the storage medium.

It is the visual appearance, the style of the Macintosh document icon, which has changed most over the years. The first change of this kind came with System 7 (1990), when color was introduced. However, this use of color (plain gray) does not make the icon more realistic, nor does it introduce new or highlight existing meaning. The same is true somehow of the Mac OS 8 document icon (1997), although now a number of shades from white to a darker gray are used to indicate light and shade on the document icon's surface; a visual code that creates the illusion of a three-dimensional body.

On the Mac OS X desktop, finally, the style of the document icon has changed drastically. The character of this icon is probably best described using the adjective *realistic*. The new generic document icon appears to be a photograph of a real page and does not look like a drawn picture, nor of a visual arrangement. Yet it is hard to say whether the OS X document icon really is less coded than its predecessors. Despite its realistic look and feel, the curled corner (it is not a real dog ear this time) seems a bit unnatural. Sheets of paper lying flat on the desktop (as the drop shadow suggests) do not usually have curled corners as represented in this icon. So the curled corner, like the dog ear, seems to be rather a visual code, used in order to show that the depicted object is rectangular and rather flattish—just like a sheet of paper.

The Folder Icon

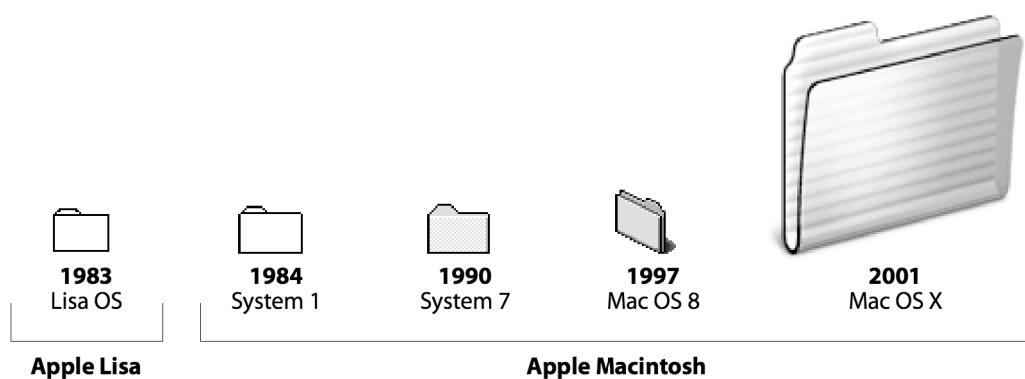


Figure 6-4: The Apple Lisa/Macintosh generic folder icon.

Most of what has been said about the document icon is also true of the folder icon. It is a mono-morphemic and mostly monosemic icon, realized by a pictographic «folder» (or «manila folder») semogram, with the simple meaning

‘folder;’ it adheres to the same interaction patterns as described above for the document icon. And while the Lisa’s document icon stood out, this time, even the Lisa folder icon is perfectly integrated into the time line.

Apart from the use of color (an unusual blueish tinge, which serves aesthetic purposes at most), another visual code is introduced with Mac OS 8 (1997)—and is this time less subtle than in the case of the document icon. From Mac OS 8 onwards, the «folder» semogram is drawn as an isometric projection (*equiangular viewpoint*); a rather technical variant of the linear perspective. Adding a third dimension to a depicted object makes the image easier to recognize (provided that the point of view was chosen wisely; cf. Horton, 1994: 144). The reason for this is quite simple: we live in a three-dimensional world and our perception is accustomed to recognizing three-dimensional things (*ibid.*, 146).—Incidentally, it remains a mystery why Apple has turned the folder icon in Mac OS X. The only semiotic reason I can think of is the fact, that the turned folder has its tab on the left-hand side as all earlier icons, except for the Mac OS 8 folder icon with its tap on the right-hand side.

The Application Icon

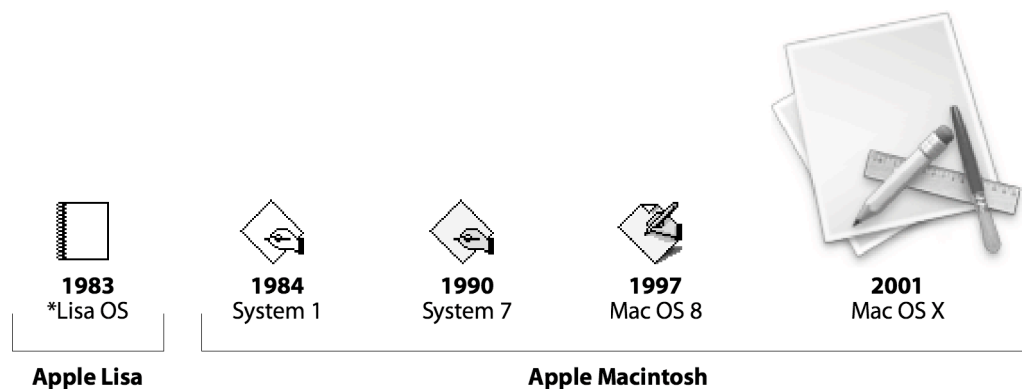


Figure 6-5: *The Apple Lisa/Macintosh application icon.*

The most interesting development of all Macintosh base data icons can be found in the story of the generic application icon. As a complex semogram it represents the abstract idea of ‘creation’ and the concrete concept of a *tool* or *utility*.

Again, the respective icon on the Lisa desktop is somewhat different from all the others in the time line given in Figure 6-5 (remember what has been said

about the absence of generic forms on the Lisa desktop, and that this icon does not occur in this form in its “natural environment”). The Lisa tool icon is realized by a «spiral notebook» stem semogram. The idea behind this icon becomes more transparent if you take into account the fact that the original Lisa desktop is *document centric*. This means that everything (literally) is concerned with documents and their manipulation. Lisa users do not need to worry about applications or tools. New documents are not created in some abstract way by launching an application; they are simply “torn off” so-called stationery pads. Such a *stationery pad* is an “infinite supply of either blank or customized paper” (Apple Computer, 1993: B16). Lisa tools rather behave with discretion and stay in the background and are only needed by the computer itself in order to be able to assist the users to get their work done. Thus, opening a tool icon (e.g. by double-clicking) does not have any effect (*ibid.*, B15).

This situation changes on the Macintosh. In a sort of paradigm shift the desktop becomes less document centric and more tool oriented. The user is encouraged to pick the appropriate tool for the desired task: a word processor for writing, the paint program for painting, and so on. The generic application icon reflects this shift in the use of a new design metaphor and reveals the increased importance for and involvement of the user in its morphology: the user becomes a part of the icon—in the form of a simplified human hand holding a pen. In contrast to the Lisa tool icon, the Macintosh generic application icon clearly represents a tool specifically designed for the user, as something that requires user (inter-)actions.

The morphologic structure of the Macintosh application icon on System 1 up to the Mac OS 9 desktop has been already described as consisting of an abstract stem plus a complex agent marker (see Figure 4-8 and Figure 4-10). A square shape which stands on the tip of one of its corners denotes the document created by the user using this application. This abstract stem (abstract because it refers to the concept of a document-to-be-created-or-edited rather than to an actual desktop object) is modified by the complex agent marker. This marker is realized by a «hand with pen» semogram, which metonymically refers to human user and the implicitly required user interaction. The use of color constantly improves the legibility of the icon, as it makes it easier to recognize

and distinguish the individual semograms. The coloring imitates reality by using a natural skin-like tinge for the hand. It is noticeable, and interesting in terms of generic concepts, that the use of color marks the hand as belonging to a Caucasian white person. The choice may be a question of contrast; a black hand might be harder to recognize. On the other hand, a black hand may be strongly associated with an ethnic group. Interestingly enough, the skin color problem has been circumvented in Figure 6-7: the «pointing hand» semogram used as a mouse pointer wears a glove.

With the introduction of Mac OS X (2001), the design of the generic application icon has changed again and another slight meaning has shift taken place along with the morphologic development. The Mac OS X generic application icon features a complex abstract stem, which consists of two «sheet of paper» or «document» semograms. And suddenly, the user is no longer part of the icon. Instead of a «hand» semogram, a typical writing utensil is depicted: ideographic semograms such as «pencil» or «ruler» convey meanings related to prototypical office activities or other creative tasks, such as writing, drawing, and painting. It is equally striking and surprising that the semograms within the complex agent marker are visually arranged to form the letter “A”—for *application*. Consequently, the overall icon is, as opposed to the other application icons on this time line, mixed-modal. There are two modes: text and picture. This is fairly unusual and generally avoided by icon designers (cf. Horton, 1994: 242/3, 310, and Apple Developer Connection, 1995: 230). The coloring of these marking semograms is noteworthy as well. The use of the signal colors red and yellow encodes them as the most salient feature of the whole icon.

As a matter of fact, the «hand» semogram has been losing importance as an agent marker constantly over the years, particularly from the System 7.5 desktop onwards. As far as regular application icons are concerned (as opposed to the default application icon), the complex agent marker (with the «hand» semogram) has been used interchangeably with a simpler marker (without a «hand» semogram) We can only guess that the major motivation for the use of the simple marker was that the whole semogram requires less detail. With the advent of Mac OS X around the year 2000, the human hand semogram has

finally dropped out of the semogram pool as far as icons are concerned, or so it seems. Consider the following illustration (Figure 6-6).

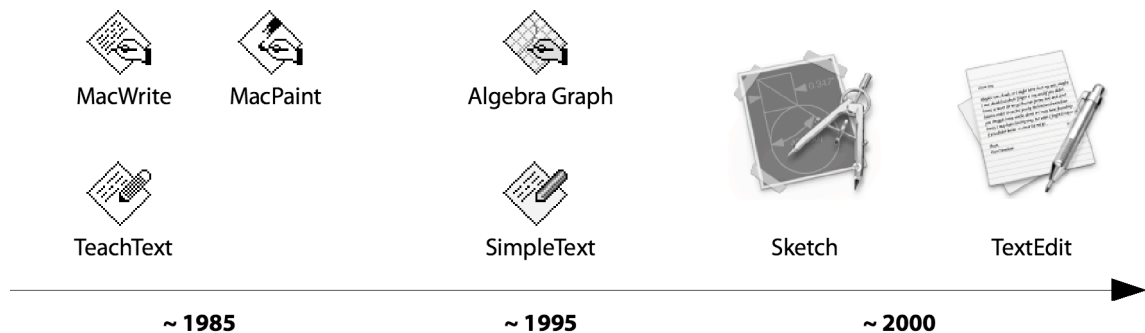


Figure 6-6: The hand semogram disappears as an agent marker (Mac OS).

While both types of agent marker existed and were used side by side before, only evidence for the simple marker is found on the Mac OS X desktop (consider the Sketch and TextEdit application icons). What is the reason for this change? From System 7.5 onwards, the traditional complex agent marker is used less frequently. But while the «hand» semogram disappears from application icons, it reappears—in connection with the rising Internet metaphor—as a mouse pointer. From the mid-nineties, the arrow mouse pointer changes into a «hand» semogram (a hand with a pointing index finger) to indicate that the mouse pointer is placed above a click-able Internet location link (URL²⁰).



Figure 6-7: The hand semogram as mouse pointer.

Used in this sense and environment, the «hand» semogram expresses a different idea: namely the idea of pointing to something. As a matter of fact, it is a mystery why such a thing as a pointing pointer did not come up earlier within a graphical user interface that is based on point-and-click as a principle.

It is not possible to say whether the occurrence of the «hand» semogram with the new 'pointer' meaning has caused the "downfall" of the old 'user action' semogram or if both processes just coincided. The meaning of the «pointing hand» semogram is a little bit more transparent; it is not required to add

²⁰URL is short for *Uniform Resource Locator*, or *Web address*, and is standardized address for some resource, such as a document or image, on the Internet (Wikipedia.org, 2005: *URL*).

another semantic determiner, such as a pen, in order to specify the meaning to something like ‘write’ or ‘paint’. On the other hand, since both semograms are used in different environments—one as part of an icon, the other one as a mouse pointer—it is not very likely that they have actually influenced or affected each other, although, of course, the pointer is the connector between the human user and the icons on the desktop.

It is an interesting fact that, up from a certain point in time, the «hand» semogram is used as a pointing pointer on every operating system, while the «hand» agent marker can only be found on the Macintosh desktop. This is perhaps a question of frequency. The mouse pointer with the pointing hand is far more commonly used than its icon-related counterpart; consequently, more users will be familiar with the idea of pointing with one’s hand, which might lead to misinterpretations whenever a hand appears as a part of an icon. This may be one reason why the «hand» semogram as an agent marker has never been introduced on other, newer desktops. However, it does not explain, why we do not find it on other, older desktops.

When I was analyzing the pointing hand semogram, I happened to come across two icons on the Mac OS 8 desktop. The icons are actually used as aliases²¹ for the default Web browser and the default E-Mail client application. Both icons feature a human hand (again the unmarked white right hand) with the “new” (in the context of the Macintosh desktop) pointing meaning. The semogram is quite similar to the mouse pointer, only turned by 90 degrees to the right. This «hand» semogram is not to be confused with an agent marker; it is not even a type marker. The semogram has the notion of ‘go to.’



Figure 6-8: The pointing hand semogram as part of an icon.

It is another recognizable fact that on the Mac OS desktop prior to Mac OS X, «hand» semograms can be found in a number of icons, of which most are not application icons. There is a tendency to indicate a number of different, yet somewhat related, ideas using hands. Or more precisely: by hand gestures. In

²¹ Alias (Mac OS): In System 7 or later, an alias is an object that represents another object on the desktop; that is, it acts as a stand-in for that object, which can be a document, image, application, or a folder. The same thing is called *shortcut* on the Windows desktop.

each icon, the hand is depicted in a certain manner. A particular gesture is illustrated, for example a hand with a pointing index finger or a hand which is holding or supporting something. Consequently, the focus is moved slightly away from the hand as a human feature towards the action performed by the hand. In this way, the «hand» semogram is an indexical sign in a Peircian sense. Just take a look at the following examples (Figure 6-9).



Figure 6-9: Hand semograms in Mac OS system extensions' icons.

None of these hands assumes the function of an agent marker. The ideas represented are (from left to right) 'share,' 'serve,' and 'configure/manipulate.' Of course, each «hand» semogram represents an action (a verb), so it could be called *action marker*. But the semogram does represent not a user action; and these icons do not represent applications, but system extensions, that is programs used by the system itself. In a way, these «hand» semograms represent software or computer actions, such as serving files or sharing code segments between different applications and so on. The ColorSync calibration assistant icon is, admittedly, a borderline case, because it is certainly the user who uses this assistant to calibrate the display.

Nonetheless, it is striking how many «hand» semograms can be found on the Mac OS desktops between 1984 and 2000. It is particularly striking because a number of icon design guidelines emphasize the problems that may arise from the use of hands as parts of icons. Horton argues that there is "almost no arrangement of the human hand that is not an obscene, or impolite gesture somewhere in this world" (1994: 245). Of all body parts, the hand seems to be the most critical one. He suggests always showing hands holding, pressing, or moving something—if you must show hands at all (see "Take care with hands" 254 – 256). Maybe that is one reason why there is no more sign of the hand semogram on the Mac OS X desktop.

A final comment on the pragmatic aspects of the application icon: It has already been mentioned that the Lisa tool icon does not respond to the double-click, while, of course, any other Macintosh application icon does so. To

application icons, generally, the same interaction patterns can be applied as to document and folder icons.

6.2.3 Base Data Icons on the Microsoft Windows Desktop

The Windows desktop prior to version 3.0 has not very much in common with the type of direct manipulation interface we are dealing with in this context; consequently, the icons (if they deserve to be called icons according to the definition used in this work) of those old versions are not included in this context.

The Document Icon



Figure 6-10: *The Microsoft Windows unknown file type document icon.*

The generic document icon is used to represent unknown or orphaned file and data types in a similar manner as on the Macintosh desktop. At first sight, there does not seem to be a logical sequence of changes. It looks like a collection of random icons rather than a time line. And it still does so at second sight.

The Windows 3.x ‘unknown file type’ icon (1990, a) resembles the old Macintosh generic document icon (1984) quite closely. It shares the same simple shape and morphology. The absence of a type marker “marks” this icon as unknown (and consequently unmarked), as opposed to the ‘known file type’ icon (1990, b), in which a type marker is used to mark it as a Windows-readable file type. Despite the resemblance of this type marker to the ‘text’ type marker mentioned earlier, it does not denote a text document. The complex semogram refers to any type of document that is understood by Windows, or rather by one of the available software applications.

The Windows 3.x ‘unknown file type’ icon differs from its successors not only in terms of morphology, but also in terms of pragmatics. While the Windows desktop has always been task or tool oriented, with users having to chose between various tools to get their tasks done, this is most obvious in the

case of Windows 3.x. This desktop actually offers two distinct types of interface: the *Program manager* and the *File manager*. Whereas the Program manager provides a tool based interface for the user to configure the computer and launch programs, the File manager represents a means of working with data files.—Imagine a shelf with tools on one side of the room and a file cabinet on the other side; and both are organized according to different rules and principles.—The File manager rather restricts user actions, since its purpose is not to provide a metaphorically consistent workspace, but an instrument solely created to manage one’s files, very much like a simple file cabinet (which is in fact what the File manager application icon looks like). In later Windows versions, the interaction patterns are similar to that on the Macintosh.

In the next step (ie. on the Windows 95 desktop), the ‘unknown file type’ document is a morphologic and semantic anomaly, at least compared to its ancestor, or to the generic document icon on the Macintosh desktop, for the reason that it is apparently marked. The stem semogram is modified by an additional pictorial image, namely the Windows product logo, which appears right in the center of the stem. The function of the logo on this icon is rather unclear. In my opinion, it cannot be analyzed as a marker, because in this case the Windows logo would establish a connection between Windows and the document represented by the icon. This would be ridiculous, since the meaning of the icon is ‘unknown file type,’ and it is consequently used to represent unrelated or orphaned documents. So it remains a mystery why of all semograms the Windows logo was chosen to adorn the center of the icon.

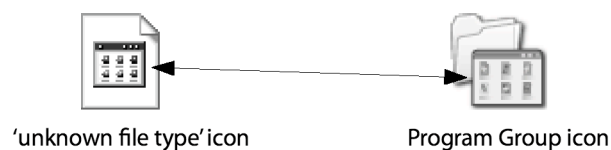


Figure 6-11: *A mysterious relationship.*

The mystery continues on the Windows XP desktop—only this time with a different extra semogram. The extra semogram in the center of the icon resembles an application window in which other icons are displayed. In fact the extra semogram resembles a semogram used as part of the Program Group icon. A program group is, roughly speaking, a user defined group of related

applications, represented by a special icon. This goes back to traditions introduced with Windows 3.0 and the program manager.

The «window with icons» semogram in the ‘unknown file type’ icon is very similar to that in the Program Group icon. Does this icon address the user? A possible assumption is the following: since Windows does not know what to do with the document, the user is asked to decide and choose the appropriate software application needed to edit the document. At least, this way, the extra semogram would make some sense as a ‘help thyself’ sort of action marker.

Summing up, it is an unusual strategy to apply a type marker to a semantically unmarked form. To mark the unmarked is a possible source of misunderstandings.

The Folder Icon

The most noticeable feature of the Windows folder icon (Figure 6-12) is perhaps, that it has always been yellow. Its color has not changed, as for instance the color on the folder icon on the Mac OS desktop has.

As far as semantics and morphology are concerned, nothing has happened. The folder icon stays the same mono-morphemic icon with a pictographic «folder» stem and the fairly concrete meaning ‘folder.’ In pragmatic terms, what has previously been said about the document icon is also true of the folder icon; namely that there is only one significant change on the way from Windows 3 to the 95 desktop.

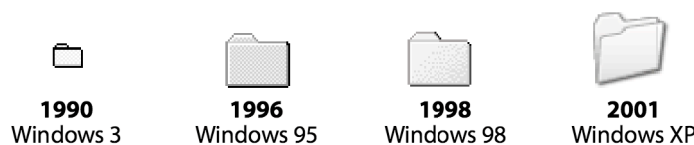


Figure 6-12: *The Windows generic folder icon.*

There is a style change similar to the one we have also encountered in the context of the Macintosh folder icon: the introduction of a new visual code by adding linear perspective. It is interesting in this context that this visual code was introduced relatively late, compared to other desktops.

The Application Icon

Another extremely change-resistant base icon on the Windows desktop is probably the default application icon. It is remarkable how little it has changed, even from Windows 3 to Windows 95. And it still looks the same on Windows XP.

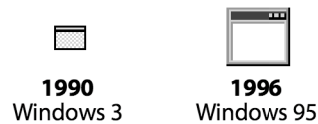


Figure 6-13: *The Windows default application icon.*

The icon only consists of a single pictographic «application window» semogram and actually represents a typical Windows application window; the icon, through, is ideographic, since the meaning is not ‘window’ but something different. I suppose the idea behind this is simply that an application usually opens a window. In other words: the window is the visible embodiment of any application on the screen. The icon is probably a reference to the application window as ‘the place where all the action takes place.’ On the Windows desktop, all application user interaction takes place in windows. Such a window usually contains everything needed by the user to accomplish a certain task. The Windows default application icon is remarkable for its semographic non-reference to such thing as a tool metaphor.

It is quite noteworthy that particularly the early Windows application icon (1990) resembles the Apple Lisa document icon, which also mimics an application window (cf. Figure 6-2, 100), only as a document icon.

6.2.4 Base Data Icons on the Amiga Workbench

The Amiga Workbench, which is what the Amiga desktop is called, is particularly interesting, since its base icons differ considerably from all other desktops. As a matter of fact, such a thing as base icon is not available at all on the earliest Workbench revisions (before OS 3.1). Instead of *generic* or *default icon* the term *pseudo-icon* is used. Pseudo-icons appear on the desktop whenever there is no real icon for a certain *project* (aka document), *drawer* (aka folder), or *tool* (aka application). The term *pseudo* denotes that these icons are not

considered to be *real* icons, because they are unmarked and unspecific as far as their meaning is concerned.

