



Markus Schröppel

Elimination of doubt

Methods for a predictive design
to direct and optimize the flow of visitors

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Acta Universitatis Lapponiensis 313

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Academic Dissertation

To be publicly defended with the permission
of the Faculty of Arts and Design at the University of Lapland
in the Esko ja Asko auditorium on 28 November 2015 at 12 noon



LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Rovaniemi, Finland 2015

University of Lapland
Faculty of Art and Design

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Cover and Layout: Markus Schröppel

Fonts in use:

Calendas by Studio Atipo, Gijón (ES)

Titillium by Accademia di Belle Arti, Urbino (IT)

*front title: image from Düsseldorf Intl. Airport · Terminal B
by Markus Schröppel (2015)*

fig. 1: Tourist Traveler Silhouette

Sales:
Lapland University Press
P.O. Box 8123
FI-96101 Rovaniemi
Tel. +358 40 821 4242
publications@ulapland.fi
www.ulapland.fi/lup

Printed by Hansaprint Oy, Vantaa, Finland 2015

Printed:
Acta Universitatis Lapponiensis 313
ISBN 978-952-484-857-2
ISSN 0788-7604

Pdf:
Acta electronica Universitatis Lapponiensis 181
ISBN 978-952-484-858-9
ISSN 1796-6310

Abstract

The rapid development of international traffic characterizes our increasingly globalized and ever more complex world. Nodal points (for example, airports) have formed where people from various cultural backgrounds and with differing levels of educational attainment need to reorient themselves in a unfamiliar and often confusing environment.

A key condition to ensure everything works smoothly in such an international junction is the extremely fast reception and processing of information by everyone involved. The dominant school of thought among many designers and planners of guidance and routing systems is still a reductionist and mechanistic one (cause - effect). It has become apparent that the use of non-internationally harmonized pictograms as information carriers has failed completely. Recent findings in the field of cognitive science demonstrate convincingly that previous models of visual perception and spatial orientation can only highlight partial aspects. For these aspects, the question has arisen: "Is there a possibility to evolve a predictive system to develop, implement and verify design solutions to direct and optimize the flow of visitors in large public spaces?"

Therefore, the moment of semiosis of the orientation seekers moved into the focus of the investigation. This moment of meaning-making, which is perceived by every individual differently, spans the entire spectrum of the perception of the designated item (the optical characteristic of the character substrate) between manifold interpretation or absolute certainty. The various viewing options of "situational awareness" with the help of various methodologies provide solutions for the design process. Taking the aspects of perceptual psychology into account leads to the development of a systemic/holistic and user-centred design of orientation systems in public spaces.

Identifying and consulting the predictive parameters in a systematic process could show a practicable solution for the planning and evaluation of guidance and routing systems. In various national and international case studies, the process reliability and processing quality of this solution were demonstrated.

Involving mixed research methodologies of qualitative observation and quantitative analysis, it was possible to develop a workable model. Through observation and interpretation, ethnic habits and personal views were taken into account to develop the methods. The use of questionnaires or surveys created statistics to prove or disprove the hypothetical model.

The capacity of the presented model and the operationalization of the research demonstrated an effective method for overcoming barriers of age, language and culture. The publication satisfies, therefore, the criteria of the academic quality of a practice-based Ph.D.

keywords : wayfinding, cultural interpretation, sign, icon, guidance, situational awareness

Tiivistelmä

Ympäristömme globaalistuu ja monimutkaistuu kaiken aikaa. Prosessi näkyy muun muassa kansainvälisen liikenteen solmukohdissa. Esimerkiksi lentokentät ovat kyseisiä eri kulttuurien keskinäisen vuorovaikutuksen kohtia. Eri kulttuureista tulevien ihmisten pitää osata orientoitua vieraassa ja usein sekavassa ympäristössä. Jotta toiminta olisi sujuvaa näissä solmukohdissa, on suunnistamiseen tarvittavan tiedon oltava nopeasti omaksuttavaa ja ymmärrettävää.