The Project Icon



Figure 6-14: *The Amiga Workbench/OS project pseudo-icon.*

On the Amiga Workbench, documents are called projects. But the Amiga project icon is not only remarkable for its unconventional name. In particular, the Amiga OS 3.1 project icon is, morphologically speaking, a little bit tricky. Its most striking feature is, of course, the letter “P” right in the center, which makes this icon mixed-modal. This letter is surrounded by circles and lines which look like remains of the original design process of this letter, or like an engineering drawing. It is hard to decode the true meaning of this icon. Probably, it should be read as a technical drawing, which can be understood as the metonymic representation of a technical project.

The newer «blank sheet of paper» project pseudo-icon on the Amiga OS 3.5 desktop resembles other document icons, like those which can be found on Mac OS and Windows desktops, for example. But even at this development stage, the icon differs slightly from other document icons. It is the position of the dog ear that makes it special. The Amiga’s project icon sports its dog ear in the bottom right corner. Or, is it a dog ear at all? A closer look reveals that the corner of the page is not really folded. It looks as if it is curled, as in the Mac OS X generic document icon. Due to the position of the curled corner, it looks more like the corner of a page that is about to be turned over. However, apart from this peculiarity, this icon is fairly similar to the Macintosh generic document icon in that it is pictographic, mono-morphemic, and lacking a type marker. The same is true of the pragmatic aspects of the icon. The Amiga Workbench is very similar to the Macintosh desktop. Consequently, all icons show a similar behavior. Icons are selected by a single-click and opened by a double-click; apart from that, they can be moved around, copied, deleted, and so on.

One note on the stylistic changes: It is obvious that there is no smooth evolutionary change process. The two stages of the project pseudo-icon are totally different (complex) semograms. Obviously, the 'project' meaning has been completely transferred to a new semogram.

The Drawer Icon

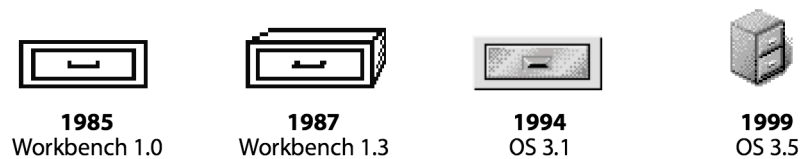


Figure 6-15: *The Amiga Workbench/OS drawer icon.*

Although the original Workbench lacks pseudo-icons, there is already such a thing as a standard drawer icon. The Amiga drawer icon is analogous to the folder icon on other desktops. Its morphological stem is the «drawer» semogram. The meaning of the icon is 'drawer' as well, in the sense of 'container of projects or tools.' The drawer looks more like the ones that can be found in regular office desks or even more so in workbenches, rather than those in a file cabinet (the latter have a rather square front). The icon is monomorphemic and at the same time pictographic and ideographic. It is pictographic because it represents a drawer and looks like one, too. But it rather seems to be the representation of the 'container' function of a drawer. It might be argued that the semograms probably can or should be analyzed as complex because of the two rectangles, of which only one refers to the actual drawer (the other one seems to refer to the environment of the drawer, ie. the front of the workbench or desk). In my opinion, such an approach is not reasonable. The two concentric rectangles only make sense in combination; they are both required to make the picture recognizable as a drawer.

The choice of this semogram is odd in comparison to other desktops. Whereas it is certainly imaginable and physically possible to put a folder inside another folder (there are and always have been nested folders on all systems), this seems to be somewhat strange with drawers. A drawer inside another drawer is implausible. Yet this is occurs on the Amiga Workbench.

The situation is, however, not quite as clear on the more modern OS 3.5 desktop. The newer drawer icon, which in fact represents two drawers, rather resembles a file cabinet. This impression is increased by the use of perspective (equiangular viewpoint). A drawer icon with perspective added to it occurs relatively early in the history (Workbench 1.3, 1987), but only for a short time. Apart from that, the early three-dimensional drawer icon seems odd because the representation is ambiguous: one cannot be sure whether it represents an opened drawer or just the drawer as it exists inside the workbench or cabinet.

The newer cabinet-lookalike drawer icon perfectly relates to the new «blank sheet of paper» project icon as it looks more office-like. It apparently violates the “Workbench metaphor” with projects, tools, and drawers, though. In this light, the «cabinet» icon may mark an important change. There may be a paradigmatic change going on: the transition from the old Workbench metaphor towards the widely accepted Desktop metaphor.

However, apparently, «drawer» or «cabinet» semograms have always been fairly popular with interface designers. There are numerous instances on any desktop, throughout the history of the desktop-based graphical user interface. Consider Figure 6-16, in which a collection of file cabinet icons through the ages is illustrated.

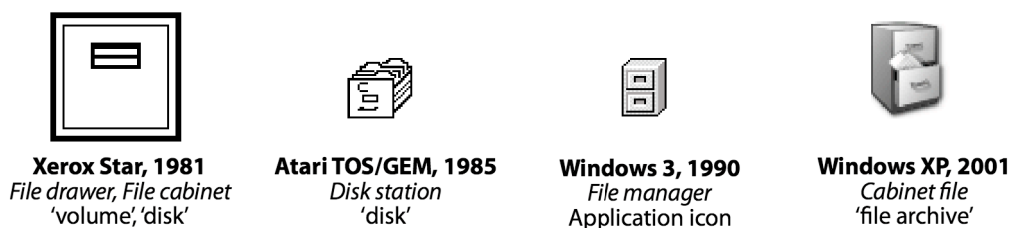


Figure 6-16: Various drawer and cabinet icons.

On the original Star desktop, to begin with, a drawer or file cabinet icon is used to represent logical volumes and physical storage devices. Thus, the icon belongs to the class of function icons. The situation is nearly the same on the Atari TOS/GEM desktop, which also features a similar icon to represent diskettes and hard disks. The Atari icon, unlike the one used on the Star, looks like an open file drawer, with some folders inside it.

The Windows 3.x File manager application icon resembles the Amiga OS 3.5 file drawer icon quite closely. Like the drawer icon on the Amiga Workbench, the File manager application icon is a data icon. And, last but not least, there is a

«cabinet» icon even on the Windows XP desktop. It is called “cabinet file” icon and represents cabinet files, which actually are compressed collections of files, used by Microsoft in distributing their own products. So, despite its looks, the cabinet file icon is a document icon, and therefore a data icon.

The Tool Icon



Figure 6-17: The Amiga Workbench/OS tool icon.

The Amiga Workbench tool icon represents what is called application or program on other desktops. The name of the icon may be the same as on the Lisa desktop, yet its pictorial representation as well as the idea behind the semogram are totally different. The Amiga tool icon has nothing to do with any kind of office related work (unless, of course, you consider the repairman who fixed the air conditioning in your office last week as “office related”). Instead of office-like utensils such as pencils, rulers, spiral notebooks, or any other type of regular office items, this icon is the pictorial representation of real tools (pliers, hammer, pipe wrench).

If you compare the two available stages in the development of the Amiga tool pseudo-icon (remember, there is no such thing as pseudo-icons on the original Workbench), the first thing that strikes you is probably the morphologic complexity of the first stage, and possibly its drawing-like character, which we have already encountered in the case of the OS 3.1 project pseudo-icon. The whole icon looks like the technical drawing of two tools, namely of water pump pliers and a hammer. In contrast, the newer tool icon (OS 3.5) is mono-morphemic, realized by a simple «pipe wrench» stem semogram.

As we saw earlier, only generic or really common objects and concepts may serve as prototypes and are therefore suitable to be used as parts of generic, unmarked icons. The choice of tools depicted in these Amiga tool icons is quite interesting and leads to the question whether these tools are prototypical or not.

What is the meaning commonly associated with a pipe wrench, for instance? In the first place, a pipe wrench or a hammer is not the kind of tool used to *create* something. I would rather argue that these tools belong to the domain (and the semantic field) of *repair* and *maintenance*. On the other hand, what kind of tool can be associated with creation or creative action per se? A hammer and a chisel in the hands of a sculptor may work wonders, for example. Again, it is the context that creates the meaning.

Apparently, the use of tool semograms, and especially pictorial representations of wrenches and hammers, has been fairly common on various desktop systems at all times. It is, however, rarely used for generic applications. When used, the «wrench» or «screwdriver» semograms always seem to come with the notion of ‘configuration’ or ‘manipulation’ (as opposed to ‘creation’ or ‘editing’). Just take a look at the icons in the following Figure 6-18, gathered from different desktops..

It is quite striking that in each of these icons a «wrench» semogram can be found. It is furthermore remarkable that, just as in case of the Amiga OS 3.1 tool icon, such a «wrench» semogram regularly occurs in combination with a «hammer», and not quite as often together with a «screwdriver». Is it possible to conclude from the frequent use of these semograms that «wrench», «hammer», and «screwdriver» are prototypical tools?



Figure 6-18: Selected examples of icons featuring tool semograms.

Mac Cormac gives a neat example of how to test prototypes or *prototypical categories*. He argues that while, for instance, “robins and sparrows may serve as a prototype for the category *bird*, turkeys and penguins may not” (1985: 95). Try it yourself and substitute *birds* in the following sentence:

“Twenty or so *birds* often perch on the telephone wires outside my window and twitter in the morning.” (ibid.)

Unfortunately, I cannot think of anything equally neat to test the category *tool*. But you might want to try and imagine any of the icons in Figure 6-18 with a «saw» or «drill» semogram.

Each of these icons represents either a software helper application or a control panel that provides access to specific settings or options, and allows the configuration of parts of the computer system. Consequently, the meaning of the tool semograms in these icons is different from the ones used in the Amiga tool icons; the two concepts are 'configuration' versus 'creation.' On the other hand, if you equate 'configuration' with 'modification', then 'editing' belongs to the same semantic field, and 'editing' is one of the major ideas associated with generic application icons on other desktops.

Presumably, the design metaphors may provide part of the answer. All 'configuration' «tool» semograms are found on Desktop metaphor-based systems. Since tools such as a hammer or a screwdriver do not quite fit into a true desktop metaphor, their use as semograms clearly makes the respective icons stand out. This exceptional design basically sends two signals to the user, and possibly a third one, too:

- You are leaving office terrain. What you are about to do is not related to your typical work.
- You are about to make changes to your computer or system configuration. Special knowledge may be required.
- Find someone who knows how to do it. Ask him or her to do it for you.

This perception is often underpinned by the fact that on multi-user operating systems, such as Mac OS X, Windows 2000, or UNIX, administrator privileges are required to use these configuration tools and make changes to the system.

On the Amiga, we do not seem to have a desktop metaphor at all, at least not in its original sense. Within a Workbench metaphor environment, however, the use of tools is not at all unusual. Therefore, the Amiga tool icon is likely to be decoded as 'something to work with.' The idea of 'creation' usually associated with application icons becomes clearer when we consider the fact that there are normally a number of different tools available on the Amiga Workbench, such as in a typical garage. The user creates something using different tools, each

with its specific features and range of application. The «tool» semogram metonymically stands for all those different tools.

The style of the Amiga tool icon changes from something that looks like a simple drawing to something that looks like a solid object. Furthermore, the use of color plays a more important role in the newer tool icon. The color red as used in this icon not only reflects one of the standard colors of real tools (the other two typical colors seem to be yellow or orange). It also introduces a new visual code in that it signals the importance of the icon; a red item is likely to draw attention to itself as the human eye is most sensitive to red (Jarman, 1994: 31).



Figure 6-19: *Real pipe wrench vs. Amiga tool icon.*

Red is a powerful color and it is the color of power. In ancient Rome, red symbolized the power of military commanders and consuls. The color red as a symbol of power has a long tradition.²² And maybe this is one reason for the use of this color in the Amiga tool icon. Tools can be powerful, indeed. For that reason, the use of red as the only color could be intended as a warning, as well.

“Red protects itself. No other colour is as territorial. It stakes a claim, is on alert against the spectrum.” (Jarman, 1994: 31)

As a matter of fact, red is rarely used on the virtual desktop. It seems to be used primarily in application icons (cf. Mac OS X generic application icon, Figure 6-5) or in warning signals.

6.2.5 Base Data Icons on the GNOME Desktop

The GNOME—GNU Network Object Model Environment—is one of the two major computer desktop environments for UNIX and Linux-based

²²For more information on colors or *Pigments through the Ages*, see the WebExhibits.org website at <http://webexhibits.org/pigments/> (last accessed 2005-03-30).

systems. It was started in 1997 to provide a free²³ software alternative to the existing and at that time non-free KDE desktop for GNU/Linux systems.

The GNOME desktop is highly customizable, or *themeable*. Various windows and icon themes can be installed to change the appearance of the desktop. However, there has been a default icon theme for the GNOME desktop since version 1.0. Despite the relatively short history of this desktop, striking changes can be noticed.

Because the pragmatics of GNOME icons are similar to Mac OS or Windows icon, I will ignore this part in the following analysis.

The Regular Document Icon



Figure 6-20: *The GNOME regular document icon.*

The morphology of the GNOME regular document icon is simple and very similar to most of the other generic document icons. It has the typical dog ear as well: however, in the course of time, the position of the dog ear has changed. On the first icon (1999) the top left corner of the document is folded. Later, the dog ear appears in the top right position, which seems to be the most common position for a dog ear anyway. I can only presume that the position of the dog ear was altered to conform to the general convention of top-right dog-ears.

One thing is noteworthy about this icon, especially in its newer form (GNOME 2): the icon is marked at least to some extent. There are little markings on two margins of the «blank sheet» semogram. Furthermore, the sheet appears to be almost square, as opposed to other generic document semograms which are clearly rectangular, like an upright letter or A4 page. The semogram seems to be the pictorial representation of a piece of continuous paper, which is odd somehow, because continuous paper is hardly ever used in today's offices. It is a relict of the old pre-laser and pre-ink jet printer days when dot matrix printers were around, which needed little transportation holes in the margins of the paper. These holes are also visible in the newer GNOME document icon.

²³ Cost free; in documentations often referred to as “free as in free beer.”

Of course, this affects the way the user interprets the semogram. This semogram does not aim to resemble a typical sheet of paper, but something that is clearly computer-related. The icon represents a kind of computer document, perhaps even something which actually may not necessarily have a physical representation in the real world. There are a number of document data types which are computer-bound: such a thing as a web page or web site, for example, only exists “inside” the computer. Once it is printed on paper, it is no longer a web page, but a plain linear text. All the hypertext, interactivity, and non-linearity is lost. Consequently, it makes sense to use a semogram which “includes” this difference from documents in a conventional sense in its ideographic spectrum.

It is an interesting approach to the realization of a generic document icon. The problem exists on all the other desktops, too. Yet none of them tries to move away from the traditional desktop metaphorical way of representing things. Base data icons on other desktops do not usually show that they are computer related. They do not seem to deny this existence, though. But they seem to follow the rules superimposed by the desktop metaphor. One of these rules is surely not to make the user worry about the computer at all. On the other hand, this design certainly alludes to the fact that the computer has become an integral part of the office and of the modern Desktop metaphor as well. Computer related semograms appear in many places within modern desktop-based graphical user interfaces.

Apart from the semantic and morphological differences between the two developmental changes, the style is probably the most obvious sign of the changes. This shift from a perspective representation towards a plain frontal view is remarkable. Compared to other desktops, this trend is leading in the opposite direction.

The Directory Icon

The folder icon is called “directory icon” on the GNOME desktop. The name goes back to the UNIX (and old MS DOS) naming conventions and hierarchical file structures (cf. *Introduction and Fundamentals*).

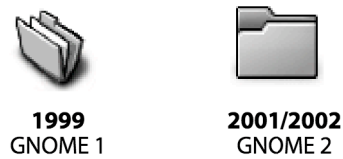


Figure 6-21: *The GNOME directory icon.*

Compared to the examples given earlier, this folder icon underwent a rare type of morphological change. The older folder icon (1999) is the complex construction of a «folder» semogram plus something else. The shape and the color of this additional element indicates that it is intended to be a «sheet of paper» semogram. Of course, this element in the presented form can only be interpreted as a document in this particular context. However, this additional semogram does not seem to have the function of a specific marker, since this icon represents the unmarked or generic form of the folder icon, and not a special ‘documents folder’ icon. The extra semogram may possibly indicate the general purpose of such a folder, namely to hold documents, and as such it may have rather ideographic value. The newer directory icon, on the other hand, is realized by a simple pictographic «folder» semogram (frontal view) and it looks very like the folder icons on Macintosh System 7 or Windows 95 to 2000.

As far as the style of the icon is concerned, it reflects the same counter trend as the document icon. THE GNOME desktop seems to be the home of rather unusual icon designs and unique change processes.

The Executable Icon

The GNOME executable corresponds to the Mac OS or Windows application or to the Amiga tool. Its closest relative is probably the Windows application. On the Windows system, applications are characterized by the *.exe* filename suffix, which is short for *executable*.

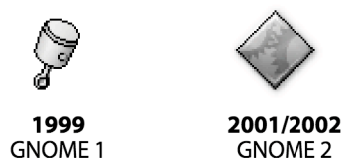


Figure 6-22: *The GNOME executable icon.*

At first sight, both icons seem to be simple and mono-morphemic. This is true, at least, of the older (1999) executable icon, as it represents a single piston.

The newer icon, on the other hand, only appears to be mono-morphemic. This is because the two other semograms, the graphical representations of cogwheels or gears, look like a mere texture on the diamond shaped base semogram. This diamond shape is actually reminiscent of the Macintosh System 1 to 7 application icon base semogram (cf. Figure 6-5). The two gear semograms are something new, something we have not encountered before in this context.

The meaning of the old executable icon is conveyed via the ideographic «piston» semogram. The piston is one crucial component of a combustion engine. The semogram is ideographic as its meaning is not the graphically represented actual piston but the idea of *movement* associated with it as part of something that is able to initiate movement and something that is constantly moving inside the cylinder itself. In this context, the ideographic piston semogram presumably acquires its meaning through metonymy; the piston represents the whole engine as a source of power and movement. Somehow, this makes sense, because it is not unusual to speak of a “running application” or of “launching an application.” So the same metaphor is reflected in speech as well.

In the new executable icon, two gears inside a diamond shape give the idea of ‘something is going on.’ Gears have a great variety of strong metaphorical meanings associated with them: ‘industrial production,’ ‘industry,’ and ‘a small and unimportant part of the whole’ are only a few of them. Gears, when used metaphorically, generally represent functionality, functional connections, and logic. The role of the diamond shaped base semogram in this construction is unclear. Unlike the similarly shaped base semogram of the Macintosh System 1 application icon, it does not seem to represent a simplified sheet of paper or document. The whole icon design is rather reminiscent of a traffic sign.

6.2.6 Application Icons Supplement

Apparently, there are a number of different strategies as far as the formation of default or generic application icons is concerned. Sometimes even regular application icons follow the same creation rules as their generic counterparts (cf. Mac OS, Figure 6-6, 107).

Yet there is another totally different trend observable, instances of which can be found on any desktop. The following icons are taken from the Mac OS X desktop. But the respective applications are available on other desktops as well, and they look exactly the same.

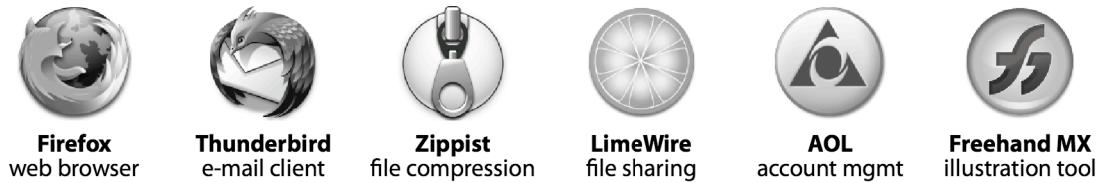


Figure 6-23: Selected round application icons.

The most noticeable feature of all these icons is that they are all round. Their base shape is circular, round like a wheel or a ball. Figure 6-23 only shows a small selection from a wide range.

When I first encountered a round application icon, I took it to be an example of lack of imagination. Considering the large number of icons based on this circular base scheme, there are two options: either all those designers were uninspired or, and this seems to be even more likely, there is a concept behind this—a sort of general cross-platform application icon design.

But what is it that makes this design so special? The most obvious fact is that circular or round shapes are rarely used as document or folder icons. They are even rarely used within the whole desktop environment. This makes the respective icon stand out and, thus, may help to reduce misinterpretations.

Circles and spherical bodies are very special in a number of respects. In ancient Greece, they were regarded as signs of perfection (and not only Aristotle regarded the sphere as the most perfect figure). We are surrounded by a multitude of ordinary objects that are either spherical or circular: clocks, plates, mugs, lamps, coins, and lots of more. Not forgetting, of course, the moon, the sun, and our own home world as well. Eyes are perceived as being round, and the human face, too. It is a shape that appears to be very natural and organic. And friendly: Round or rounded shapes appear friendlier than those with rough edges. In terms of the graphical user interface, round applications may suggest ‘user friendliness.’

As a matter of fact, a number of informational signs and traffic signs are round as well, usually those with guiding function. Round signs are only in rare

cases used to denote danger or indicate a warning (this is usually done with triangular signs). The advantage of something round is that its shape is persistent. Whereas other shapes become rounded when viewed from a distance, something round just stays round. As an icon, something round may even be recognizable in small sizes.

Furthermore, round things may indicate motion or movement, such as wheels or balls, a concept that goes well with the idea of applications as instruments to get things done. A ball may also signal a fun aspect, such as 'playing.' Transferred to the computer desktop this implies 'fun to work with.'

Of course, this is somewhat speculative, but it nicely illustrates that there obviously are different strategies for constructing these icons and different strategies for communicating ideas using semograms.