Monet muotoilijat ja suunnittelijat ajattelevat, että opastejärjestelmät ovat reduktionistisia ja mekanistisia syy-seuraus systeemejä. On kuitenkin ilmeistä, että kansainvälisesti harmonisoimattomien piktogrammien kyky välittää informaatiota on epäonnistunut. Nykyiset kognitiotieteen havainnot osoittavat, että visuaalisen havaitsemisen ja tilallisen orientaation aikaisemmat mallit ovat vain osittain toimivia. Siispä oli syytä kysyä ”onko mahdollista tuottaa ennakoiva malli jonka avulla voi kehittää, toteuttaa ja varmistaa suunnitteluratkaisuja, jotka ohjaavat ja optimoivat vierailijoiden virtaa laajoissa julkisissa tiloissa.“

Tutkimuksen keskiössä on tästä syystä tilallisessa orientoitumisessa tapahtuva kulttuurinen merkityksellistäminen ja paikkatietoisuuden lisääminen (situation awareness). Juuri tuo yksilöllinen merkityksen tuottaminen voi tarkoittaa laajaa kirjoa erilaisia tulkintoja. Paikkatietoisuuden syntymisen erilaiset mahdollisuudet yhdessä erilaisten menetelmien kanssa voivat tuottaa ratkaisuja suunnitteluprosessiin. Suunnitteluprosessissa voidaan ottaa huomioon myös havaintopsykologisia näkökulmia. Kaiken kaikkiaan tämä johtaa systeemis-holistiseen ja käyttäjäkeskeiseen ajatteluun julkisten tilojen opastejärjestelmien suunnittelun kehityksessä.

Esitän myös käytännöllisen ratkaisun opastejärjestelmien suunnitteluun ja arviointiin tarkastelemalla olemassa olevien järjestelmien rakennetta ja parametreja sekä niiden kehitystyötä. Työ sisältää yhteensä yhdeksän tapaus-tarkastelua.

Tutkimusmenetelminä käytin laadullista havainnointia ja kvantitatiivista analyysiä. Havainnoin ja tulkitsin etnisiä tottumuksia ja henkilökohtaisia näkemyksiä. Tekemäni kyselyjen perusteella näyttää siltä, että konstruoimani mallia voitaisiin käyttää kehittämisen ja todentamisen välineenä.

Avainsanat: wayfinding, kulttuurinen tulkinta, merkki, kuvake, ohjaus, situational awareness

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1.1 Basic Reflections

Our planet is getting figuratively ever smaller and yet ever more complex. As global mobility parallels a steady growth in air travel, more and more airports come into being as nodal points, where people from different parts of the world, diverse cultures, and varied backgrounds converge and interact. In the past, pictorial representations were used at airport terminals to solve the resulting communicative problems. International picture language wound up exerting a strong influence everywhere that information needs to be conveyed and explained quickly and simply, especially concerning public spaces. A potential issue, which is not usually apparent at first glance, is the fact that the pictograms used in airport passenger signage systems are not internationally standardized.

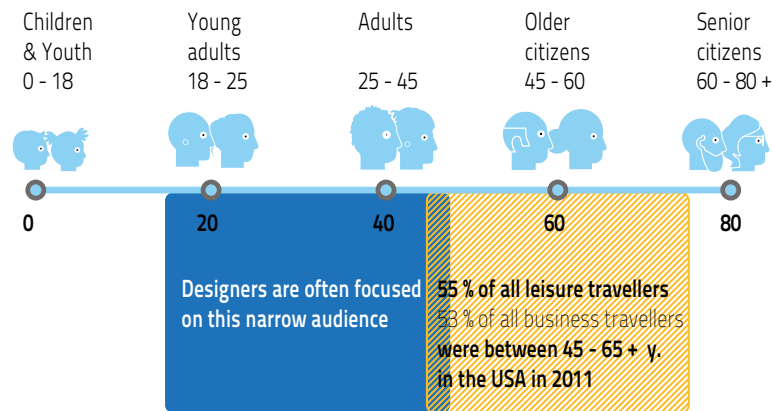
Icons alone are often insufficient for international public needs. Innumerable studies have exposed the difficulties experienced by airline passengers trying to navigate their way through an unfamiliar and crowded environment with the help of symbol- and text-based signage systems. The increasing growth of civil aviation in the 1950s led the International Civil Aviation Organization (ICAO) to consider the compliance of all typographical signs. This led to an investigation on the requirements for an international pictorial language that could be understood by various ethnic groups. Clearly, a sense of orientation or direction alone is no longer enough to find your way in an international airport; the aid of pictorial, graphic, written and spatial signals are also needed. The goal of airport signs and wayfinding systems in airports is to show visitors their way, from finding the right terminal, check-in counters, gate, transfers, toilets or even the nearest café.

Creating a wayfinding system sufficient to guide thousands of visitors in an airport requires an in-depth case study of the visual environment, traveller streams, detailed prints of the building and much more. The freeze-framed gestures based on the Western way of thinking are often insufficient for international public or different traveller groups. Pictograms are supposed to be self-evident, but in fact they often produce confusion and doubt. Differences in wayfinding behaviours between genders, age groups, types of travel groups, and levels of familiarity with the environment have been identified. Airport authorities handle this problem as being mostly a topic of interest to planners and designers, claiming that a new context of navigation in the built environment has recently been developed. Human navigation in an indoor or outdoor public environment is based on a few basic

elements – such as colour contrast, field of vision, and the categorization of information.

Creating wayfinding systems for airport terminals is uniquely difficult. This is partly due to the complex nature of a building that often has three or more separate levels, comprising several types of processing areas and many different types of passenger waiting zones (Fewings, 2001). Airport authorities currently treat the passenger as “PAX” (which originated as an abbreviation on telex messages for passenger boarding (enplanement) - PAXLST) which must be cleared quickly and efficiently. This narrow economic perspective is efficient for the airport authority, but not very helpful for the airport visitors themselves. The designers tend to focus on an audience that represents a relatively small age group, ranging from 18 – 45 years (Mijksenaar (fig. 2)).

*fig. 2
Designers' focus audience
The individuals who are often most in need of guidance in large public buildings fall completely outside of this group.*



What started as a design task first helped me to gain insight into the fascinating world of human perception and behaviours to develop wayfinding solutions. Over the past years, I have been confronted with many almost identical questions concerning similar design problems in public spaces. A strong suspicion arose that there might be an overarching answer or framework within which all of these similar questions could be addressed. I developed methods in design research and design solutions focused on user-centred design. The requirement was always to cover all the orientation needs of the visitor who will use the signaletic system, focusing on the needs of human perception concerning the steady increase of visual input.

1.2.1 Introduction: The Motives Leading to this Research

This research involves the areas of visual perception and of perception psychology of guidance and orientation systems in public spaces and buildings primarily. This work challenges the semantic and semiotic function of the used signs as well as their effectiveness. The research includes an investigation of the process of orientation in shared common spaces as well as an investigation of the individual interpretations of given pictographic (iconic) information in different cultural contexts. The scientific work is a critical consideration towards existing orientation and information systems and an examination of the iconographic particularities of different orientation systems and their demands on the recipients. Flowcharts show the designated processes of an airport and highlight where the recognisable malfunctions in the system are and where passenger agitation could be expected. The flowcharts are presented together with the analytical investigation of passenger movements in public common spaces (e.g. an airport) and give us information about the semantic relevance of the signpost and its basic necessity. With the aid of different index methods it was possible to measure and enhance the visibility of the signs in the field of cognition science, with a broader focus not only on airports but also on different public facilities from public buildings and parks and even suburban areas.

1.2.2 Theoretical Frame

The present study fulfils the criteria of practice-based research. This type of research is context-bound and tightly focused on concepts such as “reliable”, “useful”, “good” and “wise” (Winter, 2007). The research builds a bridge between practical “problem-solving” and the complexity and interrelatedness of a traditional Ph.D. thesis. Contrary to popular belief, it is not true that a designer devises an idea in a creative act to improve the world. The designer is usually assigned from outside with the task of designing to solve a specific communication task. At the beginning of my studies, I was assigned just such a design task as a designer (Düsseldorf Airport, see chapter 3.1). It became increasingly clear during the design process that developing a public guidance and routing system in a reasonable and workable way is a general problem. Derived from real circumstances in practice with their complex conditions, I set about developing a theory of practice and I was looking for available scientific solutions in other areas that might already have a working

hypothesis. This thesis will allow designers, planners and operators of public-frequented areas, to develop, examine and improve such guidance systems. The paper therefore includes definitions of boundaries in actual research and literature, thus connecting the scope and possibilities of the focused topic. The expertise lies in the personal field of practice. The final outcomes are thus creative artefacts (see chapter 3.1 - chapter 3.8) on the basis of a contribution of knowledge (Winter, 2007). To arrive at the point to be able to create such artefacts, several original investigations have been undertaken in different ways to gain new knowledge as a result of practice. These include classical questionnaires, online surveys and practical design implementations with students from the University of Lapland (Bremen Airport [chapter 3.3], Lübeck Airport [not further elaborated here], Lapland Central Hospital, Rovaniemi (Finland) [chapter 3.8]), students from the HMKW (Hochschule für Medien, Kommunikation und Wirtschaft), University of Applied Sciences Berlin (Bremen Airport [chapter 3.3], Berlin Brunnenquartier [chapter 3.6], Junior Uni, Wuppertal [chapter 3.7]) and students from the HMKW University of Applied Sciences Cologne (Cologne Airport [not further elaborated in this paper], Junior Uni, Wuppertal [chapter 3.7]). The practice-related outcomes are based on a rigorous analysis in the tradition of scientific objectivity in balance with the needs for practicability. “The different creative artefacts are the basis of the contribution to knowledge, so the research is practice-based.” (Candy, 2010, p. 3)