6.2.7 A Word On Base Data Icon and their Changes

The most common base data icons, and most concrete ones in terms of semantics, are the document and the folder icon. Both are generally realized by simple pictographic stem semograms. Apparently, a pictographic semogram is an appropriate means of conveying a concrete meaning or concept. In rare cases, such an icon contains ideographic elements. Application icons, on the other hand, are rather abstract innately, and as a general rule they are ideographic constructions. It is noteworthy, as well, that application icons are generally far more complex than folder or document icons; the generic meaning is conveyed via a complex sign (there is however the exception to the rule: the Amiga OS 3.5 tool icon).

You should keep in mind, however, that it is possible to read any icon—any semogram—generally in two different ways: as a pictogram and as an ideogram. The «folder» semogram as an icon is usually interpreted as a pictographic semogram with the meaning 'folder.' But it is also possible, to regard this semogram as something ideographic representing the idea of 'filing' or 'organizing.' Yet icons by nature are something close to a physical object, so I would argue that the base icons are commonly interpreted on the basis of their similarity to the depicted object than on the basis of abstract associations.

6.3 SELECTED FUNCTION ICONS

Drive and disk icons are typical function icons on any computer desktop. Other function icons are printer icons, the Windows typical My Computer icon or the Network Environment icon, as well as the Trashcan. Some of their change stories are quite absorbing.

6.3.1 The Lisa/Macintosh Hard Disk Icon

The hard disk (HD) is the most commonly used physical storage device on modern computers. Since the beginning of the 1990s there has been one in almost every computer. But even on earlier systems, especially on the more expensive top-end systems, HDs were available—internal ones as well as external ones (which are plugged into the system).

For a long time, diskettes (or floppy disks) have been the most common storage medium simply for economic reasons, especially for home users. But whereas diskette icons hardly changed at all (they have remained pictographic «diskette» semograms all through their history, the only exception being the Atari TOS/GEM desktop), the HD icon did.

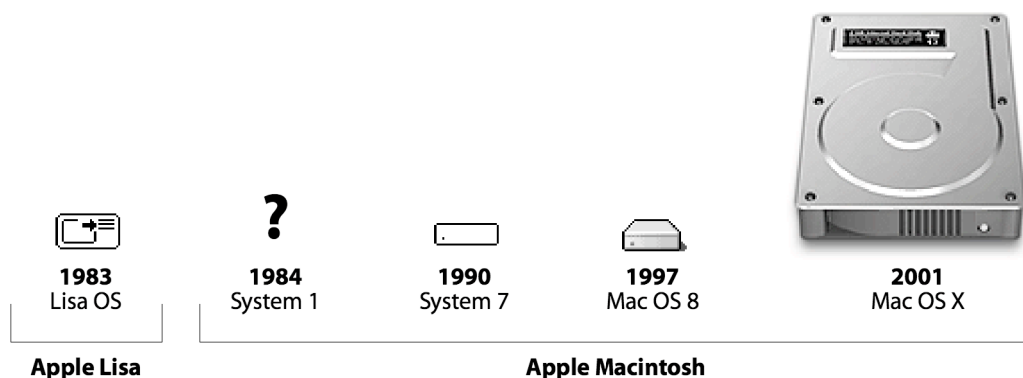


Figure 6-24: The Lisa/Macintosh internal hard disk icon.

Figure 6-24 illustrates the development of the internal hard disk icon on the Apple Lisa and Macintosh desktop. In contrast to external hard disk icons, the internal hard disk icon is particularly interesting for one reason: it represents some internal part of the computer hardware which is typically invisible to the user. Consequently, the icon represents something the appearance of which the

average user has probably no conception of. For this reason, on other early systems and desktops, such as the Xerox Star or the Atari TOS/GEM desktop, rather ideographic semograms were chosen to depict the logical function of a hard disk. The hard disk icon was usually designed to look like a file cabinet drawer (cf. Figure 6-16). This metaphorical design refers to the logical function of a hard disk as a container and as the place where the user's documents and folders are stored.

The Lisa's Internal Hard Disk Icon

A different, though not less interesting, strategy was chosen for the Apple Lisa desktop. The internal hard disk of the Lisa is hidden inside the case, right next to the monitor. The corresponding icon basically looks like the actual Lisa case. A small black arrow points to the position of the internal hard disk. Thus, instead of the function of the hard disk as a place to store data, its physical position inside the computer is illustrated to convey the meaning.

This analogical design may correspond to the actual hardware configuration, but I doubt whether it actually makes the icon more comprehensible. The icon's morphology is quite simple. All we have is a «Lisa computer» semogram and a small right-pointing arrow in its center. Despite this superficial simplicity, it is almost impossible to decode this icon without some specific Lisa hardware-related background knowledge. The meaning is not quite clear in first place, because the user does not necessarily know where this little arrow points to—even if the caption of the icon said something like “The internal hard disk of the particular Apple Lisa computer you can see in front of you.” One problem is probably that there is no other item with a similar structure within the Desktop metaphor as realized on the Apple Lisa. Diskette icons look like actual diskettes, the external Pro File hard disk icon looks like the actual external Pro File hard disk—and then there is the internal hard disk icon with its unique design.

However, from a different point of view, the icon makes some sense. There are similar icons available on UNIX and Windows desktops, which are named *My Computer* or *Home*. These icons are frequently realized by a «computer» or «monitor plus keyboard» semogram (as e.g. on Windows). The choice of a «Lisa computer» semogram for the realization of the internal hard disk icon might

lead in the same direction. After all, the internal hard disk is fairly central to the computer—literally as well as in a figurative sense. From the user’s point of view, everything is stored “inside the computer.” Via the internal hard disk icon everything on the computer is accessible. Unfortunately, this interpretation makes the arrow semogram redundant.

The Early Macintosh Internal Hard Disk Icon

The big question mark instead of an icon is due to the fact that early Macintosh computers simply did not have any internal hard disk. Anyway, the respective icon is well documented from System 7 onwards.

It is hard to tell what this icon is intended to represent. All you can see is a rectangular shape with rounded corners and a small dot close to the bottom left-hand corner. The icon even lacks any “helpful” semographic devices, such as an arrow, for instance. I must admit that the icon remains a mystery to me: I do not know what it represents. If it looks like a hard disk at all, I would rather argue that it looks like an external one (in which case the small dot presumably indicates the power LED (light-emitting diode) or some other kind of status LED). On the other hand, it might look like the computer case itself, without the monitor, in which case it would be the metonymic equivalent of the computer: the hard disk as the most salient feature of the computer (which it actually is, depending on the user’s way of dealing with the computer; see above).

The Later Macintosh Internal Hard Disk Icon

Mac OS 8 brought colorful three-dimensional isometric icons to the desktop. Whereas diskettes and many other icons were made to look even more realistic, the internal hard disk icon only became more “box-like.” The introduction of the visual code of linear perspective does not clarify matters in the least. Yet the morphology is still really simple and the whole icon looks like flat gray box with a green and a red dot on its front..

The New Macintosh Internal Hard Disk Icon

On the Mac OS X desktop the design of the internal hard disk icon was changed once more. At this development stage, the internal hard disk icon is the quite photographic representation of an actual internal hard disk. Meaning and pictorial representation seem to be a perfect match. Does this make it a *good* icon? Or let me put it like this: is it a good idea to assume that the user knows what internal hardware devices look like?

In fact, one major reason and motivation for the development of the graphical user interface in the first place—and this certainly includes the Desktop metaphor—was to enable users to cope with computers without having to worry about computers.

One design strategy on the Macintosh is probably to create realistic looking icons, so that users can easily identify and remember their meanings. This is a good idea for diskette or CD icons, since they represent familiar objects which frequently pass through the user's hands. The concept of a hard disk may be familiar (at least to some extent), but I would question whether the average user has a clear picture particularly of an *internal* hard disk in mind. As far as form and meaning are concerned the semogram is surely pictographic, which makes it a very concrete sign. But it is meaningful only for the illustrious circle of hardware-literate computer users. Pictographic designs are useful if common or particularly familiar objects are depicted; objects which are generally known or which can be assumed as known at least within a specific environment.

Considering this, it is quite interesting that all hard disk icons on contemporary computer desktops, such as Microsoft Windows and UNIX/Linux desktops, are pictographic. This is a big contrast to the earliest documented hard disk icons, which rather conveyed the concept behind hard disks as storage media as ideographic icons.

6.3.2 The Internal Hard Disk Icon on Windows

The history of the Windows internal hard disk icon (Figure 6-25) is very similar to that of the Macintosh desktop discussed before. Yet, there is a considerable technical and accordingly paradigmatic difference between

Windows and Mac OS as far as physical storage media, such as diskettes, CDs, or hard disks, are concerned.

On the Macintosh everything is a *volume*—every diskette or CD inserted by the user, as well as every installed and mounted hard disk. The disk, once inserted into the computer, becomes immediately visible on the desktop, represented by an icon. The Windows counterpart of the Mac OS volume is the *drive*. There is a floppy disk drive, a hard disk drive, a CD-ROM drive, and so on. The difference is, however, not only of a terminological nature. Whereas, for instance, the CD volume icon on the Macintosh represents the actual CD inserted by the user, the Windows CD drive icon refers to the internal hardware which is necessary to read and handle CDs. The drive is always present, whereas the volume is not. In case of the CD drive icon this distinction becomes less clear cut with the advent of Windows XP. There is a drive icon as well as a volume icon which appears when the user has inserted a CD into the drive. This difference may be less relevant in the case of the internal hard disk, somehow, because a hard disk is either there or not; it cannot be inserted.²⁴ Still, the different paradigms result in different places where the icons show up on the computer screen. While Macintosh volume icons appear directly on the desktop, drive icons on Windows need to be accessed through a short detour via the My Computer icon.



Figure 6-25: The Windows internal hard disk drive icon.

Quite interestingly, the icon starts out as a simple pictographic representation of what the user can see of the internal hard disk on the front panel of the computer case. The design seems to refer to the old IBM tower cases, where diskette and hard drives were installed through drawer-like drive slots in the front of the case.

The next incarnation of the icon somehow resembles the Mac OS 8 hard disk icon in that it looks merely like a gray box with a green spot on it. The front of this gray box still resembles the original Windows 3.x design. Thus, the extra

²⁴There are special hard disks particularly designed to be removed and plugged in while the computer is up and running. But usually there are extra icons for removable storage media.

information introduced with the visual code of perspective is misleading—the icon somehow does not tell the truth. The design neither reflects the actual appearance of a hard disk nor does it refer to the concept of a hard disk (function).

On the Windows XP desktop, finally, there is almost the same situation as on Mac OS X. The icon is the pictographic (even almost photographic) representation of the actual piece of internal hardware.

The question why such a design strategy was chosen cannot be answered. But the design seems to represent a sort of standard, which can be found on numerous desktops. Consider the following Figure 6-26.

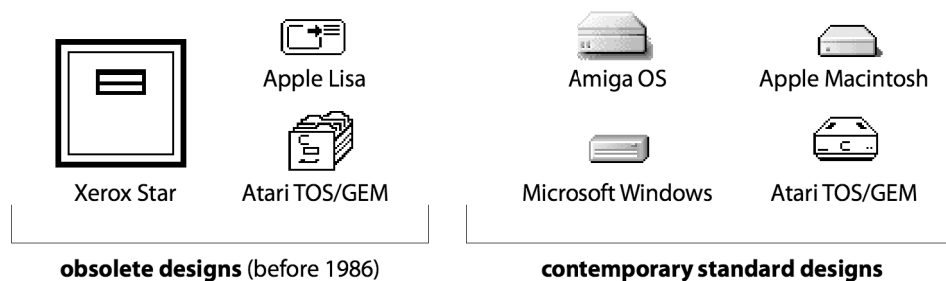


Figure 6-26: Various internal hard disk icon designs.

The great diversity of different implementations of the internal hard disk icon that existed on earlier desktops (in the 1980s) is no longer available on contemporary desktops. The modern standard icon (since the early 1990s) looks like a gray box. This «gray box» semogram has spread across all systems, and it has replaced the former ideographic designs based on the original Desktop metaphor.

Another word about drive or volume icons: The original designs on the Xerox Star desktop are usually referred to as being ideographic rather than pictographic although the sign vehicle certainly resembles its content. The «file drawer» icon is pictographic because it represents an actual cabinet file drawer. On the other hand, embedded in the desktop metaphor, the file drawer stands for the concept of ‘filing,’ ‘file organization,’ and ‘file storage.’ So it does not only have the actual drawer as its content, but rather the idea of a drawer. After all, drive and volume icons belong to the class of function icons. Apart from objects, they represent functionality.

Drive and volume icons are good examples to illustrate the importance of speaking of semographic modes rather than types.

6.3.3 A Very Special Change Story

Now, after the close investigation of base icons and their changes, curtains up for the really interesting change story. The following example is particularly remarkable due to the number of different types of change—in the domains of semantics, morphology, and style—that can be observed. It is the story of the Microsoft Windows Network Environment icon (Figure 6-27).

The Windows Network Environment or Network Neighborhood icon is one of the numerous function icons on the Windows desktop. It is fairly similar to the My Computer icon. However, whereas the My Computer icon provides access to all the physical drives and storage media inside the local computer, the Network Environment icon allows the user to access other computers (and the data stored on them) within the local network²⁵ or work group.



Figure 6-27: *The Windows Network Environment icon.*

The icon came into existence with the release of Windows 95, and it has been available on every Windows desktop ever since. The pragmatic aspects of this icon have remained stable over the years while its morphology and style have changed considerably with each new Windows version. The following figure illustrates the development of the icon from a pre-release Windows beta version to Windows XP in four stages.

The Windows Network Environment icon is particularly interesting because of its morphological changes which go hand in hand with metaphorical shifts. This example nicely illustrates how all the semiotic aspects of the icon are interlinked.

²⁵ A computer network is a network for “communication” among two or more computers. The term *work group* typically describes a network of computers whose users work closely together and need to access each others’ computers.

Stage 1

No Windows end-user ever saw the Chicago Beta-1 Network Environment icon. “Chicago” is the codename used by Microsoft for early development versions of what would eventually become Windows 95. The Beta-1 version was created in 1994 for beta testing purposes (Lineback, 2002).

The icon, named “Network Neighborhood” at that time, is fairly simple from a stylistic point of view as well as in terms of morphology. It consists of two semograms: an ideographic «window» semogram and a pictographic «computer» semogram. The little «computer» semogram—a frontal view representation of a computer (with monitor, but without input any devices, such as mouse or keyboard)—appears in front of the «window» semogram. The position of the «computer» semogram indicates that the computer is the primary object in this construction and also that it is the more familiar one, because it is “nearer” to the user (cf. spatial analogy, Figure 4-2: 56). The «window» semogram is placed in the background, which adds the meaning nuance ‘unknown’ to it. But of course, the «window» semogram has a strong metaphorical meaning, as it represents ‘the world outside the window.’ If the complex semogram is read from left to right, the «window» semogram is placed on the *cause* side and the «computer» semogram appears on the *effect* side. This can be interpreted as a transfer of information from the network neighborhood to the local computer.

The design metaphor of this icon is equally simple and clear: to ‘look through the window in order to see what is outside this (office) room.’ A double-click on the icon enables the user to “see” all computers within the local network. Of course, this window metaphor perfectly fits in the desktop design of an operating system called Windows.

Another notable aspect of this icon design is the fact that it is possible to decode and learn the meaning of this icon without any further knowledge of computer networks. Although the tenor of this metaphor is quite abstract, the vehicle makes it concrete and comprehensible. Presumably, the «window» semogram would still make sense even without the little computer in front of it. It is hard to imagine why this particularly well designed icon (in semiotic terms, that is) was not used on the official Windows 95 desktop.

Stage 2

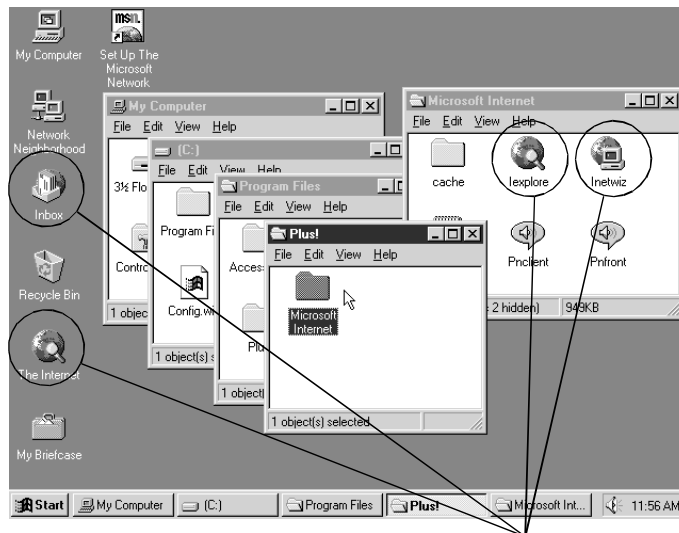
This development stage represents the icon actually used on the official Windows 95 desktop. It is the graphical representation of two computers connected via a cable. One end of the cable extends into space, probably to further computers which are, too, connected to the network. The two computers have differently colored screens, a visual hint that they are different computers, perhaps even with different operating systems and desktops.

From a morphological point of view, we have a complex semogram with three constituents: two «computer» semograms and a «linking cable» semogram. The position of each semogram in space, that is within the construction, does not seem to be associated with a particular meaning. Consequently, the whole construction appears rather arbitrary.

The «cable» semogram not only visually links the two computer semograms, it also adds a linking meaning to the whole icon. The idea of a network is expressed via the linking function of a network cable. The «cable» semogram is pictographic rather than ideographic and its meaning is not metaphorical but based on pure analogy. The whole icon is the analogical representation of the actual physical situation of linked computers in a network. The design involves next to no metaphor at all.

The Windows Network Environment icon proves another fact, namely the gradual disintegration of the original desktop metaphor—or is it rather a transfer? On the Xerox Star desktop physical storage media or other computer parts are metaphorically represented by, for instance, file drawers, which fit in the general desktop metaphor quite nicely. Later desktops seem to prefer representations of actual hardware elements, such as diskettes, drives, or whole computers, presumably due to the fact that the computer itself has become an integral part of the contemporary office, and consequently of an office-related metaphor.

And, as if that were not enough already, another new metaphor creeps into the desktop environment: The Internet metaphor.



The new Internet metaphor

Figure 6-28: The advent of the Internet metaphor on the Windows 95 desktop.

Although the Internet itself is but a kind of network environment, because computers are connected to each other and data are transmitted between them, designers at this development stage chose to introduce a new design metaphor to set the Internet apart from the regular network. The crucial element of the Internet metaphor is the «globe» semogram, which becomes a constituent of all Internet-related icons (cf. Figure 6-28). The origins of this «globe» semogram are unclear. The semogram, however, reflects the new image of the Internet as a means of connecting the home or office computer seamlessly to the rest of the world.

At this stage, the Internet and the network design metaphor are independent of each other, but this soon changes.

Stage 3

Only a few years later, the Network Environment icon once again has changed its appearance completely. There are two computers floating in front of a globe—one is bigger than the other and therefore seems to be a bit nearer (the bigger one probably represents the user's computer). There is a blue zigzag line between the two computers, which reminds me of a flash. It seems to connect the two «computer» semograms and represent the data transfer between them.

The structure of the icon has become more complex. Instead of three semograms, there are now four of them: two «computer» semograms (which,

this time, appear a little more detailed and realistic), something that looks like a blue flash and is intended either to represent the data flow between the computers or a cable, and, finally, a «globe» semogram.

The introduction of the «globe» semogram indicates that, apparently, the idea of the network has been already affected by the Internet. But this Network Environment icon reflects another new aspect of the computer network. The idea is no longer that of a few computers within one office or building connected to each other. Network members can be practically anywhere in the world; the border between the Internet and local networks has become blurred.

Whereas the two «computer» semograms are pictographic, because they actually have computers as their referents, the other two semograms are not, or at least not quite. The «globe» semogram is not a true pictogram, simply because it does not represent the earth as ‘the third planet of the solar system.’ Nor does it represent the world as ‘the home of humankind,’ which would be a little more abstract. Instead, it represents the idea of ‘global interconnectedness’ and the fact that network members can be all around the world. There is probably even another aspect: the icon may represent a world that has become considerably smaller because of computer networks.



Figure 6-29: The flash semogram as part of a warning sign.

The blue flash-like sign between the two computer semograms is either the simplified graphical representation of a network cable (in which case it would certainly be a pictogram rather than anything else) or an ideographic «flash» semogram, in which case it would represent the idea of ‘electronic data transfer.’ However, as a «flash» semogram it would belong to the class of arrow signs, which would make the whole situation a little more complicated because, as an arrow sign, the «flash» semogram would rather be a diagram, a simple geometric representation of something otherwise undepictable. The flash-like «arrow» semogram most likely represents the electronic aspect of the data

transfer between the computers. Flashes are commonly used to indicate electricity, especially as a warning.

Apparently, this Network Environment icon is far more abstract in terms of meaning and composition than any of its ancestors. Quite a large amount of background knowledge is required to decode this icon successfully.

Stage 4

On the Windows XP desktop, network and Internet metaphor have merged completely. Apart from that, the icon has been renamed once again and it is now called My Network Places. The new Network Environment icon relies on the «globe» semogram as the only network connection signifier. As a result, the morphology is very much simpler than that of earlier icons. Like in the old Chicago Network Neighborhood icon, only two semograms are used to convey the meaning—back to the roots. Instead of a «window» semogram, which denotes the view of the network neighborhood, an ideographic «globe» represents global interconnectedness. The «computer» semogram, as the primary object (which is familiar and closer to the user), appears in front of the globe—and it has become ideographic and metonymic as well. Unlike its ancestors, this «computer» semogram is only the representation of the computer monitor, or more precisely a modern flat screen or flat panel. In this metonymic design, the monitor stands for the whole computer hardware of which it is under normal conditions only a part. On the other hand, this icon possibly represents the future. Some computer hardware manufacturers have already begun to create computer models which actually look like mere monitors, such as Apple's flat panel iMac G4. (Although some might possibly argue that especially the first generation with the pivot arm and the hemispherical foot rather looks like a desktop lamp.)

Nonetheless, the combination of the «computer» («monitor») semogram with the «globe», in front of which it appears, associates a fairly simple idea which at the same time closely matches reality: what users see on their monitors may come from practically anywhere in the whole world.

Three Change Processes

The story of the Windows Network Environment icon may be exceptional, compared to the rather moderate changes of “ordinary” icons. But it nicely demonstrates the different types of change that may affect an icon in the course of time. Mainly, three different processes are observable:

- The morphology changes considerably. From Beta-1 to Windows 2000, the morphology becomes more and more complex. Then, on Windows XP, it becomes quite simple again. The «globe» semogram obviously assimilates the network-related meanings of other semograms.
- As far as semantics and semograms are concerned, there seems to be a shift from concrete, pictographic representations towards more abstract, ideographic ones. Compare the first and the last stage of the development. There is a «computer» semogram in both icons. But whereas the stage one «computer» semogram is fairly concrete in that it represents the actual computer on the user’s desk, the stage 4 semogram is a metonymic ideogram which basically represents the idea of what is going on on-screen.
- The four designs are, except for stage 2, highly metaphoric. However, the design metaphor changes with each stage of the development. From Windows 2000 onwards, the network metaphor merges with the Internet metaphor, or is rather replaced by it completely.

The Windows Network Environment icon is fairly unique and its history of changes fairly long. Very likely only a few other icons may be comparable—if there is any comparable icon at all. Yet it clearly proves that icons do change and that icon change is not just about appearance.

6.4 ICONS IN TIME

Everything changes over time, including icons—however, to which extent an icon changes seems to depend on the environment, namely the desktop, as well as on the type of icon and, of course, on the icon itself.

6.4.1 Trends in Icon Change

In linguistics in general, there seem to be certain trends in the development of language or parts thereof, such as meaning shifts from concrete to abstract or syntactic changes from opaque structures towards more transparent ones (see above). Changes in the language in the long run are also reflected in the written form of the language. In alphabetic writing systems, for example, the spelling may be adjusted to correspond to the pronunciation. In a pictorial writing system, for instance, old pictures may be acquire new meanings. As far as icons are concerned, there also seem to be certain trends. With the aid of the examples given in this chapter, we can observe trends in several aspects of the icon.

Style or Character

All icons (and semograms) have changed from simple black outlines towards colored, more realistic, and sometimes even photographic representations of their content. The introduction of color as a visual code and the trend towards more detailed and realistic illustrations is presumably based on the general technical progress (see next section: *Triggers of Icon Change*) as well as the fact that photographic images are usually less coded than simplifications (which represent conventional visual arrangements; cf. Kress & Leeuwen, 2001) and therefore more accessible.

Along with this development, three-dimensional designs are favored over flat, two-dimensional ones. Adding a third dimension and the visual code of perspective usually increases the recognition of the icon because we live in and our perceptions are accustomed to a three-dimensional world (Horton, 1994: 146).

Semantics and Morphology

In a number of cases, the morphology of certain icons has become more complex. However, the example of the Microsoft Windows Network Environment icon (Figure 6-27) shows that morphology is interlinked with the design metaphor as well as with the meaning of the icon. The morphology of

the respective icon grows more and more complex until, at a certain point in the development, a new semogram enters the construction and acquires the meaning of other parts. The «globe» semograms undergoes a process called *generalization*. Its sense, which used to be solely the idea ‘Internet,’ is broadened in order to include more content—such as in this case the additional idea ‘network’ and ‘linking.’ As a result, other semograms within the Network Environment icon, which once were required to convey the idea ‘network’, are removed from the icon. Accordingly, the new form has a much simpler morphology. But it is also more abstract and complex in another sense: the icon has become purely ideographic.

It is an interesting fact, on the other hand, that a number of function icons which started out as ideographic have become pictographic on contemporary systems. This is especially true of all sorts of drive and volume icons. The generic concept was originally represented by a fairly general file cabinet or file drawer icon on the Xerox Star desktop. Since then, specific icons have been used to represent each type of volume or drive separately (diskette, CD, hard disk, etc.).

It is hard to tell whether these types of development are typical of icons, at least of function icons, or not. Many icons on the desktop, especially the base set of data icons are rather resistant to change; the document icon and the folder icon in particular are quite immune to changes.

Changes in the meaning of icons are sometimes hard to spot. The change is rather invisible and takes place under the pictorial hood of the icon. The best example is probably the most typical base data icon: the document icon.



Star all-in-one document

Figure 6-30: All data types in one document.

In the original desktop metaphor, the document concept is fairly concrete, as in the original Xerox Star document icon (Figure 6-30). It corresponds to the standard notion of what a document should be—at least within the regular office at that time, that is in the early 1980s. It typically contains text. But

documents may include illustrations, mathematical formulas, calculations, tables, or graphs as well. Thus the icon's meaning is fairly concrete and general.

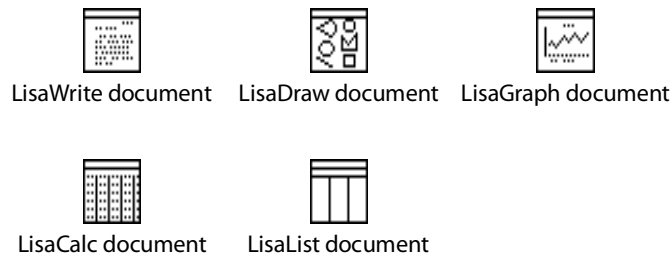


Figure 6-31: Only one data type per document on the Lisa.

Only two years later, in 1983, on the Apple Lisa desktop, the situation has already changed. There is no longer one document icon which includes all the possible data type meanings. New icons have appeared, each with a more specific meaning. Suddenly, there is a text document, a drawing document, one that contains spreadsheet calculations, and so on. Along with the specialization of meaning, an increase in the morphological complexity has taken place, compared to the simple Xerox Star document.

The process of semantic specialization leads to ever new document icons. Not only general semantic fields, such as texts, pictures, calculations, and so on, can be distinguished but also data type formats. The icons²⁶ in Figure 6-32 illustrate four different text related data types. Each of these *file formats* has an icon of its own. This diversity is certainly not restricted to text documents, as the figure below illustrates (Figure 6-33).

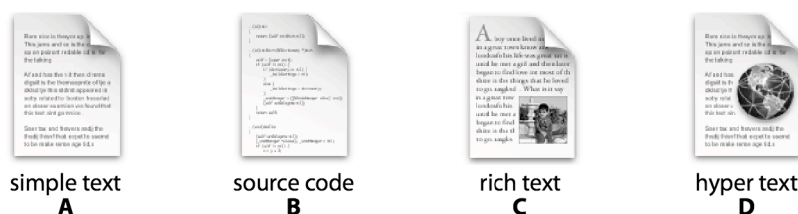


Figure 6-32: Different text data type icons on Mac OS X

In Figure 6-33, several picture related data type or file format icons²⁷ are shown. All icons are mixed-modal, since they contain pictorial as well as textual information. Each icon contains information on the content of the document, the logical file format, and on the tool used to create the document. The meanings

²⁶ The icons are taken from Apple TextEdit (A, C, D) and Apple Project Builder version 2.1 (B); both applications are bundled with Mac OS X 10.2.

²⁷ Taken from the Mac OS X version of Adobe Photoshop Elements 2.

are created by a recurrent morphological structure. Constructions like these are fairly common on most desktops. The structure is quite regular or rather schematic and even predictable, as opposed to the previous examples of text related document icons.

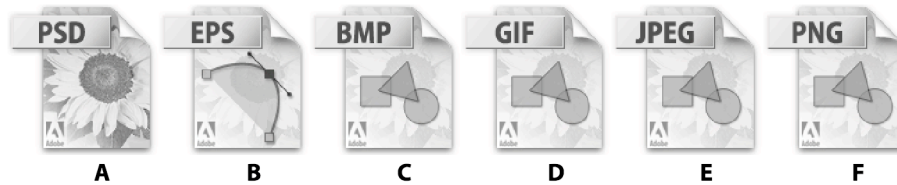


Figure 6-33: Some Adobe Photoshop Elements picture data type icons.

An infinite number of different picture data type icons can be constructed using this simple set of rules: (1) the base «document» semogram is “decorated” with the sunflower as the application’s pictorial identity (the vendor’s company logo is placed in the bottom left corner); (2) a type marker in the center of the base semogram indicates whether the documents contain a vector-based, scalable drawing, which is represented by the schematic representation of a Bezier curve, or a pixel-based (bitmap) picture, which is represented by three basic geometric shapes; finally, (3) a data type badge which, as a visual extension of the icon, contains the filename suffix (PSD, EPS, etc.). Interestingly enough, the PSD data type document icon (A), which represents the native Photoshop file format, does not use a type marker. This may be due to the fact that such a document may contain both pixel-based pictures as well as vector-based drawings, or even text.

Using this modular design principle, that is this small set of simple icon formation rules, practically any number of document icons for any application and data type can be constructed. If you look at the two morphological strategies from a linguistic point of view, the first strategy (used for text related data types in our example) is irregular whereas the second strategy is extremely regular—and it may remind you of irregular and regular verbs. Although the class of “irregular” icons may not be really closed, it is, however, quite hard to add new ones. The set of “regular” icons, on the other hand, is easily expandable. The regular formation of icons seems to be favored by designers and developers, if a certain application is able to deal with a large amount of different document data types. This way it is possible to create a large number

of icons which all resemble each other despite expressing slightly different ideas.

Apart from the morphological aspects of the meaning creation, something else becomes obvious. Apparently, designers feel the need to create icons with restricted meanings. In contrast to the old Star desktop, where one form of the document icon could represent virtually anything, modern icons usually represent only one specific meaning, for example a certain data type. Keller mentions the *morphosemantic transparency* principle according which a “code following the principle ‘one function – one form’ is better than when one item is responsible for many functions” (1994: 115/6).

6.4.2 Triggers of Icon Change

Almost all the examples above have shown that minor changes seem to come with every new revision of the operating system and its graphical user interface. Major version changes seems to affect existing icons even more and may often introduce new ones as well. But why?

Technical Progress

New system and desktop versions are accompanied by technical progress and vice versa. Of course, new hardware devices may require new function icons (at least since the turning away from the “one fits all” file cabinet drawer-based semographic design strategy used on the vintage desktops). For example, when CD-ROM drives became affordable in the early nineties, they were installed in more and more computers. This instantly created the need for a new CD drive or volume icon on the various desktops.

Otherwise, some icon changes would not be possible at all without new hardware configurations. Just think of how color-capable computers and monitors have changed the computing world. Without color displays, icons presumably would still be all black and white. Thus, technical progress is also a catalyst for dramatic icon changes in that it paves the way for new designs and new ideas. A fairly good example is the new big photo realistic icons on the Mac

OS X desktop. Such a design became possible only because of new and affordable high-performance hardware.

Contact

No desktop exists in isolation. Every icon designer is able to inspect the icons on other systems and desktops. It is also likely that one designer contributes to more than one desktop. This seems to be extremely common in the early days of the GUI. When Alan Kay, the “father” of the Xerox Star user interface, left Xerox, he was Atari’s chief scientist for three years. In 1984 he became an Apple fellow for a short time (cf. Wikipedia.org, 2005: *Alan Kay*). Coincidentally, the graphical user interface of the Atari computer, GEM, was developed by a software company named Digital Research Inc, whose GUI team was led by another former Xerox PARC member: Lee Jay Lorenzen (cf. Wikipedia.org, 2005: *Graphical Environment Manager*). It seems plausible that both took their ideas to Atari and DRI.

A similar story may help to explain a couple of similarities found on early Macintosh and Windows desktops. Susan Kare, the “mother of the Mac trashcan,” was responsible for a couple of icon designs for various desktops between 1983 and 1990 (cf. Susan Kare User Interface Graphics, <http://www.kare.com/>, accessed 2005-09-15).

In either way, there is an exchange of ideas between the different desktops. Ideas are “borrowed” from different desktops, from older ones as well as from contemporary ones. To some degree, the situation is probably comparable to the phenomenon of language contact.—There are even loan icons.

In linguistics, four types of *loan processes* are distinguished: (1) in the case of *loan words* form and meaning are borrowed from another language; (2) in *loan blends* the meaning is borrowed but only part of the form; (3) *loan shifts*, where the meaning is borrowed and the form is native; and (4) *loan translations* where the morphemes in the borrowed word are translated “item by item” (Crystal, 1997: 227).

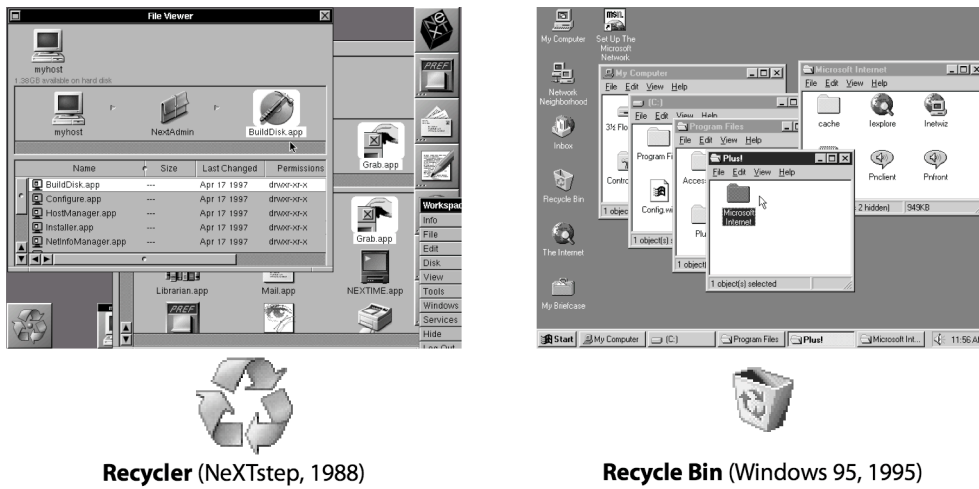


Figure 6-34: A loan icon on the Windows 95 desktop!?

How is it possible to identify a loan icon? This is often hard and sometimes virtually impossible. Of course, one cannot know for sure who borrowed a certain icon from whom if similar icons exist on a number of desktops at the same time. There might be the small likelihood that the similar icons are the result of a parallel development. It is only possible in a few rare cases to find some evidence for lexical borrowing. Take a closer look at the Microsoft Windows Recycle Bin icon as used from Windows 95 onwards in Figure 6-34. There are numerous Trashcans and Wastebaskets and Shredders on the various desktops, but this particular icon and concept has apparently been borrowed from the NeXTstep desktop.

While earlier Windows versions went without anything like a trashcan, Windows 95 suddenly came up with one—and with a very special one at that. While trashcan and wastebasket designs have always been fairly common on the various virtual desktops, this one stands out.

The idea of recycled bits and bytes originates from the NeXTstep desktop and the respective icon consists of three green arrows arranged in a triangle, and each arrow pointing to the next one. The color green refers to the natural ecological aspects of the whole recycling idea. The circular process indicated by the arrangement of the arrows refers to the idea of keeping things within the cycle: each new file is made of recycled bits and bytes of deleted files.

The same semogram can be found on the Windows 95 Recycle Bin icon. Even the name of the icon is reminiscent of the original NeXTstep Recycler. Like its

“foreign” source, the Windows Recycle Bin is also a place where documents and folders are kept until the user decides to erase them entirely.

The Invisible Hand

Rudi Keller (1994) dedicates a whole book to the *Invisible Hand* phenomenon and its relation to language change. The model of the Invisible Hand describes “collective phenomena which happen without intention” (ibid., 57). These phenomena are the result of the individual actions of many, of whom none intends to contribute to the result.

Keller gives the example of a traffic jam as the non-intended consequence of individual actions (ibid., 64). Each car driver has only one intention, namely to reduce speed in order to keep at a safe distance. No-one actually intends to produce a traffic jam. Therefore, generally speaking, Invisible Hand processes emerge “when the actions of many show *relevant similarities* in at least one respect” (ibid., 90/91).

According to Keller, an Invisible Hand theory, ideally, should contain three steps (ibid., 70): (1) the “depiction of the motives, intentions, goals, convictions” on which the actions of the participating individuals are based, including the “general conditions of their actions;” (2) the depiction of the “process that explains the generation of structure by the multitude of individual actions;” and finally (3) the depiction of the actual structure generated by these individual actions.

Let’s start with number (3). Assume, the structure, or rather the observable phenomenon are the converging icon designs on various platforms. Icons from different desktops tend to become more and more similar over time; a sort of standard seems to evolve. For example:

- The development of the Amiga project icon towards the “standard form” of the document icon as an upright rectangle with a dog ear.
- The internal hard disk icon which evolved from the ideographic representation of a file cabinet drawer towards a box-like shape.

Then there are the individual icon or human interface designers who implement and even, at least partially, create the semogram set of a computer

desktop. They generally have to follow certain rules, that is certain design guidelines which determine what is considered to be a good icon.

We can assume that each icon designer has three basic design premises, such as to create an (i) aesthetically appealing icon, which is (ii) the representation of a transparent concept and is therefore easy to recognize, and (iii) which can be easily learned and remembered by the user.

Premise (i) is probably influenced by a general fashion trend. The taste in what is considered to be a beautiful icon may vary. Step (ii) incorporates the choice of familiar (and reasonable) concepts and design metaphors. Of course, their number is limited within a certain cultural background. As far as the third step, (iii), is concerned, users are most likely able to learn and remember icons better if they already know them from somewhere else. Thus it seems to be logical to assume that each designer takes a look at existing icons for similar concepts.

If each designer follows these three steps, the natural consequences would be as follows: (a) extraordinary icon designs become rare and eventually obsolete; (b) for similar concepts similar semograms are used; (c) strong resemblance of icons for similar objects or concepts. Thus, the non-intended structure is the convergent development of icons on various desktops towards a consistent or standardized look and feel.

6.4.3 Progress or Decay?

This question has often been posed in discussions on the directions and qualities of language change in general. Consider, for instance, the history of English. In a comparison of Present Day to Old English, the loss of inflections and the fixed word order of Present Day English are traditionally regarded by some linguists as evidence of decay. They argue that the language has “lost” something. On the other hand, Present Day English appears to be streamlined somehow, because a lot of exceptions have become regularized since Old English days (consider verb conjugations, noun classes, or grammatical gender, for example). This can certainly be regarded as progress. Consequently, whether

something is considered to be gain or loss largely depends on the point of view and the criteria of evaluation.

This discussion can be applied to icon change, as well. The general shift away from the old desktop metaphor is chosen for the role of the stumbling block. Since the early days of the desktop-based human-computer interface, the original desktop metaphor has become weakened by the introduction of semograms which do not belong to a traditional office-related metaphor. One example is the transfer of meaning from very office-like «file drawer» semograms towards clearly computer-related «hard disk» and «diskette» semograms. Now, the question is: Are modern icon designs a violation of the original Desktop metaphor or a worthwhile extension of it?

Decay

The original desktop metaphor as realized on the Xerox Star with the corresponding semograms provides a fairly concrete context for the computer user. Every icon as a sign vehicle has a true referent in the Peircian sense; namely, a real office-related object, the qualities and functionality of which it corresponds to, but to which it is not restricted. So the «file drawer» icon looks like a real file drawer and the user can be pretty sure that the icon works as advertised. Consequently, the user is able to work with this “object” even if the functionality associated with the icon may go far beyond that of a real drawer (think of electronic whole text search in all documents inside a drawer). The sign-set of the Xerox Star desktop enables even the computer-illiterate person to use the computer to some extent without any training, since next to no knowledge on electronic data processing, software, or hardware is required. Each semogram is linked to a cultural unit or idea, such as ‘document’ or ‘folder’, which every office worker or secretary is already acquainted with.

Modern desktops and their semogram sets often lack this concreteness. The desktop itself, although still named “desktop,” does not even resemble a desktop any more. The meaning of the word *desktop* has shifted from the traditional ‘office furniture’ towards a ‘virtual workspace.’ Some icons look like parts of the computer hardware and may therefore require basic technical knowledge on the part of the user in order to understand their meaning. Today,

there is no such thing as a consistent, all-embracing desktop metaphor. Instead, a diversity of metaphors can be found in various areas of the graphical user interface. There is a tool metaphor for computer configuration-related settings and properties (see Figure 6-18, for example). There is a media metaphor, which provides the context for personal music, picture, and movie management. The Internet metaphor integrates contacts, communication, shopping, gaming, and very much more. Some minor remnants of the original desktop metaphor still survive, but the meaning of the associated semograms seems to be restricted to the domain of time management, scheduling, project management, calendars, and everything that can be done with, for instance, Microsoft Outlook or Lotus Notes (two personal information management and communications applications). This extensive use of different design metaphors and rather technical icons seems to be a loss of clarity in contrast to the original concept. A very much higher degree of literacy is required in order to understand and operate the icons. A larger number of semograms has to be remembered by the user, and more complex icons have to be decoded.

The inflationary use of semograms all over the desktop poses another problem. Whereas pictorial illustrations were originally reserved for concrete objects, the extensive use of ideographic tool bar elements, for example, is fairly common today. Users are confronted with a growing number of visual signs, each of which needing to be decoded, understood, learned, and remembered. In some cases a considerable amount of specific background knowledge is required.

On the GNOME 2 desktop, the same «diskette» semogram is used in pictographic mode as an icon and in ideographic mode as a glyph. The trouble is, the glyphs have little to do with a diskette. The glyph goes back to times when the diskette was the most typical (and only) physical storage medium. Today, diskettes have already become almost obsolete; on some computers there is not even a diskette drive available. Consequently, the novice user has to learn that the «diskette» glyph stands for disks or volumes in general, such as hard disks, memory sticks, or portable music players—for the concept of a storage medium or device.