I would like to convince my peers that paying attention to my work is worth the effort. The fundamental problem that the present study sought to address is that which three million air passengers are faced with in international airports on a daily basis. However, as this problem is the same as that faced in all kinds of large public spaces, a substantial contextualization of the creative work is possible. I try to identify and delineate the problem explicitly and to define the particular knowledge gap I am addressing. This Ph.D. project might be a solution aid for existing problems in international signage systems. The different creative outcomes are not explanations in and of themselves. The description of different cases is related to the development steps and the nature of the artefacts to understand the creative process.

Any doctoral research proposal has to fulfil three key conditions:

- A series of research questions and objectives must be defined in terms of seeking to enhance the body of knowledge.
- A research context must be specified, i.e. why it is important for this particular question or problem to be examined and to identify what other research is or has been conducted in the area.
- A research method must be specified, firstly to address and answer the research problem and, secondly, to provide the most appropriate means to answer the research question.

(AHRB [Arts and Humanities Research Board {now Council}], 2000, in Candy, 2010, p. 19)

In this doctoral research, I would like to depict the confusion and irritation caused as a result of signage diversity in common public spaces. My initial findings at Düsseldorf Airport made it obvious that spatial guidance might indeed be lacking due to various reasons, and this helped me to formulate the research question. The importance of the research context was confirmed by my private online survey involving a “comparative test of public symbols” and approved by the ACRP REPORT 52 “Wayfinding and Signing Guidelines for Airport Terminals and Landside” from the U.S. Transportation Research Board (TRB)’s Airport Cooperative Research Program (ACRP). The presumption that commonly used signs in airport signage systems are not as understandable for the majority of passengers as might be expected is set. The method of measuring the visibility of guidance signs (conspicuity index method [A.H. Wertheim, 2009]) at Bremen Airport showed how to solve the visibility problem with simple changes in design. The situation is aggravated when passengers/visitors are in a stressed position, for example, under time pressure to catch a connecting flight and so on. First at the Lübeck Airport [LBC], and later as an airport tester at the under-construction Berlin Brandenburg International Airport [BER], I was confronted with this problem, when all my tasks in the test-process of moving through the airport failed to get me to the flight on time.

In several of my lectures at both the University of Lapland [course: AGRA0715 Environmental Graphics] and at the HMKW [course: M4 Grafik im Raum und Umgebung {transl: graphic-design in space and environment}] I started to focus on elements of the traditional Human-Computer Interaction (HCI) design. The idea to focus on the ‘User Experience’ as a design source in our ‘wayshowing’ design development was doubtless the right decision. Aspects of a person’s interaction similar to an IT system are also included in

wayfinding, that is, elements such as the interface, graphics, industrial design/ architecture and, finally, the physical interaction or behaviour. Our case included, developing a wayshowing system for the Humboldthain People's Park (in Berlin) followed by the public request to develop a signage system for the Berlin Brunnenviertel quarter, Wedding; Berlin. The tools of User Experience Design (UXD) helped to address all aspects of a signage system as perceived by users. In this special case, we reached the limits of the method of user-centred design: "situation awareness" (Endsley, 2003) that I had introduced as a model. It had to be expanded to give consideration to the fact that users can learn, and this afforded learning is changing the signage method drastically. In the following two User-Centred Design cases the first tested the changed situation awareness at Cologne Airport: User-Centred wayfinding (2013) with students of HMKW [course: M4 Grafik im Raum und Umgebung] and the second used practical-based research of the situation awareness of different age-groups in order to develop a common signage system with a focus on user-centred design (2013) at the Junior Uni, Wuppertaler Kinder- und Jugend-Universität für das Bergische Land gGmbH (Wuppertal, Germany) [Children and Youth University]. This was designed and implemented in the new building of the Junior Uni with students of HMKW from Berlin and Cologne. [see chapter 3.7] With this and other projects I tried to verify the answers to my research questions and meet the objectives of the focused and specified research context in this area with the appropriate research method applied. All of this had to be carried out in an international setting and presented at conferences.