Figure 6-35: The GNOME 2 diskette semogram as icon and glyph.

Not to mention semantic erosion. The old Xerox Star document icon—despite its simple form—represents everything that can be a document with any type of content, such as text, diagrams, graphics, tables, etc. Modern document icons have lost many of the meanings. Each icon is only able to represent one specific meaning, thus being semantically more precise, but with the drawback that the user has to learn and remember dozens of different icons.

This slightly disproportionately negative view of icon changes is intended to illustrate possible arguments of language-change-as-decay advocates. But from another point of view with different priorities, the whole thing certainly looks totally different.

Progress

The human-computer interface had to change simply because we as its human users have changed—and the changes are very likely to continue. Since the very first GUI mainly addressed people who at that time had not had any contact with computers before, it was designed to meet the specific needs of that particular group of users and enable them to draw from their existing office work-related background knowledge. Thus, the computer desktop had to look like a real desktop, because the real desktop at that time was central to the office worker. Today, we are all more or less used to computers. A whole generation literally grew up with computers in the 1980s—and the graphical direct manipulation interface has grown with them. There is certainly a sort of co-evolution.

The multitude of metaphors that exists on the contemporary “desktop” was pointed out earlier as a really bad thing. But if you look at it from another point of view, it turns out to be just quite up to date. The modern computer user is not necessarily the dedicated office worker: There are designers, architects,

musicians, teachers, students, linguists, historians, and many more. And: there are even people who have computers at home for very non-office purposes; people who just want to organize their holiday photographs and listen to music. The modern human-computer interface is required to be as versatile as its users. Consequently, instead of implementing a single one-fits-all metaphor, various different design metaphors are introduced, suitable for the various context-specific needs. For example, a jukebox metaphor is so much more appropriate if you want to organize or just listen to the music stored on your computer.

The diversity of metaphors creates topic based contexts which can be easily learned even by the computer newbie.

Apart from that, the types of object the modern computer user has to deal with these days are commonly far from the concrete objects of the old Star days. A notable number of document icons, for instance, lack a real referent. There is, for instance, no physical analog to a hypertext²⁸ or HTML document, and no such thing as a compressed ZIP²⁹ archive. Other document types may have physical referents in a wider sense, but are, on the other hand, just fine without them, animations or movies, for example. The need for a real objects metaphor (*real* in terms of 'which exists in the physical world') has probably decreased over the years. The reality concept of the modern desktop is not immediately coupled with the physical world. It is more a kind of parallel reality in which objects look similar but possibly have different properties and behavior.

There is another aspect which could be mentioned to rehabilitate the metaphorical changes: *experience*. The very first desktop-based graphical user interface had to introduce new ideas, new devices, new concepts, and new types of visual signs. The use of the desktop metaphor was a perfect means of transferring existing knowledge of office-related tasks and processes to the new domain of computers. During the last 20 years, more and more people have become acquainted with and used to the technology and the respective

²⁸ "In computing, hypertext is a user interface paradigm for displaying documents which contain automated cross-references to other documents called hyperlinks. Selecting a hyperlink causes the computer to display the linked document within a very short period of time." (Wikipedia.org, 2005: *hypertext*)

²⁹ The ZIP file format is a compressed file format and contains one or more files that have been compressed or stored. (Wikipedia.org, 2005: *ZIP file format*)

semograms. The semograms and their meanings have finally become cultural units themselves, that is parts of our common or collective knowledge. So, in a way, we have all become computer-literate to some degree. Therefore, if you encounter a new semogram on the screen for the first time, you do not necessarily need to interpret it on the basis of your knowledge of the depicted object or concept. You are normally able to decode it just because you inherently know other semograms in this context. You are able to draw from your experience. This also enables you to work with the new icon immediately, because you have already learned to work with other icons and you know that all icons within the same context behave in the same way.

It seems to be reasonable to talk about progress as far as the icon changes are concerned. After all, the changes are the (intermediate) results of an evolutionary process in which the human-computer interface has adapted to changing user needs, hardware specifications, functionality, and many other things. For example: the appearance of new semograms along with a general semantic specialization of the individual icon reflects a growing “vocabulary”; this includes “lexical” borrowings, for instance.

6.4.4 In a Nutshell

Obviously, some of the change processes are similar to language change phenomena in general, and they may lead to similar results. It is also quite obvious that the graphical desktop-based human-computer direct manipulation interface with its special sign set has developed into something like a fixed part of our culture. There is a great spread of semograms into other domains, such as commercial advertisements (e.g. the use of a globe semogram as a symbol for connectivity), manuals (e.g. illustrations in manuals or user guides for photocopiers, digital cameras, or mobile phones), or even other types of interfaces, such as on mobile phones and DVD players. All of this is only possible because (1) these semograms are accepted and have become a part of a culture’s visual vocabulary, (2) the codes are familiar and known, and (3) their meanings have become cultural units.

7. *Synchronic Section: “Icon Dialects”*

Really smart people with reasonable funding
can do just about anything that doesn't violate
too many of Newton's Laws!

—Alan Kay

Actually, it is not much of a secret that icons look different on different desktops. This has already become clear in the diachronic section of this thesis. And although you have seen that there seems to be a convergent development towards more similarities, similar meanings may still be conveyed using different semograms. This raises the question of how to describe the different variations of the same pictorial idea writing system. Are there “icon dialects,” and how can these different icon dialects be characterized, if they exist?

7.1 **SIMILAR, YET NOT THE SAME**

The icons on today's desktops generally resemble each other quite closely. This is particularly true of the base data icons and common function icons (such as drive or volume icons). However, the icons may look similar, but each desktop comes with a distinct variety of the general pictorial idea writing system. Anyway, since the similarities usually outweigh the differences, it is

possible to recognize a certain icon on one desktop if you know its counterpart or relative on another desktop.

7.1.1 Icon Sociolects

Ordinary computer users are primarily acquainted with one operating system, desktop environment, and—accordingly—with one icon set. Even if such users know about the existence of other desktops, they may not be aware of the differences between the related icons sets, because they usually stick to their “traditional” desktop environment.

Now, if groups of users are commonly centered around a certain desktop environment, is it possible to relate a certain icon set to a specific group of users? Is it sensible to talk about icon sociolects?

The term *sociolect* is used by some sociolinguists to refer to “a linguistic variety” defined on a social basis as opposed to a regional one, “correlating with a particular social class or occupational group” (Crystal, 1997: 353).

The 1980s were the era of *home computers*. Children’s rooms were invaded by C64, Atari, and Amiga computers. Those of you who grew up in the 1980s may have been aware of the sheer endless Amiga vs. Atari debate, for instance (provided you were interested in computers). There were two major groups, one for each of the two computers. Somehow, they never grew tired of pointing out the particular advantages of their computer model over the other one. It could almost be compared to a kind of religious war, or a war between two different cultures. Presumably, similar discussions between dedicated Mac and PC users still go on today.

However pointless these arguments may be, they reveal an important fact: the members of the different groups of users feel differently about their system; they have different attitudes—maybe because they have different motivations for using their computers. Let me give you three stereotypical examples³⁰:

- The typical Windows user is either a secretary or a gamer.
- The typical Mac OS user is either a designer or a musician.

³⁰ Attention: cliché! Not to be taken too seriously.

- The typical Linux user is either a computer science student or simply a nerd.

These caricatured user types are intended to illustrate the fact that there are indeed different groups with different customs, habits, motivations, and attitudes—even with different levels of computer literacy. In fact, there are different “computer user cultures” (this term is used without reference to the actual specific socio-cultural environment the user actually lives in). Each group uses and is used to a certain variation of the general pictorial idea writing system with distinct features, such as different design metaphors, semogram-meaning relations, and icons.

But because of the similarities between the different variations of the pictorial writing system, a user from one group is most likely able to understand the semograms and icons of another group’s desktop. Apart from that, it is not possible to detect a connection between the distinctive features of a specific user group and the distinct features of the specific variation of the pictorial writing system used by this group. We can only guess that a certain semogram set is probably optimized for specific habits, needs, and motivations. However, it may be more appropriate to assume a sort of “common law,” because there is a sort of co-evolution of a semogram set and its users.

It therefore does not seem to make much sense to define distinctive semogram sets on the basis of the “corresponding” groups of users.

7.1.2 Icon Dialects

A *dialect* is described as a “regionally or socially distinctive variety of a language” which is characterized by a “particular set of words and grammatical structures” (Crystal, 1997: 114).

If *regionally or socially distinctive* is interpreted as ‘operating system and computer hardware related,’ it is possible to say that there are operating system-dependent distinctive varieties of the same pictorial idea writing system with their corresponding icon sets, semograms, and syntactic rules. These dialects may be characterized by the following four aspects:

- Different semograms may be used to express the same idea. Consider, for instance, the different visual metaphors used for application icons.
- The same semogram may be used to represent different ideas. The pen semogram, for instance, is an agent or action marker on the Macintosh desktop and only used as a part of application icons. On other desktops, such as Windows or KDE, the same semogram is regularly used merely to indicate text documents.
- Different rules for the combination of semograms to form complex icons may exist. Just think of the irregular vs. regular (or modular) design principles for the formation of different picture or text document data type icons.
- Different icons. In other words: There may be an icon for a certain idea on one desktop but not on another one. Take the Windows My Briefcase icon, for example, which does not exist on the Macintosh desktop (or on a number of other desktops).

The variations of the pictorial idea writing system are characterized by the presence of either one or rather a number of these points in combination. Accordingly, and according to the definition given by Crystal, at least some of the distinctive varieties may qualify as icon dialects.

7.1.3 Icon Functiolects

The differences between the icon and semogram sets on the various desktops can neither be related to their user groups nor to “regional” differences clearly.

Typically, the pictures on the screen represent a certain interactivity and functionality of the system. Just think of the volume vs. drive distinction on Mac OS and Windows desktops mentioned earlier. Accordingly, a setup in which pictorial sign sets are defined on the basis of the functionality and interactivity of the environments in which they are used seems to suggest itself.

Such a *functiolect* then would be (1) operating system dependent, because the design of semograms and icons most likely takes into account specific functionality of the operating system (cf. volume icons on Mac OS vs. drive

icons on Windows), and (2) hardware configuration dependent, because icons (particularly function icons) represent parts of the computer hardware (e.g. drive or volume icons, which only represent the hardware that is actually available).

7.2 VARIATIONS ON A THEME

Since a picture is worth a thousand words, I will present some semograms and icons in order to literally illustrate the four characteristics of icon dialects.

7.2.1 Similar Idea, Different Semograms

Similar ideas are frequently realized by different semograms in different dialects. This phenomenon is quite common in the case of application icons, which are highly ideographic and therefore less "fixed" on most desktops anyway. Less fixed, because such an association driven ideographic semogram can of course be easily replaced by another semogram that triggers the same or a similar association.

The following figure (Figure 7-1) shows several application icons from several desktops between 1997 and 2002. I tried to arrange them according to their design metaphors and constituting semograms.

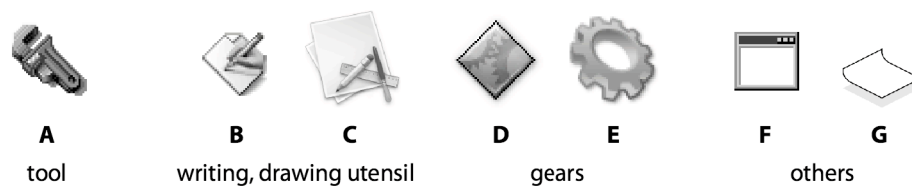


Figure 7-1: *Different application icons.*

Application icons were discussed in the diachronic section of this paper. It turned out, that, from one desktop to another, different metaphors are used to illustrate the essence of a software application. A variety of metaphors is used to make the abstract concept of software more concrete and comprehensible to the user. The general idea behind a computer software application—no matter whether it is called *program*, *tool*, *executable*, or *application*—is that of a piece of

computer software that “employs the capabilities of a computer directly to a task that the user wishes to perform” (Wikipedia.org, 2005: *application software*). Typical applications are word processors, spreadsheets, and database management applications.

This generic idea is realized through a number of different metaphors and semograms in the examples given above. Icon *A*, the AmigaOS 3.5 tool icon, uses a «pipe wrench» semogram to symbolize the task performed by the user. The icons *B* (Mac OS 9) and *C* (Mac OS X) use «writing utensil» semograms, such as a pencil.

While the first three icons all associate a human user (who is required to use the tools and utensils), *D* and *E* are rather technical and go very well without a human user. The gears have a strong metaphorical meaning and commonly represent the ideas of functionality and functional connection. Therefore, the gear semogram highlights the technological and functional aspect of the computer software idea.

I have included the last two icons, *F* and *G*, in order to demonstrate that there are even more ways to represent the idea—even without taking the user or the technology into account. Icon *F* (Windows 95 – XP), for instance, imitates the visual embodiment of the application on the computer screen (ie. the application window). Finally, icon *G* (IRIX 6.5) resembles a simple sheet of paper, which is slightly curled at one end.—Does this unusual semogram represent a sheet of paper lying flat on the desktop, waiting to be “deflowered” by the user?

But application icons are not the only examples for the use of different semograms for similar ideas. Sometimes even the most concrete icons and ideas are realized differently in different functiolects.

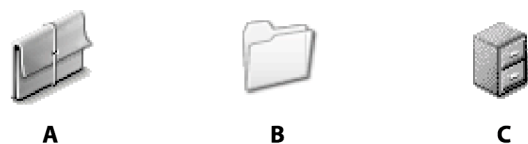


Figure 7-2: Three ‘folder’ icons.

In most functiolects, that is on most desktops, the folder icon actually looks like the one in the middle (*B*) of Figure 7-2, like a simple folder. However, one exception to this rule has already been mentioned in the diachronic section;

namely the AmigaOS drawer icon. This counterpart to the general folder icon on other desktops is the graphical representation of a file cabinet.

Those who are still skeptical and think that the drawer semogram represents a different idea might want to take a look at icon *A* in Figure 7-2: it is the folder icon on the NeXTstep or OPENSTEP desktop. It is even called *folder*. But instead of the standard folder semogram, a sort of «brief case» semogram is used. Again, same idea, different semogram. Apart from that, the «brief case» semogram comes with a different metaphor. Whereas the folder semogram associates pure filing, the brief case semogram adds the notion of “carrying” the documents.

7.2.2 False Friends

Of course, the opposite situation can be found as well. Sometimes, the same or rather similar semograms with even similar constructions are used to represent different ideas or concepts. It has already been touched on that the «pen» or «pencil» semogram is not always used as the agent marker, which it is on the Macintosh desktop. Consider the following Figure 7-3.

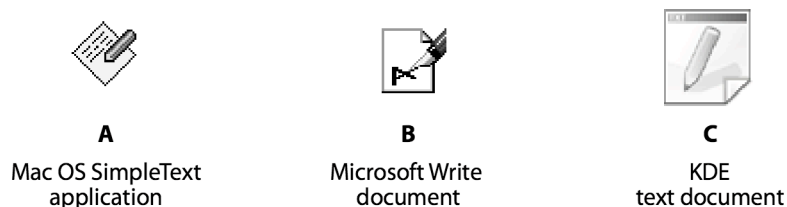


Figure 7-3: Different ideas represented by the «pen» semogram.

There is a «pen» semogram in combination with a «sheet of paper» semogram in all three icons. All icons are rather similar; especially *A* and *B* look like close relatives. But they are *false friends*. While the first icon is an application icon, the other two are document icons.

In the first icon *A*, the «pen» (or rather «pencil») semogram is the agent marker of the icon. It stands for typical user actions or tasks, such as writing or drawing. But what is the role or function of the pen in the second icon *B*?

The depicted pen seems to have just finished writing the letter “A” (which makes this icon mixed-modal) on an otherwise blank sheet of paper. In contrast to the «pen» semogram in the application, which has the function of the agent

marker, the «pen» semogram in icon *B* is a mere type marker. It marks the document as a text document. In this construction, the «pen» probably symbolizes the human action that has taken place in the process of the document creation—namely the fact that the text was written by the human user. Consequently, this use of the semogram is a sort of antonym to the agent marker, which stands for any future user action and it represents what the user is going to do. The text type marker in icon *B*, on the other hand, implies a past user action; something that has happened or was caused by the human user. Thus, although the ideas are different (at least measured against a temporal and causal scale), the same semogram is used.

The situation is similar in case of the KDE text document icon *C*. A simple «pencil» semogram is intended to work as a type marker, this time without an accompanying alphabetical letter.

As a matter of fact, it is not very surprising that the «pen» or «pencil» semogram is used differently in different functiolects. It is a very basic semogram with a generic meaning and you can probably find it on any desktop if you just look for it. Recall, for instance, the GNOME “save as...” tool bar glyph in Figure 6-35. The semogram itself is hardly marked. It basically stands for ‘writing’ or ‘drawing’ or for something written or drawn. It implies the action of a human being, as well. It is as simple as that.

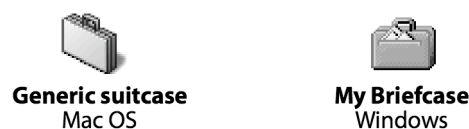


Figure 7-4: Two similar cases with different contents.

The two different «case» semograms illustrated in Figure 7-4 represent a similar situation. The basic concept of either a suitcase or a briefcase is ‘to carry something.’ The two semograms resemble each other quite closely, yet their meanings are different. In fact, both icons even belong to different classes: the Mac OS generic suitcase icon is a data icon, whereas the Windows My Briefcase icon is a function icon.

The Mac OS suitcase is a special hybrid between folder and document. Technically speaking, it is a sort of container file which contains resources. On

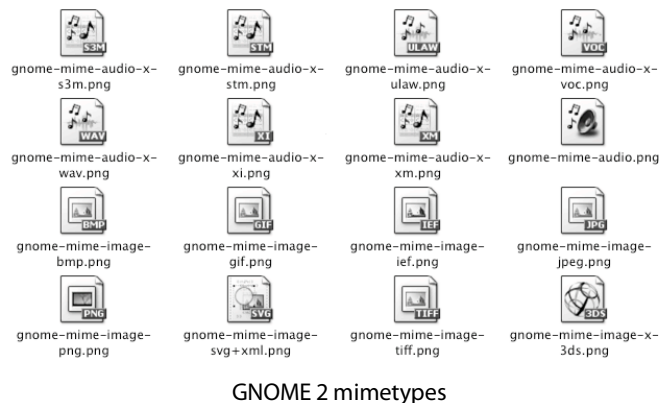
the Mac OS (up to version 9, anyway) typical resources are sounds, pictures, and fonts (typefaces).

The Windows briefcase is something completely different. Introduced with Windows 95, the Briefcase keeps track of the relationships between files on two or more computers, helping keep them current at all times. The Briefcase is both a data icon and a function icon. Although it is connected to the network, the user can create more briefcases and delete them by dragging the icons on the Recycle Bin.

Probably, some semograms are more likely to be used for different purposes than others. This seems to be true especially of simple semograms with unspecific or general meanings. More specific semograms are less likely to be used differently from one functiolect to another, simply because the meaning of such a semogram would usually be more fixed or specialized already by its form (remember the «magnifying glass» semogram and the «binoculars» semogram).

7.2.3 Syntactic Differences

Apart from the different strategies for the visualization of ideas in the various functiolects, there are different rules for the combination of semograms to form complex icons. In the diachronic section, two different morphological structure types, or types of internal syntax, have already been illustrated. In Figure 6-32 and Figure 6-33 irregular as well as regular morphological structures of document icons are illustrated. While on Mac OS X both strategies can be found, the situation is different in other functiolects.

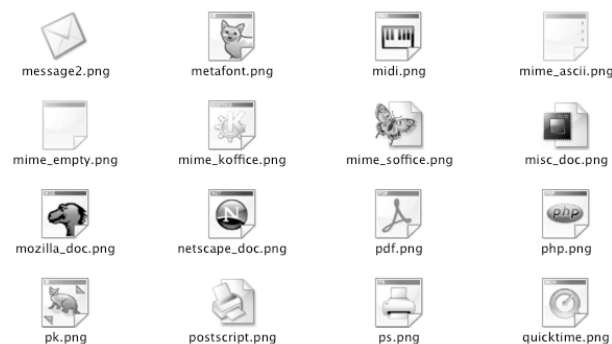


GNOME 2 mimetypes

Figure 7-5: Regular icon constructions on the GNOME 2 desktop (selected icons).

The GNOME 2 document icons are constructed according to a few simple rules, hence the high degree of regularity. Very much like the Adobe Photoshop Elements icons discussed earlier (see Figure 6-33), all document icons share the same syntax: document base semogram + type marker semogram in central position + textual file extension badge in the lower right corner. Following this simple set of composition rules, similar file formats may even use the same type marker. So some icons are only distinguishable by their suffix badge. More than eighty percent (roughly speaking) of all mimetype icons on the GNOME 2 desktop (default theme) are constructed like this. Somehow, the design of the GNOME 2 icons seems to be really exceptionally regular. Presumably, one reason for this extreme regularity lies in the “tender age” of the desktop compared to other systems.

The GNOME project started in the mid-nineties. At that time, other desktops had already been around for more than ten years. Consequently, the GNOME project team was able to incorporate all the knowledge that other design teams had to learn in a longer process. Apart from that, when the GNOME team started, there was already a strong need for numerous file format icons. Ten years earlier, this had not been necessary. Consequently, all the different icons could be designed at the same time without any interference of “common laws” that had grown over the years.



KDE 3 mimetypes

Figure 7-6: Irregular icon constructions on the KDE 3 desktop (selected icons).

Another Linux desktop, the KDE, is slightly older. It is hard to say whether or not this is the reason why the file format icons on the KDE desktop are less regular. Even at first sight, the difference between the KDE 3 desktop (Figure 7-6) and the previously introduced GNOME 2 desktop (Figure 7-5) is striking. The

internal syntax of the document icons is far less regular. There even seem to be different types of base semograms used for similar data types. Compare, for example the “mime_soffice.png” icon (second row) or the “postscript.png” icon (bottom row) to the other “.png” data type icons. While the majority of base semograms sport a dog ear in the lower right corner, some have the dog ear in the upper right corner. Also, no file suffix badges are attached to the icons. Apart from that, application identifiers (see Figure 7-6 “netscape_doc.png” or “quicktime.png”) are used in place of type markers on some of the icons. This is rather unusual; type markers are the most common strategy to specify the meaning of an icon. Apparently, in this case, the application identifier is used synonymously for the traditional type marker. For example, the Apple QuickTime logo on the “quicktime.png” icon (bottom row) can be interpreted as a sort of cover type marker for all types of media that are associated with the QuickTime application.

Icons with different syntactic structures can be found on the Mac OS X desktop as well.

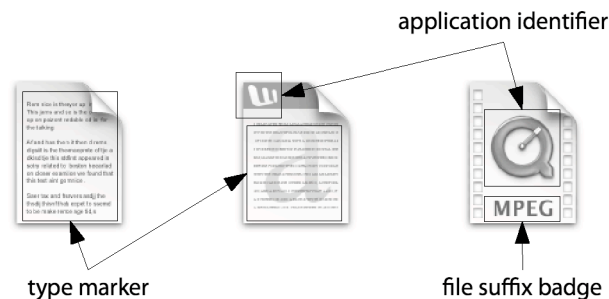


Figure 7-7: Different syntactic document icon structures on Mac OS X.

The three example document icons illustrated in Figure 7-7 (from left to right: TextEdit text document, Microsoft Word document, QuickTime movie of “mpeg” data type) reveal three different structures commonly found on the OS X desktop. On the first icon a simple type marker is used. In the case of the Word document icon, in addition to the type marker an application identifier is used to establish a causal relation to the application used to create this document. The last icon has no type marker at all. Instead, an application identifier appears in place of the type marker. Additional information on the data type is provided via the file suffix badge, placed without framing right under the application identifier. A construction like this is certainly more

opaque than the first two examples, as it requires specific computer software-related knowledge in order to interpret the meaning correctly as a movie document.

Such syntactic inconsistencies or irregularities can be found on any desktop. They are like remains of earlier versions, like relics. And it sometimes reminds me of the famous Wittgenstein quote:

“Unsere Sprache kann man ansehen als eine alte Stadt: Ein Gewinkel von Gäßchen und Plätzen, alten und neuen Häusern, und Häusern mit Zubauten aus verschiedenen Zeiten; und dies umgeben von einer Menge neuer Vororte mit geraden und regelmäßigen Straßen und mit einförmigen Häusern.” (PU, 18)³¹

Today, there are design guides available for every desktop-based graphical user interface. The icon design guidelines tell icon designers how to create icons that comply with the respective funciolect “spoken” on a certain desktop (cf. Apple or GNOME *Human Interface Guidelines*, or Microsoft’s *Windows XP Visual Guidelines*) . This includes the use of visual codes, such as perspective and coloring, as well as the choice of semograms. This contributes to a generally consistent look and feel and, in the long run, will probably eliminate existing inconsistencies. Depending on the preferences of the style guide developers, this process eventually leads to either more or less distinctive funciolectal variants.

7.2.4 Exclusive Icons

Apart from the base icons which can be found on any desktop, there are some icons which are exclusively available within only one or two particular desktop environments. Good examples are the previously mentioned Mac OS suitcase icon and the Windows My Briefcase icon, for instance. Another exclusive icon is the IBM OS/2 Shredder, which in contrast to the trashcan variations on other desktops immediately deletes anything dropped on it. Another example is the AmigaOS RAM Disk icon, a sort of virtual hard disk or diskette which resides in the computer’s workspace (memory).

³¹Ludwig Wittgenstein, *Philosophische Untersuchungen* (cf. http://de.wikipedia.org/wiki/Philosophische_Untersuchungen, accessed 2005-09-23)



Figure 7-8: Selected exclusive icons.

Exclusive icons seem to be good candidates for loan icons, sometimes. On the Windows desktop up to version 3.x no such thing as a trashcan existed. When the functionality was introduced, the corresponding icon was “borrowed” from another system and renamed Recycle Bin (see Figure 6-34). Curiously enough, the Microsoft people did not borrow the Mac OS Trashcan with its very peculiar and unique pragmatics and functionality: it is the only trashcan that aside from deleting documents and folders is also used to eject removable storage media, such as diskettes, CD-ROMs, and so on.—A functionality for which the Apple guys actually have always attracted a lot of criticism. This eventually made them re-think the trashcan for the Mac OS X desktop and design it to shapeshift into an “eject” button whenever the user attempts to eject a volume. This is perhaps the most obvious example of motivated “language change” in terms of the desktop-based graphical user interface, as it is a clear reaction to user needs.

7.3 MORE ON ICON FUNCTIOLECTS

The idea behind the use of the term *icon functiolect* in this context is to make clear that there are systematic differences between the semogram and icon sets on different desktops, which in the course of time may either increase or diminish. In a way, the term simply subsumes the peculiarities of a variant of the pictorial idea writing system on a certain graphical user interface.

7.3.1 The Future of Functiolects

There is one pictorial idea writing system of which we can find distinctive variants on various desktops that differ from each other in terms of semantics, syntactics, and pragmatics. Icon functiolects are not about different styles of icons (at least not only), but about different uses of certain semograms

as well as different rules for their combination in order to form complex constructions, such as icons and glyphs. These variants are not, or only very loosely, connected to the groups of users who use and are used to a certain desktop environment in which such a variant occurs. However, it is quite certain that the users within a certain group develop certain habits (Raskin, 2000: 18 – 20) in correlation with the specific desktop and its icon dialect. These habits are developed by regular users of a desktop who inevitably get used to its semograms and icon pragmatics. The user learns their meanings and functionality and consequently expects a certain behavior. That is why designers and developers will most likely take these habits into account with every change they make to the desktop or its semograms and icons.

This also means that a certain desktop with its associated icon funciolect will not be changed significantly from one day to the next. In the long run, without much doubt, funciolects will become less apparent. Consider the recent changes in the AmigaOS project icon (see Figure 6-14), in which the icon's form was substituted by a standard document semogram (even though with a differently placed dog ear). Or recall the introduction of a trashcan icon to the Windows desktop in 1995. And one more example: the shift from the old file cabinet drawer lookalike diskette drive and hard disk drive icons towards standard semograms (see Figure 6-26).

Presumably, decreasing funciolectic differences between the icon sets on the various desktops represent a kind of motivated or even managed change. Funciolects make the switch from one desktop environment to another one complicated for the user—which surely is of economic interest for the software developers as, for example, the Apple Switch³² ad campaign shows. Apple advertises successful switching stories from former PC users who became happy Mac users and emphasizes the ease of switching

Successful switching is possible because today all desktops look more or less the same and because they all use the same pictorial idea writing system. The more similarities there are between two funciolects, the easier it is for the user to learn and get used to a new dialect. The process of switching will be totally

³²See <http://www.apple.com/switch/> (accessed 2005-05-03).

smooth if the user is not required to get rid of old habits which otherwise would lead to erroneous actions with unpredictable results.

8. *The Future of Icons*

The best way to predict the future is to invent it.

—Alan Kay

Icons have come a long way. When they started out as simplified black and white outlines in the early 1980s, probably no-one would have expected them to become the grown-up realistic and colorful depictions that they are today on contemporary desktops. But what is the next step? Will the changes continue in the future? Do icons have a future on the virtual desktop, anyway?

8.1 THUMBNAIL ICONS

Icons once started out as simplified black and white outlines, as highly coded pictorial images. Code is not a bad thing, at least if you know the code. Such a coded picture has a number of advantages over any uncoded picture, such as a photograph.³³ Advantage 1: you actually do not need colors to draw a coded picture; particularly shades of a certain color is something you do not need at all. Advantage 2: since you do not need to rely on details very much (think of illustrations in children's books), the coded image will be recognizable

³³The author is aware of the fact that even photographs involve codes, although they are not "visual arrangements" and the relation between signifier and signified is not arbitrary. Yet photography involves both "mechanical *reduction*" in terms of perspective, proportion, and color as well as "human *intervention*" through the choice of subject, framing, focus, speed, etc. (Chandler, 2002: 163)

even in small dimensions (try that with a photograph). Advantage 3: coded pictures are usually generic, and unmarked to some extent; their meaning is rather general. Imagine the simplified, coded drawing of *a tree*. Depending on your skills, you will be able to make a distinctive drawing to indicate that it is either a coniferous or a deciduous tree. Still, it remains just *a tree*. Now consider the photograph of a tree. The photograph, for instance, shows *that particular common oak tree (Lat. Quercus robur) in the small park near your flat in the late summer of 1999*. This extreme specificity makes this photograph rather inadequate as an example of just *a tree*.

Working with coded pictures involves working with prototypes. These prototypes include the most salient feature of “the real thing.” A prototypical tree, for example, includes all the crucial characteristics that make a tree a tree, at least within a certain cultural and regional environment. This is where the codes and cultural units come in (see earlier section on semograms and their meanings).

The advantage of simplified and coded pictures used as semograms, that is being rather general and unmarked, is at the same time their disadvantage if used as icons since users may expect or at least wish their icons to be marked and quite specific, so as to be able to find, for instance, a certain document among others. This can be quite a challenge, if there are many document icons of the same type within a folder. Usually, the only distinguishing feature of a document is the filename. Thus, icons seem to have one major weak point: icons of the same type, that is, for instance, created with the same software tool, all look the same. After all, they are all instances of the same sign on the screen (tokens).

Recent developments have introduced an extended use of what might be a solution to this problem: the *thumbnail icon*. Thumbnails are “reduced-size versions of pictures, to make it easier to scan and recognize them” (Wikipedia.org, 2005: *thumbnail*). They work for images as a text index does for words.

8.1.1 Icons without Code—An Oxymoron?

Thumbnail icons have already been around for a couple of years. Especially photo-retouching and painting applications such as Adobe Photoshop, for instance, have been using picture thumbnail icons for quite some time. But also complete computer desktops make use of thumbnails. Newer versions of the Microsoft Windows desktop also offer a special thumbnail view for pictures.



A photograph...



...and its thumbnail icon.

Figure 8-1: A standard thumbnail icon as used by Adobe Photoshop.

Instead of the standard icons, miniaturized versions of the actual images are displayed. However, the major drawback of thumbnail icons is that they do not work properly in very small sizes. Usually, a certain amount of detail is required in order to be able to recognize a photographic content. Thus, results may vary depending on the subject of a certain picture. For example, it is most likely easier to identify a certain type of flower even in a small picture than a certain person in a group shot. Consequently, such a too small thumbnail would probably be of no more use than an ordinary document icon.

Anyway, this drawback is almost compensated by another big advantage of thumbnail icons: they are less coded. As mentioned earlier, any visual arrangement is coded. Icons are usually visual arrangements, generally composed of one to four semograms. However, such a thing as a photograph, for example, is not arranged in the sense of composed of different parts. It represents an “analogon to reality” and can therefore be regarded as “a message without code” (Kress & Leeuwen, 2001: 22/23). At least a photograph involves much less code than the usual visual arrangement. Only transitional codes are

used to provide a copy of something three-dimensional in two dimensions, as opposed to rule governed transformation (cf. Chandler, 2002: 163). Considering this, the thumbnail icon is somewhat strange. It is an icon and it behaves like one, but it is not visually arranged. And although it is an icon, it is unique; there is usually no other similar thumbnail icon on the desktop (unless, of course, you tend to keep multiple copies of the same photograph), because the thumbnail icon *is* the picture, only smaller. The absence of any semograms from the pictorial writing system used on regular icons makes the thumbnail icon a highly specific and individual resident of the desktop. (Admittedly, this is only partly true, because, as you will see quite soon, there is an exception to this rule, as usual. Even thumbnail icons may contain coded, semographic parts, which makes it easier to recognize them as icons but may create a number of new problems).

This poses the questions of what exactly a thumbnail icon *is*.

8.1.2 In Terms of Philosophy

Before diving into the philosophy behind thumbnail icons let me point out the difference between a regular thumbnail and a thumbnail icon. The former is the reduced-size version of a picture, made for preview purposes, which itself is a picture. The latter is also a reduced-size version of a picture, but it is an icon, which means that it has properties and behavior, and that it has some physical feel to it. This is where the trouble begins.

Identity

The regular thumbnail is usually not identical with the corresponding picture in “physical” terms. The thumbnail is the miniaturized *copy* of the actual picture, yet with the same “content” (just think of photo thumbnails on a contact sheet). The thumbnail differs from the real photograph in size, and possibly as well in terms of brightness, color, contrast, etc. The same is even true of non-physical or rather abstract things such as web pages on the Internet. For example, in an interactive photo gallery on the Internet, thumbnail pictures are used as small previews in order to reduce the time it takes to load the page on a

computer with a slow Internet connection. Thumbnails and full-size pictures are two different files.³⁴

The thumbnail icon, on the other hand, is often technically identical with the picture, even beyond the content. It is the “smaller self” of the picture. But, being an icon, it is certainly more than the picture. It is an icon in two ways: First of all, it is a desktop icon in Alan Kay’s sense. It has intrinsic properties and behavior and the user tends to think of it in physical terms. Secondly, the thumbnail icon is an icon in the Peircian sense, too. It is similar to the picture and the relation between thumbnail icon and picture is isomorphic. The thumbnail icon alone already enables the viewer to make a statement about the actual picture, its contents, colors, and composition.

As said, technically speaking, there may or may not be a “physical” identity of thumbnail icon and picture. Discussing the technical and software-related details (for instance whether or not they are two different files) would not have anything to do with linguistics at all—apart from the fact that this is not something that is commonly experienced by the human user; it simply doesn’t play a role. Thus, the question should rather be: how should *identity* be defined in this case?

Now, one thing that distinguishes a thumbnail icon from a regular thumbnail is the fact that the regular thumbnail is a self-contained picture which is physically and technically independent of the actual picture. Talking about photography and contact sheets, you have to create a thumbnail through a process that is similar to (or that is the same as) the process used to create the original photo. Once you change the photo (retouching, etc.), you’ll have to create a new thumbnail.

The thumbnail icon, however, is not independent of the associated picture document. Every change made to the picture is automatically visible in the icon—without any action required on the part of the user. Regardless of the technical and operating system-dependent realization of thumbnail icons, they are inevitably linked to the contents of the associated document; their manipulation lies beyond the scope of the common user. This is the reason why it is possible to argue that thumbnail icon and picture are identical.

³⁴Unless, of course, the web designer is inexperienced; see Wikipedia.org, 2005: *thumbnail*.

Sign Character

If thumbnail icons are icons, they should be signs as well, and as such they should have meaning. As already mentioned, a sign can be practically anything that stands for something to someone. Since a thumbnail icon represents a picture document, it seems to be plausible to conclude that it stands for that document and is therefore a sign which has meaning. But now, the situation becomes more tricky. Ordinary icons are either semograms or complex constructions with two or more semograms as their constituents (e.g. base semogram plus type marker). Additionally, icons are coded images while thumbnail icons are said to be not coded. A thumbnail icon is a picture; and the picture itself may of course be coded. But this does not make the thumbnail icon a coded picture. A thumbnail icon does not consist of semograms. It is not a composition. Is a thumbnail icon a semogram? It has meaning. Any sign has. It is an iconic sign, because it resembles the thing it represents. But what does it represent?

Consider the photograph of a tree. The thumbnail icon resembles the photograph of the tree. And it resembles the tree. But its meaning is not 'tree,' of course. As an icon, its meaning is expected to be something like 'picture document,' 'illustration,' or simply 'photograph.' Hence, it is obviously necessary to distinguish carefully between the meaning of the icon and the meaning of what it represents.

Normally, neither its contents nor its shape tell us that it is a document icon, although sometimes thumbnail icons come with a dog ear to make it easier to recognize them as document icons. Apart from that, users can always either draw from their experience or, with a little bit of common sense, conclude from the fact that thumbnails appear in place of icons, that is in an environment (namely on the desktop) that is typical of icons. In terms of reasoning this analytic process is called *deduction*:

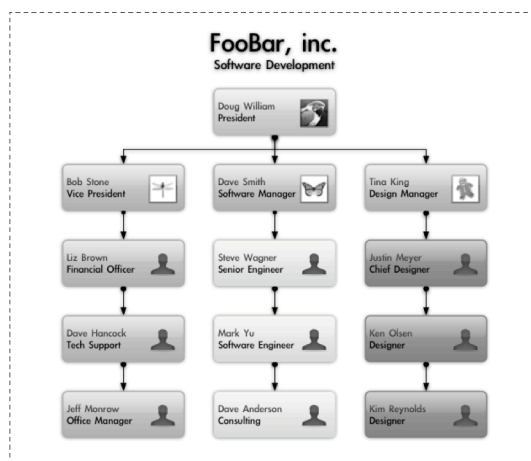
- As a general *rule* all icons have properties and behavior and the user thinks of them in physical terms.

- This particular thumbnail picture (*case*) has properties and behavior and I can think of it in physical terms.
- As a *result*, this thumbnail picture must an icon.

Once users have learned this, they will remember and henceforth be able to identify thumbnail icons.

8.1.3 A Variation of the Thumbnail Icon

Apparently, thumbnail icons are extremely effective when it comes to pictures in general. They make visual searching (as opposed to text or keyword matching) possible and browsing or scanning through collections of pictures so much easier. There is no better way of representing a picture on the screen than by a small preview as the user is not obliged to remember the name of a certain picture file (document). File names are generally not a good idea. Raskin argues that there “should be no distinction between a file name and a file” (2000: 118). Usually, it is the content of a file the user remembers best, not its name. While this works just fine with pictures, what about all the other document types? How about text documents or spreadsheets, for example? Is it possible to make use of thumbnails in every case—and would it make sense, too?



An OmniGraffle chart...



...and its thumbnail icon.

Figure 8-2: A thumbnail icon as used by The Omni Group's OmniGraffle.

Provided an appropriate icon size, a thumbnail icon practically could be used to represent anything. At present, most thumbnail icons are used in relation to graphics or graphics-based file formats, such as pictures, photographs,

diagrams, or charts, as in the following example (Figure 8-2). It is, however, imaginable to create thumbnail icons for text documents or web page documents, for instance, too. But more about that later.

The icon in Figure 8-2 looks quite like a standard document icon, yet it is a thumbnail icon. We can find a miniature of the actual chart in the center of the icon. This is an interesting fact, really, because it was said earlier that a thumbnail is not generally composed. Well, this one certainly is. It is a complex semogram. There is clearly a base «page» semogram, which is marked at the top with five geometrical shapes.³⁵ The real thumbnail part of the icon appears in the position of a type marker, in the center of the icon. This *pseudo type marker* (*pseudo* because it does not mark the type of document but its specific content) contains the thumbnail information and makes this icon unique and absolutely individual. This icon is only used for this particular document created by the user. Consequently, this *hybrid icon* is a mixture of both a standard document icon and a thumbnail icon: there is a coded, pictographic part and an uncoded, isomorphic part. Compared to the thumbnail icon illustrated in Figure 8-1, this one, at first glance, does not give the impression of being a thumbnail icon. Indeed, it becomes primarily clear when there are more of those document icons—then, the individual part of the icon literally hits the user right in the eye.

8.1.4 Size Matters

This semogram-thumbnail construction has some major advantages over the “simple” thumbnail icon illustrated earlier. While the ordinary thumbnail icon is quite useless in small sizes (because it is likely to be unidentifiable), the hybrid icon will still be recognizable as—as in this case—an OmniGraffle chart document. Semograms work in (almost) any size, in contrast to thumbnails.



Figure 8-3: With small sizes, shape is more important than content.

³⁵In fact, these five shapes represent the word OMNI, which actually is the name of the software developing company.

Especially with small sizes, the shape of the icon becomes more important because the content is usually too small to be identified without ambiguity. It is the stem semogram that endows the icon with a particular and recognizable shape. If the stem semogram is missing, as in case of the icon in the middle (Figure 8-3), the whole recognition process becomes difficult. Even if the user knows that it is a photograph, the only secure information that can be gathered from this small thumbnail icon is that the photograph has a landscape orientation (as opposed to portrait). The user can probably only guess that the image shows a flower; it could be a fried egg on a green plate as well.

The hybrid document icon seems to be just perfect to represent all sorts of document file types, even text files, because it contains all the information needed by the user to decode and understand the icon's meaning. The semogram part contains the necessary information on the file type and the thumbnail part specifies the file's content. Even in small sizes it is possible to identify the icon as a document icon, because of the stem semogram. And although the thumbnail part at small sizes lacks the amount of detail needed to recognize its contents, it may still play the role of a type marker sufficiently successfully. Consider the hybrid icon in Figure 8-3; you may not be able to identify its content as a particular chart, but it is still possible to read it as *a chart*, still suitable as a type marker.

This hypothesis is obviously supported by actual icon designs on the current version of the Mac OS X. The photographic document icons already look like hybrid icons, regular document icons with what-looks-like-thumbnails as their type markers. Recall the following icons, already shown in Figure 6-32.

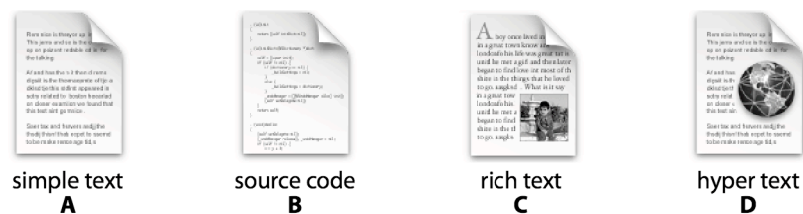


Figure 8-4: Text data type icons on Mac OS X

Each of these four text document icons (taken from Mac OS X applications TextEdit and Project Builder) already looks like a thumbnail icon—like a “photograph” of a page of an actual text document. These icons nicely illustrate a problem that essentially arises with the use of text document thumbnail icons:

text pages tend to resemble each other. Even at an appropriate size, thumbnail icons for different letters, for instance, would rather remain indistinguishable for the user. Consequently, a thumbnail icon for a text document is likely to be far less useful than a picture thumbnail icon.

However, there is another strategy to cope with this challenge.

8.2 BEYOND THUMBNAILS

Thumbnail icons are unbeatable when it comes to pictures or pictorial illustrations. But with other document types, particularly text, their benefit is rather limited and they are of no more use than standard document icons. But how is it possible to make regular icons more specific for the user?

8.2.1 Label Colors

Mac OS has been offering label colors since version 7.5.³⁶ Users can change the color of certain icons to represent various categories, such as, for example *Work in Progress* or *Hot Stuff*. Each label color can be customized and the labels can be renamed. The label colors make the labeled icons stand out. Yet the labels make the icons more specific only to some extent; that is, their category is specified, but not the individual document icon.

Colors are famous for their connotations. They are commonly associated with abstract concepts, such as red as the color of love, green as the color of hope, or blue as the color of fidelity. Colors are also well-known for their signaling character. Yellow is discernible even from a great distance; “[t]raffic signs, changing traffic lights, life jackets and tennis balls are all yellow” (cf. WebExhibits, 2001). Both yellow and red signal danger, and consequently also importance.

A color label is, at least to some extent, suitable to add extra meaning to a complex semogram such as an icon. But, in fact, colors may only convey fairly general meaning. Apart from that, the relation between a label and the

³⁶This feature was missing in Mac OS X until version 10.3 Panther. However, icons are no longer colored. Instead, the color label is laid underneath the caption of an icon; thus it is rather filename coloring.

associated color is rather arbitrary. Consider the relation between the color *dark blue* and the corresponding label 'personal' in Figure 8-5. The color-meaning relation is not self-explanatory and has to be learned in advance in order to be able to successfully decode its meaning when applied to an icon.

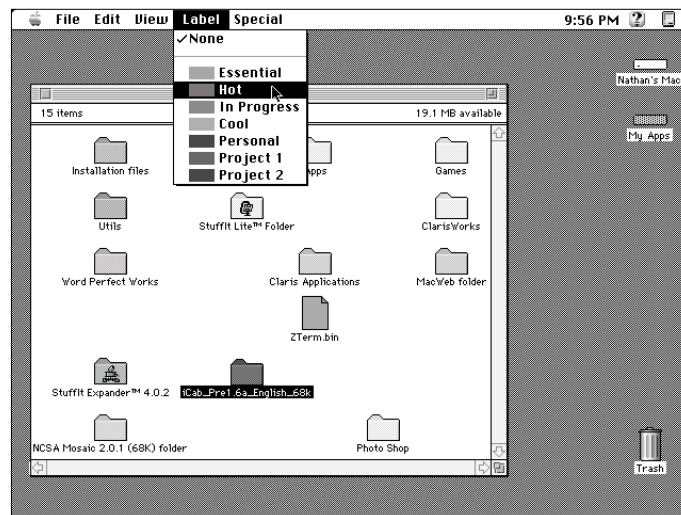


Figure 8-5: Color labels on the System 7.5.5 desktop. (Lineback, 2002)

Color labels may not be the right tool to create individual and specific icons, but they make organizing things easier.

It should be mentioned, however, that it is generally possible to customize every single icon on the Mac OS desktop and thereby create a unique icon for every document. But since this requires specific knowledge and the use of additional software applications, it is usually not an option for the average user. This is why I do not take this operating system functionality into account as a serious option for of making document icons document-specific.

8.2.2 Emblems

Emblems, or badges, start where Mac OS color labels end. Emblems are used, for instance, on the GNOME desktop to tag document icons, that is to mark them as *important*, *special*, or *urgent*, for example. While this use is, at first sight, not very different from the color label approach, as the default emblems are used to represent different categories, there is much more potential in this system with the use of custom (user defined) emblems. Adding an emblem to an existing icon means adding an additional semogram and thereby

contributing to, or rather specializing, the icons meanings. Consider the following illustration (Figure 8-6).

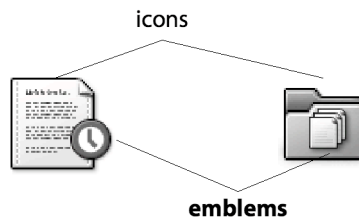


Figure 8-6: *Icons with emblems on the GNOME desktop.*

Figure 8-6 shows the exemplary use of emblems on document and folder icons. The user chooses an emblem (or a number of them) to add specific meaning to an otherwise unspecific icon. In the first icon, on the left, the meaning of a text document icon is extended by an additional 'urgent' emblem. The emblem is an ideographic «clock» semogram, which to the user stands for an obligatory and prompt completion or processing of the respective document. It specifies the meaning 'a text document' to, for instance, 'the particular document which I have to complete by Sunday,' or something similar.

The second icon, on the right, is constructed in the same manner. The generic folder icon is specialized by a pictographic 'documents' semogram in order to form the new, more complex meaning 'documents folder.'

An emblem works like a semantic determiner. It attributes to the icon's meaning and is morphologically (that is in terms of the internal syntax) similar to, and sometimes (as, for instance, in case of the folder icon) appears in place of, a typical type marker; a type marker that modifies the complete icon.

On the GNOME desktop it is even possible to assign more than one emblem to a certain icon. Combinations of emblems allow more complex ideas. Therefore it is not only possible to assign certain icons to different categories, but to tag certain important documents or folders and make them more specific, almost individual.

8.2.3 No Icons At All

Considering the masses of information stored in innumerable files on our computers today, the usability of icons has become exhausted. Icons are not much help if the user wants to find one specific, let's say, text document or

presentation. To remember the location and the name of every document is virtually impossible. It is easier by far to remember the contents or content keywords of a certain document. This is similar to the common inability to remember the exact title of a motion picture, yet to be able to easily narrate its plot.

Search engines are one of the biggest revolutions brought to computer users by the Internet or so you might think. It has become quite popular to “google” for information. And as a matter of fact, a human mind “can more effectively use a fast, whole-text search engine” (Raskin, 2000: 118), so searching for the right thing in abstract file structures could be realized through a simple, interactive interface—without icons.

Actually, this idea is anything but new. Prior to assembling the Xerox-inspired, desktop-based graphical direct manipulation human-computer interface with icons, the Apple Lisa development team considered another approach: icons were rejected for a number of reasons. Some argued, for instance, that there was no point in mimicking the office filing system as it would simply give people an electronic version of something that already had a number of problems; in fact, most paper filing systems had serious difficulties in both filing and retrieval (Perkins et al., 1997: 47/48). So, instead, a sort of file browser was used, which became known as the “Twenty Questions Filer” (ibid., 50). In a dialog, the user was prompted to select a disk, folder, or document. After the user made a selection, an action menu would appear with filing options, such as *pull*, *refile*, or *discard*. The selection of one of those items would apply the appropriate action to the selected document. Apparently, the system was fairly efficient and easy to use, but the constant prompting made users feel “that they are playing a game of Twenty Questions”—and it also failed to achieve one of the Lisa’s major goals: it wasn’t fun to use (ibid.).

On a contemporary system, such as Windows XP or Mac OS X, for example, search functions are pretty powerful (cf. Figure 8-7). They provide the user with file name as well as whole-text search functions. The search can be limited via filters, so the user may specify the data type of the document in question, or restrict the search to documents created using a certain software tool (such as a particular word processor, for example).

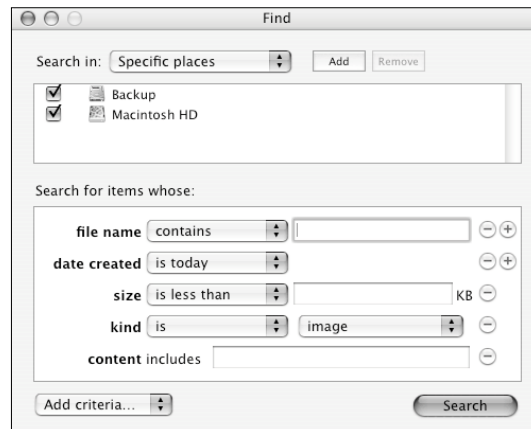


Figure 8-7: The Mac OS X 10.2.8 Find dialog.

8.3 THE FUTURE

Considering the enormous number of documents on contemporary hard disks (especially in networks), it is often far more efficient to use a search engine than to manually browse through all the folders in order to find a certain document. In my opinion, search engines will become more and more important in the future. Apple's new Mac OS X "Tiger" (version 10.4) feature named "Spotlight" seems to prove this. This is what they say on their homepage:

"Stop looking. Start finding. With Spotlight, you can find anything on your computer as quickly as you type. Search your entire system from one place: Files, emails, contacts, images, calendars and applications appear instantly." (Apple Mac OS X 10.4 Tiger homepage³⁷)

Maybe, one day icons will eventually become extinct. If search engines are unbeatable in finding a certain document without a hassle, why bother to use a virtual desktop with drawers and folders? Now imagine search results displayed as previews or thumbnails, enabling the user to literally see the documents that match the search criteria. Combined with the context-sensitive task approach for document manipulations, as used, for instance, on Windows XP, any need for a physical objects metaphor is practically eliminated. As soon

³⁷ Found at <http://www.apple.com/macosx/features/spotlight/> (accessed 2005-05-22).

as the user selects a certain search result preview, the human-computer interface reveals what can be done with this type of document. Let's take, for example, a picture: possible tasks would be *Print this picture*, *Order prints of this picture online*, *Delete this picture*, *Send this picture to...*, and so on. Such an approach would surely make icons as we know them useless or at least dispensable. But, of course, such an approach may offer a range of new opportunities and uses for semograms as well.

And there is another *maybe*: what if human-computer interfaces become three-dimensional in the future (which is not too unlikely, considering that there are experimental interfaces around already)? Spatial data management as a concept may become more important in that case. Such an interface does not rely on data being pulled by the user; accessing data would mean going to where it is. The use of traditional icons as idea pictures would not make much sense in this case. In a virtual world there is actually no need to "play pretend" because such a three-dimensional space already implies "real objects" with properties and behavior.

Of course, much of this is highly speculative. But recent developments seem to show that icons have their limitations. As mentioned previously, already in the late 1970s and early 1980s some developers questioned the advantages of icons (e.g. Lisa's Twenty Questions Filer) and thought about alternatives.—So this one goes out to all those human interface designers: "The best way to predict the future is to invent it" (Alan Kay).

9. *Discussion of Results*

Well, standards do change, but in light of this change may we ask ourselves what the reactions of people in a hundred years time will be, when they contemplate us with the raised eyebrows we reserve for the normalities of yesterday.

—Sir Peter Ustinov, *Still At Large*

To take up the old concept of petroglyphs and adapt it to the modern world by replacing the mammoths with office items was a stroke of genius. In doing so, the Xerox PARC development team around Alan Kay created a new kind of human-computer interface and additionally formed the basis for a new system of idea signs.

9.1 THE RESULTS SO FAR

The analysis of semograms and icons in the context of the human-computer graphical direct manipulation interface shows that pictorial signs, despite their superficial simplicity, are a fairly complex matter and a fairly absorbing one at that.

Pictures in general are pretty complex, and it is difficult to talk about them in particular. Although they are nowadays practically omnipresent, they are “scientific wasteland,” somehow. The old question *What is a picture?* has not yet been fully answered. And, as Scholz (2004) puts it on the cover of his book,

“Dieser ‘Bilderflut’ steht eine große praktische und theoretische Inkompetenz gegenüber.”³⁸ Even the rather limited number of examples given in this book illustrate nicely the various problems that arise when trying to describe, compare, and analyze pictures. Terms such as *resemblance* or *similarity* turn out to be far less descriptive than expected, a fact which is particularly critical, since pictorial signs rely on various modes of resemblance or similarity in order to convey their meaning. Accordingly, the theoretical background required to describe a “simple” picture is enormous.

Somehow, it verges on the miraculous that this analysis still brought to light a considerable number of interesting insights, and also some answers to the questions posed at the beginning of this work.

9.1.1 Questions and Answers

The following summary of answers is intended to remind you of the original questions and the findings so far.

Q: Are the differences between icons and their changes systematic in terms of a linguistic approach, or are they “merely” triggered by technological development in general?

A: Icon change as a global phenomenon (ie. covering all desktops) turned out to be remarkably systematic from a linguistic point of view. Although changes are certainly governed by technological progress to a great extent (even language in general is affected by technological progress), they are not at all random, and they are also dependent on the socio-cultural environment in which they exist and in which they are used. Computer literacy seems to play a major role in this context. If you compare today’s computer users to the users of 1981 you will find that they differ considerably in terms of experience. Whereas the user of 1981 had no computer-related background knowledge to draw on, the modern user is commonly able to look back on a few years of at least indirectly acquired computer-related experience. This change in the group of users is reflected in the use of icons within the human interface. The original icons were designed to convey ideas from parts of the “real world” unrelated to

³⁸My translation: This ‘picture overload’ is confronted by a great practical and theoretical incompetence.

computers in order to make the hardware which was new at that time accessible. The resulting idea pictures were representations of extremely concrete concepts. Later icon designs tend to represent more abstract concepts, often with reference to computer-related topics. This is true especially of function icons. A successful interpretation of such a modern icon therefore requires computer-related background knowledge.

The really interesting thing about this is the following: the icons, which originally had to rely on an existing (metaphoric) framework of cultural units in order to become meaningful, have eventually become a framework for the interpretation of icons and other kinds of idea pictures themselves. They have become cultural units themselves.

Consequently, modern icons are able to represent concepts established by their forebears without any reference to physical objects in first place. A computer user today may talk naturally about, for instance, a *Microsoft Word document* and it goes without saying that there is no concrete counterpart for such thing in the real world. The sense made of the respective sign vehicle on the screen is related to an abstract content, to the cultural unit 'Word document,' rather than to an actual physical referent. It was different for a user of 1981 who actually needed the physical referent in order to be able to understand the icon.

The differences between the icons on different desktop systems follow a sort of biconvex development: (1) they all share the same origin, namely the original Xerox Star icons; (2) during the early period of desktop-based interfaces up to the 1990s, the desktops began to develop semographic as well as metaphoric peculiarities which set them apart from other existing desktops (cf. the «drawer» semogram and the 'tool' concept as implemented on the Amiga desktop, or the 'volume' and 'drive' concepts on the Windows and the Macintosh desktops); (3) in the recent past, the designs have been converging again, due to borrowing and the emergence of "standards"—resulting in more similarities between icons on different desktops.

Icons have in fact changed their users and vice versa.

Q: *Is it possible to identify specific types of changes and describe the mechanisms or processes that are responsible for them?*

A: Since icon changes apparently do not occur at random and without any systematics it is not very surprising that indeed different types of change can be observed. It is even possible to identify processes which led to these changes. Generally, all three semiotic aspects of an icon (syntactics, semantics, and pragmatics) can be affected by these change processes.

Of all these three aspects, the pragmatics of icons is usually least affected by change. Significant changes in the grammar of user interaction patterns are found only in the context of a general paradigm shift in the early 1980s, which took place with the advent of the Apple Lisa and Macintosh computers. At that time, *drag-and-drop* was introduced, and it substituted the former *move* command-based operations. Since then, existing patterns have not changed but additional patterns have been introduced on a number of desktops (e.g. right-click drag-and-drop). Somehow, this change resistance of the pragmatic aspect of any icon is rather a required condition, since abrupt changes in the grammar of interaction patterns would surely lead to unpredictable and erroneous results—and frustration on the part of the user (which is, of course, not at all desirable for any software developer with profit in mind).

In contrast to this, change in the other two semiotic aspects of an icon occurs more often—and it can occur at shorter intervals (e.g. from one revision of a desktop to the next). Frequently, syntactic and semantic changes seem to accompany each other, one as a logical consequence of the other. A rather typical change process is growing morphological complexity along with semantic specialization of a certain icon type (e.g. from the one-fits-all document on the Xerox Star towards multiple document data type icons on contemporary systems). There seems to be a global trend from simple forms with generic meanings towards more complex forms with more specific meanings—towards *one form = one meaning* configurations.

The process in which the morphological complexity of an icon changes is not necessarily unidirectional; that is, the complexity of an icon only increases up to a certain point. The number of constituents is rather limited and rarely exceeds four semograms per icon. In some cases, the complexity of a particular icon even decreases again at some point in the development, when a certain (newly introduced) semogram suddenly assumes the meanings of other constituents

(cf. the globe semogram, which in the course of the development of the Network Environment icon acquires all network related meanings formerly represented by different semograms).

Another type of semantic change that can be observed is lexical borrowing. This seems to happen whenever a new feature is introduced to a desktop, which creates the immediate need for a new icon. The most famous example is probably the Windows Recycle Bin, which goes back to the NeXTstep Recycler.

Meaning change in icons is often about metaphoric change. Since metaphors within the human-computer interface provide the context in which icons become meaningful, the change of a metaphor, or the introduction of a new one, certainly affects the meanings of icons or of certain semograms. An exceptionally good example is the historical development of the Windows Network Environment icon. During its history, several different metaphors emerged and each affected the semographic construction around the «computer» semogram.

The triggers of change, however, cannot always be clearly identified. Various approaches have been suggested to describe the phenomena observed, such as the Invisible Hand, language contact, technological changes, or changes within the socio-cultural environment.

Q: Is it possible to identify and categorize differences between icons on different graphical user interfaces and describe the mechanisms and processes that lead to these differences?

A: Icons on different desktops can be referred to as icon dialects. While icons on all desktops are realized by similar semograms, the resulting icons frequently differ from one desktop to another one in terms of morphology and semantics. These distinctive desktop-specific variants are characterized by four factors: (1) different semograms may represent similar ideas; (2) similar semograms may represent different ideas; (3) the rules for the combination of semograms to form an icon may differ; (4) icons may exist on one desktop, but not on another, because the object represented by an icon may not be available elsewhere. The two first criteria, and probably the third one as well, are related to the socio-cultural environment. And they are rather important in terms of computer literacy, since they are about background knowledge, experience, and

expectations. Users of a certain desktop may have become accustomed to a specific use (with a certain meaning, or in a certain context) of a particular semogram, and probably to the rules for the combination of semograms to form complex signs. The fourth criterion is connected with the technological peculiarities of a certain desktop or the computer on which the desktop is used.

It is hard to trace the origins of the desktop specific differences, especially in linguistic terms, but it is possible to provide explanations for the increasing similarities between desktops.

It has already been mentioned in the first answer that change processes have led to converging icon designs in the recent past. This means that the peculiarities of the various desktops have decreased, which certainly also means that the dialectical differences have become less obvious and—if this development trend continues—will become marginal in the future.

However, in all likelihood, some differences will remain. The distinctive use of certain semograms, for example, will remain stable and consistent in the whole environment of a particular desktop. This is because, depending on the importance of icons in which such a semogram appears (e.g. a frequently used icon, or a critical function icon), changes may result in misinterpretations and erroneous user actions.

Q: Does a pool of semograms used to compose icons and draw ideas for the computer screen qualify as a sort of pictorial writing system?

A: The semograms as used within the human-computer interface are somehow comparable to a pictorial script in an early development stage. This stage is characterized by the considerable independence of the script from spoken language. Semograms are pictorial representations of simple ideas. Complex ideas are expressed through the combination of semograms.

There is no strong link between the signs and speech. There is no fixed representation for any semogram in spoken language. Semograms are not designed to be realized as speech, nor does their internal structure represent the rules of spoken language in a strict sense. Meaning is assigned to individual parts of a complex construction by rules and codes derived from cognitive processes and human perception (size, detail, color, framing, position, sharpness of form, perspective, etc.).

Apart from that, particularly the complex signs actually used on the screen (icons and glyphs) seem to have some qualities of a “visual language” as well. They represent a kind of pictorial vocabulary. The changes in this vocabulary resemble typical language change phenomena, such as borrowing and semantic shift.

9.1.2 Interesting Findings

In the course of various analyses and the evaluation of results, three simple and stunning discoveries within the whole complex iconymology topic have been made.

Development trends

The development trend of individual semograms is running counter to that of complex constructions (icons and icons). While icons have invariably become more specialized in the course of time, their constituents have become increasingly generic.

In the beginnings, when icons were rather mono-morphemic, semograms and icons were identical. The «document» semogram, for instance, existed only as a desktop icon. No other use is documented; pictorial signs were only used to represent concrete objects (text was used elsewhere). Consequently, the meaning of the semogram and the icon were in the same way both specific and generic (consider the wide range of data types represented by the Xerox Star document icon). On later desktops, semograms have been increasingly used in other domains of the graphical user interface. In conjunction with the new necessity to distinguish a growing number of data types due to the paradigm shift from a document-centric towards a tool-oriented desktop, the need for more specific icons emerged. In those more specific and at the same time morphologically more complex icons, semograms began to play different roles as stems and markers. Depending on the role, attributing meaning became a more abstract process. Instead of concrete objects, semograms started to represent more abstract concepts or ideas. Since then, almost all semograms have undergone semantic generalization in that they have assumed all sorts of

meanings related to the depicted object (cf. the «magnifying glass» semogram, which represents a range of meanings between ‘look at’ or ‘preview’ and ‘look for’ or ‘search’). Through this process, the individual semogram became less marked, while respective icons became more marked.

The need for specific icons has eventually even led to individual icons, which in some cases even seem to do without any semograms at all (e.g. thumbnail icons).

The seeds of the evolution

The semograms of the human-computer interface are a system of signs which has outstripped its planned origins.

Individual pictorial signs as well as complete sign systems tend to develop naturally. Only in rare cases are signs systems explicitly set up (cf. Scholz, 2004: 138). One of the few exceptions to the rule are road signs. Two other examples of synthetic writing systems are probably Charles Bliss’ *Semantography* (also *Blissymbolics*) and Otto Neurath’s *Isotype* (cf. Horton, 1994: 12/13).³⁹ Both are systems of pictorial signs intended for visual writing.

The system of idea pictures as it is used today in the context of the human-computer interface was not set up or planned in every detail, but in its earliest stage, the graphical user interface was the outcome of a long preparation process. The first semograms used on the Xerox Star desktop, such as the «folder», «document», or «file cabinet» semograms, were definitely planned by the designers and developers. Like a system of road signs, the system of Star base icons was set up. Evidence for this can be found, for instance, in *The Xerox “Star”: A Retrospective* (Curbow, 1989). Actually, four candidate sets of icons were created for the Xerox Star and tested in terms of usability (ibid.).

The developers of the Apple Lisa were inspired to some degree by the Star and certainly “borrowed” some concepts. The resulting loan icons were supplemented by original designs, which enlarged the sign set considerably. At some point in the history, the number of icons or idea signs may have begun to

³⁹For more information see the Blissymbolics dictionary available on the Internet at <http://www.symbols.net/blissymbolics/dictionary/> (accessed 2005-10-12).

increase without a “plan;” the growth of the system eventually became independent of the designers’ plans.

Finally, the system of pictorial idea signs is the result of the “collaborative work” of independent human interface designers and developers who use the signs and add new ones to the existing system as they need them. As if guided by an Invisible Hand, they all contribute to the same writing system or visual language.

In the course of time, some semograms have become obsolete and have been replaced by others. Different representations of similar ideas across different “icon dialects” as well as changing sign vehicle/sense relations within one and the same desktop environment are a result of this gradual development of the sign system. Each development stage follows the tradition of an earlier stage to some degree. Older constructions are reanalyzed and modified (cf. Windows Network Environment icon).

Today, the icon set of an average desktop environment features more than 300 different icons.⁴⁰ But while the number of icons and glyphs (complex signs) has definitely increased, it is hard to tell whether the same is true of the set of semograms. It has already been mentioned that the meaning of individual semograms has become more generic in the course of time (semantic generalization), which makes them suitable for the representation of more ideas (as parts of complex constructions). I would not be surprised to hear that there has been only a relatively small increase in the number of semograms. It may well be that the current number of semograms is sufficiently large to be able to express any idea within the human-computer interface—either alone or in combination. New meanings are created and assigned to existing semograms through metaphors. So changes affect the structure of complex signs rather than the semogram pool.

If this is true, it means that the sign system has reached a stage at which it may become (more) closed, a special circumstance that would make it even more comparable to other (ancient) pictorial scripts, and even more recognizable as a writing system that deserves to be so called. Furthermore, it would also mean, that it is possible to observe the genesis of a writing system in

⁴⁰The GNOME 2.10 icon set contains more than 350 icons, and additional glyphs, such as tool bar elements and emblems.

the making. Yet to what degree a system of signs must become closed prior to deserve being called “script” is hard to define. After all, the major reason for the ancient Egypt hieroglyphic script being closed, for instance, is that it is no longer used.

But even a much used writing system such as the Latin alphabet is not as closed as you might think. It may depend a little on the point of view, on the criteria used for the evaluation. But if you take into account all the signs that are in active use, the Latin script as a whole contains far more characters than the core of 26 letters from A to Z. Consider the following signs:

- The numbers 1 to 9, and the 0.
- Accents, such as á, à, â, ä, å, ã, ā, ǎ, a, etc.
- Ligatures, such as & (from Lat. *et* ‘and’) and ß (from Ger. long *s* + *z*).
- Currency signs, such as €, \$, £, and ¥.
- Additional symbols, such as, for instance © or ®.

All the signs listed above are found in the periphery around the core of the typical alphabet—and they are commonly found in all sorts of texts, either typed, printed, or handwritten. The signs are part of every newspaper article, book, and even of this thesis. In this peripheral area, variants and changes are possible. And they actually do occur: one of the most recent additions to the peripheral area of the writing system probably the European “Euro” currency sign €. And it is still imaginable to add characters to the sign system, such as, for instance, special ligatures.

If you look at the system of semograms with this in mind, it seems to meet one more criterion to be quite close to a valid script. There is a set of core semograms (e.g. *document* and *folder*). Around this rather closed core of base semograms, further signs can be found in an area which is still somewhat less fixed, and in which changes may occur.

Somehow, this variability around the pictorial core set seems to contribute to the “icon dialects” hypothesis. When you compare the use of semograms in complex signs (icons and glyphs) on different desktops, it may remind you of the use of the Latin alphabet. The same alphabet is used for writing in German, English, and French, for example. They all make use of the same core. Yet each

language uses a distinctive set of characters from the peripheral area of the sign system (consider German umlauts, or French accented letters). A similar situation seems to exist with the use of semograms within the human-computer interface. The same pictorial script is used on every desktop, with the same core set, yet with varying portions of the peripheral set.

Cultural units

The semograms and desktop icons, which originally had to draw from an existing framework in order to become meaningful, have finally become a framework themselves in the context of which other signs may become meaningful.

It is an amazing fact that those tiny pictures on the screen have made it into our hoard of cultural units in less than twenty years. Only twenty-five years ago, no-one was computer-literate in the sense most of us are today. Being computer-literate either meant being a technician with the proper knowledge of how to plug cables in a matrix of sockets or someone with a dictionary-like memory able to remember all the cryptic textual commands.

The first icons had to draw on the real world-related background knowledge and experience of the computer user. Later generations of icons already drew on computer-related user experience and on meanings already established by their predecessors.

The codes introduced to us by the graphical human-computer interface have been learned by a broad community of users. People have become accustomed to these codes. The semograms and their meanings have become cultural units. Codes and pictures have finally become part of our socio-cultural background and therefore a part of our visual vocabulary. This knowledge certainly enables us to decode similar pictorial constructions even beyond the computer screen. Consider the following picture I found on a writing pad.



Art.-Nr. 52 428
BRUNNEN
Baier & Schneider GmbH & Co. KG

Figure 9-1: An icon-like semogram on a "real" writing pad.

The complex semogram is a mixed-modal construction which is reminiscent of the 'document' semogram. The stem «blank sheet of paper» or «page» semogram even has a folded corner, a dog ear. The figure "50" appears in the center of the stem and, as a semantic modifier, adds the meaning 'fifty' to it. The resulting meaning is something like 'fifty pages' or 'this pad contains fifty pages.'

Apparently, today, the pictorial idea pictures have leaped beyond the computer screen, and have become a framework for the interpretation of other signs themselves.

9.2 ADDITIONAL RESULTS

9.2.1 Metaphors and Literacy

Metaphors provide the context in which semograms become meaningful. The original design metaphor of the human-computer interface is the desktop metaphor. Its original purpose, namely to transfer the familiar concepts of daily office work to the new and at that time alien computer technology, has gradually taken a back seat. Since people have become accustomed to computers over the years, this primary purpose of the desktop metaphor has given way to a new aim, namely to make computers more fun to use, a paradigm shift which also takes into account the new requirements of computer users, since the new user is not necessarily a traditional office worker. User needs range from gaming to multimedia, to professional and highly specific tasks. A common desktop metaphor is not able to include all these ideas. Therefore, on recent systems, numerous partly overlapping task-related metaphors can be found (e.g. media metaphor, Internet metaphor, mail metaphor).

But there is another aspect that may trigger the shift of an existing metaphor or the emergence of a new one. This is where literacy comes in. Because users have become accustomed to the use of computers, they have also become used to the signs and the codes used to convey meaning. They have learned how to make sense of the signs and how to interact with the computer via these signs.

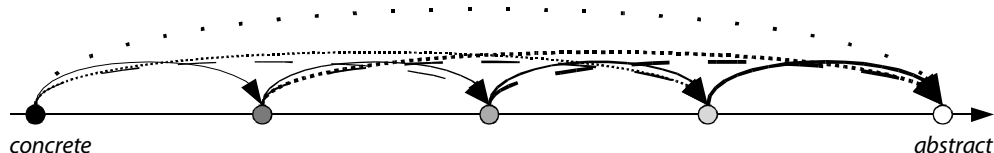
Once the basic principles are internalized, a user is potentially able to cope with new signs, probably even in new contexts (provided that the principles of meaning creation as well as interaction patterns do not change considerably). Consequently, if a particular sign is known, the user can probably make sense of it even in a different context.

For the “very first user,” the desktop metaphor was an obligatory requirement for working with the computer at all. Subsequent users already had the chance to accumulate computer-related knowledge and experience to draw on.

The computer has now become an integral part of the modern office. At the same time, the computer itself has become a part of the metaphor, too. «Computer» semograms appear in a number of places and context on every desktop-based graphical user interface (cf. the Microsoft Windows Network Environment or the My Computer icon), a sign of a (at least assumed) increasing computer literacy.

This also explains the emergence of icons with fairly abstract meanings, such as the ‘HTML’ or ‘web page document’ icon, which signifies a cultural unit without any physical referent. Icons like this one are used to represent “objects” that only exist “inside” the computer. This may contradict the model of a physical objects metaphor, but, in fact, it represents the extended view of what is considered to be real. One can say that this extensive use of metaphors combined with the fact that the principles of the physical world have been made available on the computer has broadened our image of reality (cf. the Word document example mentioned earlier).

Figure 9-2: Shift of experience and background knowledge.



This shift of experience from concrete to abstract is illustrated in Figure 9-2. In the beginning, the physical objects metaphor enabled users to draw on their “real” physical world experience and on their knowledge of the depicted objects. During the historical development, this experience has become mixed:

an increasing amount of the user experience is related to the abstract world of the computer. Particularly users who have used computers before will draw on their computer-related experience as well. On modern desktops, a higher level of computer literacy is an absolute necessity. Abstract cultural units, such as a *Word document*, cannot be understood and handled with physical world experience alone. A much larger amount of abstract computer-related experience is required. In Figure 9-2, the dotted and thin lines indicate that with each step in the historical development, the amount of concrete experience required to operate a computer decreases.

It is true, however, that even newer metaphors, such as the jukebox or media metaphor, also relate to the physical world. This may be helpful for the novice user. But I doubt whether experienced high-level computer-literate users actually draw on their physical tape-recorder-related background knowledge when operating for example the Windows Media Player or Apple QuickTime Player application. The diagraphic «arrow» 'play' semograms may have been learned earlier in another computer-related context.

Summing up, we can say that the human-computer interface itself has become a "place" in which users gain experience which they may recall later in other situations.

The physical object metaphors, which in the first place were introduced to make a "certain amount of reality" available on the computer desktop and thereby facilitate the processes of human-computer interaction, have over time affected other parts (and devices) of human lives and reality itself. Nowadays, computer-related metaphors are actually used to transfer now extremely familiar concepts of human-computer interaction to other types of devices: for example, virtual desktop metaphors be be found on contemporary cell phones, PDAs, or other types of devices used for contact management and communication purposes.

Since this means, furthermore, that a computer-literate person is able to operate a cell phone, for instance, the concept of computer literacy probably has to be extended to include other types of media and devices. Obviously, an average degree of computer literacy enables anyone to go beyond the human-computer interface. This type of literacy can also be referred to as *interactive*

media literacy. A further analysis will presumably reveal that similar metaphors and semograms are widely used in all sorts of “human-machine” interfaces, today.

9.2.2 Semograms

The analysis has shown that some objects are more likely to be depicted and used as semograms than others. Particularly unmarked forms and meanings seem to require the depiction of extremely familiar concepts. As a rule, the less marked a certain depicted object, the more generic and accordingly polysemous is the respective semogram (cf. the «microscope» vs. «magnifying glass» semogram).

The semographic fondness for familiar concepts does not only affect the choice of objects for depiction, but the manner or perspective of depiction as well. A «hand» semogram is usually the depiction of a right hand (and one with white skin at that). In contrast, the left hand is only used in specific, highly marked cases (such as the Apple Mac OS desktop accessory icon). The use of perspective (if there is one) is intended to “highlight” a salient feature of the depicted object in order to make the semogram more transparent. Accordingly, an object is depicted from a familiar angle or characteristic viewpoint (cf. Horton, 1994: 144ff).

Sometimes, several semograms may be used almost interchangeably to represent a certain idea or meaning. However, for each idea, a specifically marked semogram seems to exist, which is more suitable for representing a certain idea rather than others even within the vicinity of another less marked semogram which is potentially able to represent the same idea (cf. realization of the concept ‘search’ through «magnifying glass» vs. «binoculars» semogram). Apparently, although I have not tested this hypothesis thoroughly, a more marked semogram tends to be used whenever, in the same environment, a less marked semogram, which usually represents a similar idea, has already been used for a similar concept.

It is an interesting fact that certain semograms may go out of fashion. Consider the «hand» semogram once more. The use of the semogram as an

agent marker has become obsolete. This does not mean that the semogram dropped out of the idea writing system. It does mean, however, that a new meaning has been assigned to it, namely that of 'pointing' as a mouse pointer. In almost every other sense it has gone out of fashion. This development may have sometimes to do with the socio-cultural environment of the users. Political correctness has become more and more important. Hands in particular are always good for confusion, misunderstandings, and sometimes even for taboos (cf. Horton, 1994: 245, 248 – 249).

Apparently, each semogram—due to the semantic properties of the depicted object—has a certain representational scope, a kind of field of ideas which can be assigned to the respective semogram. In the course of time, however, the “rating,” that is the perception of which meanings are appropriate for representation by a particular semogram, may vary. This shift in perception may also be responsible for the paradigmatic shift from ideographic «file cabinet drawer» semograms towards modern hard disk icons (aside from other factors such as shifting literacy, metaphorical changes, user experience, etc.).

And again the question must be raised in how far the semograms and icons themselves have initiated these change processes (mutual interaction of computer desktop and “reality”).

9.2.3 A Success Story

As *Homo significans* ('meaning-makers,' cf. Chandler, 2002) we are and have always been surrounded by pictorial signs and idea pictures in particular. We are used to pictures. We probably need pictures. The concept of idea pictures is probably as old as humankind. Since about the middle of the 20th century, pictorial sign systems have become a standard for international guides. Pictorial signs decorate road sides, hang down from airport ceilings, and hit us in the eye in commercial advertisements. And especially lately, the spread of pictorially wrapped information seems to have increased.

Why is it that semograms have always been so successful, practically during the whole history of humankind? While Neanderthals and Cro-Magnons, due to the absence of other writing systems, had no choice, modern Information

Age people seem to be especially keen on using pictures instead of the traditional alphabetic writing system.

Pictures are appropriate in our fast-paced modern life, because they are really time-saving and economical: pictures are able to convey a relatively large amount of meaning within a relatively short time. Since we are confronted by so much information these days, it has to be transmitted really fast. Sometimes, the time span available to communicate or signify a certain meaning is only a few seconds, or merely fractions thereof. Think of traffic signs, or commercial ads. Pictures work so quickly because everything is visible at the same time. In contrast, written messages are slow, due to the linearity of their construction, which is based on temporal and causal aspects. Usually, we have to read the whole message in order to get the information right. The representation of a familiar concept with known codes can be decoded in next to no time. Pictures are welcome time savers in these cases.

Semograms can be international, too. Within the same or a similar cultural environment, ideas may be depicted independent of language. Thus, one and the same semogram can be understood by a person within that cultural environment regardless of the person's tongue.

Pictorial signs are thus extremely mass compatible and recognizable in a very short time. They are easier to learn, because the relation between their form and meaning is not arbitrary, and therefore easier to remember. Because of these advantages they are just perfect for fast changing circumstances, such as in the graphical user interface as well as any other kind of signposting.

The success story of idea pictures is most likely to continue.

9.3 WHERE TO GO FROM HERE

The results have shown that it is not only possible, but also reasonable, to look at icons and their constituents with a linguistic focus. Icons and semograms as pictorial signs have clearly become an integral part of human culture and are as such used in a number of contexts related to communication in order to convey meanings. They have become extremely common.

It turned out that iconymology is a three-fold subject, and that it goes far beyond the simple “history and development of desktop icons”-thing. It is about

- a pictorial idea sign set,
- semantics and metaphors,
- and (computer or interactive media) literacy.

Each of these topics probably deserves more detailed analyses. It is, however, beyond the scope of this thesis to analyze each subject in depth, nor is this possible with one and the same approach. In order to be able to do a proper analysis of the literacy phenomenon, for example, a more psycholinguistic approach in combination with use and usability studies would have been necessary. Gunther Kress offers a “toolkit” to deal with the phenomenon of literacy in the “New Media Age” (2004: 37ff).

Metaphors in particular are a vast subject. A far more psychological and philosophical approach would be required to be able to evaluate the different hypotheses, and figure out the appropriate way to deal with the context- and reality-contributing design metaphors of the graphical user interface. Such an approach would also have to deal with cognitive theory (psychology) and the concept of reality (philosophy). Good places to start looking for building blocks of such an approach are probably George Lakoff and Mark Johnson (1980), *Metaphors We Live By*, and Max Black (1962), *Models and Metaphor*.

The analysis of pictorial signs within the graphical user interface as a writing system would require a complete corpus of semograms in first place. In a contrastive analysis ancient as well as contemporary complex scripts are compared to this semogram set (and its grammar) in order to elaborate similarities and differences in more detail. In the course of such an analysis it should be possible to find out more characteristics of this pictorial idea sign set; and it should be possible, too, to either prove I am wrong or right in calling it a writing system. To form a basis for such an approach consider Peter T. Daniels and William Bright (eds., 1996), *The World's Writing Systems*, and Hans Jensen (1969), *Die Schrift in Vergangenheit und Gegenwart*.

10. *Finally*

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

—T. S. Eliot, *Four Quartets* (No. 4)

If you start thinking about the origins and development of icons within the graphical human-computer direct manipulation interface, and about their future, there are two directions you can go. One is to regard their story as the results of alternating design and usability testing processes; change as a simple technological necessity. The other approach is to realize the socio-cultural aspects of idea writing and interactive media literacy, and their interaction; change as a result of interaction between a sign system and its users.

Both points of view are valid, and one can most probably not exist without taking the other into account, too, yet the point of view clearly affects the way the results of this analysis are interpreted and weighted. There is probably little space for language change phenomena in an icon change hypothesis based on the technological imperative.

On the other hand, since icons are constructs that convey their meaning via cognitive processes, which involve seeing, decoding, recognizing, and remembering, it is also quite plausible to think of icons as something that is affected by exactly those processes; change as an obligatory reaction to shifting

perception. And that perception shifts can be illustrated quite easily. For example, the computer today is no longer perceived as a complicated apparatus used for calculations and database operations (although this still represents a major part of its functionality); modern computers are rather considered multi-medial fun and life style products.

Icons are still designed and tested, but no longer on a purely theoretical basis. Instead, desktop-related traditions, established habits, and the experience of users are taken into account in order to preserve a certain consistency which enables the users to become and remain computer-literate in the long run. Existing icons and successful concepts are rarely replaced by completely new designs. And prior to the development of completely new icons and functional concepts, existing and successful concepts from other desktops are "borrowed." After all, the computer-literate user is an economic factor.

The direction of change as far as individual icons are concerned has been described as leading towards more specific designs. There is a shift from icons with generic meanings towards more specific, or even individual, designs (cf. thumbnail icons). The sign system as a whole, on the contrary, will probably become more general. The individual semogram is usually characterized by considerable polysemy. In terms of literacy this means the following: The entry level for the novice user becomes lower, since less specific or technological knowledge is required to decode the semograms, and users may rely on purely task-related background knowledge. On the other hand, this task-related background knowledge becomes more technological, since a growing number of activities is associated with the computer, so even the generic semograms may include an increasing number of non-concrete and computer-related contents.

Computer literacy will probably develop into something like an Interactive Media literacy phenomenon. Already at this stage, a user capable of using a computer, for instance, is commonly also able to operate digital cameras, cell phones, televisions, gaming consoles, and any other interactive electronic device, because they all use similar interface metaphors. In this process, literacy does not only become a byproduct of an increasingly technologically stamped socio-cultural environment, but a requirement for anyone who lives within this

particular environment. In other, more colloquial words: if you do not “speak” icons today, you had better learn it soon since you might need it tomorrow.

When more and more people became literate in the sense of ‘being able to read and write’ in the course of industrialization (which made paper, printing, and books cheap and consequently affordable for all classes), this probably marked the origins of the modern Information Age. Today, more and more people are continuously exposed to pictorial signs and multi-medial messages displayed by all sorts of electronic information and communication devices. Pictures have become “cheap.” If this stage is somehow comparable to the situation two hundred years ago, there must be a lot to come. Time will tell how New Media literacy (cf. Kress, 2004) affects the future distribution of information.

It has become more and more apparent during the process of analysis and in the evaluation of the results that literacy plays a dominant role in the (hi)story of icons. But in order to be able to analyze this phenomenon in more detail, it is necessary to broaden the scope and include more sign systems either based on or related to the semograms of the human-computer interface. Parallel use and usability studies of computer users, cell phone users, and users of other kinds of interactive media devices (e.g. hand-held computers) combined with a psycholinguistic approach may reveal details on the processes and circumstances in which a person becomes Interactive Media-literate; on how a user builds up a visual language in mind, and how this knowledge is organized.

It is amazing how a set of tiny pictures—written ideas—, originally used merely to mimic reality, has leaped beyond its non-physical existence and how it has eventually managed to become a part of reality itself.

Semograms are around in almost everything we do. Few of us spend a single day without their company. The fact that we have ceased to consciously perceive their existence proves how common they have become. We have all become *idea readers*.

There is some irony in the fact that in order to become fit for the future we had to become literate in a Stone Age fashion.

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