1.3 Quest for the Research Question

It was a surprise when Steven Leib (Leib, 2010) pointed out in his Master's Thesis that although an increasing number of international passengers pass through US airports, of which a growing number are Chinese nationals, airports have apparently done little to reflect the changes in terms of the demographics of airline passengers. On the one hand, an international airport is itself like an aerotropolis, an existing entity with all the rules and regulations of a city and as fast-growing as the nearby dwellings. On the other hand, frequent international travellers who regularly find themselves in different airports around the world are often faced with differing pictograms pointing to the same amenity or destination. Those differing pictograms often have a completely different look and feel, which varies from airport to airport.

1.3.1 Comparing Signage Systems

Every year the reader of the international luxury travel magazine Condé Nast Traveller vote for the “Condé Nast Readers” Travel Awards’ in different categories and “voice their opinions on the best airlines, airports, and hotel chains”. (Conde Nast Readers Traveller Awards, 2009 p. 19) The winners are awarded a place on the so-called Gold List: The World’s Best Places to Stay.

According to a report on etravelblackboardasia.com, the 2014’s Condé Nast Readers’ Travel Awards has named Beijing Capital International Airport (PEK) as the best airport in the world, unseating Spain’s Madrid-Barajas International Airport (MAD) from its top spot in 2012. Following Beijing’s score of 87.30, completing the Condé Nast Readers’ Travel Awards’ top three airports list were Incheon International Airport (ICN), in Seoul, South Korea, which ranked second with a score of 86.44, and Singapore Changi Airport (SIN), Singapore, in third place with a score of 86.38.

Condé Nast Traveller calculates an index based upon the satisfaction levels of their readers; asking them to score airports out of 100 based on various criteria including facilities and services, an overall percentage score is then produced. In terms of individual sections Condé Nast Traveller mentioned that, for example, the Incheon International Airport in Seoul is clean (with a score of 96 for cleanliness) and that getting through Madrid-Barajas International is convenient due to its design/layout (93.69). However the 2012 winner, Beijing Capital International, emerged on top in that category (97.50), as well as for flight information/clarity of signs (90.57) and location/accessibility (92.46). The Top 15 airports in the Condé Nast Traveller 2009 Readers’ Travel Awards include:

- | | | | |
|----|----------------------|-----|--------------------|
| 1. | Beijing (87.30) | 9. | Sydney (84.40) |
| 2. | Incheon (86.44) | 10. | Barcelona (83.35) |
| 3. | Singapore (86.38) | 11. | Zurich (77.63) |
| 4. | Schiphol (86.17) | 12. | Frankfurt (76.84) |
| 5. | Hong Kong (85.65) | 13. | Munich (76.53) |
| 6. | Dubai (85.56) | 14. | Copenhagen (72.74) |
| 7. | Madrid (84.53) | 15. | Vancouver (71.06) |
| 8. | Kuala Lumpur (84.47) | | |

In the spring of 2010 I took the opportunity to request information from the thirty listed international airports about their signage, architecture and the airport authorities' struggles with regard to international standards of graphic symbols. The answer from Hong Kong International Airport, also known as Chek Lap Kok Airport, strengthened me in my research. This indicated that I had encountered a problem, which had, so far, been widely ignored. It began to emerge that I had to take a broader approach going to the very root of the problem. It was obvious that the main problem occurs not only at airports. All public spaces including public transport or facilities are affected. The key problems are, on the one hand, ineffective design implementation coupled with a cross-cultural misunderstanding, and on the other hand, the largely inadequate research of the responsible entities for the deeper communication processes which take place in the envisaged guidance and routing systems. It must be asked which factors contributed to circumvent the hampering of the implementation of successful visitor guidance.

The questions were as follows:

- Is it possible to improve the Passenger/Visitor Experience in large public spaces?
- How could this be achieved with respect to different cultural backgrounds, different age groups, different tasks, and different stress levels?
- Can exact predictions be made about the future needs of guidance systems with the aid of detailed and accurate modelling?
- Could these be tested in a specific project?

In the first findings of my investigations, for example, in Düsseldorf International Airport, it became obvious that certain locations and amenities are difficult to locate for visitors who are strangers to the area, and that spatial guidance is hidden for inattentive passengers. The purchasing power and discernment of airport travellers is rising – the price of airlines tickets, for instance, influences travellers' decisions, but also increasingly important is the conscious punishment and rewarding of under- or over- performance, that is, the customer/passenger preference of departure airport/arrival airport is made depending on its performance. Many passengers, such as the readers of Condé Nast are asking themselves: Why should I depend on a boring, confusing airport? So I had to pose my research question.

1.3.2 Research Question:

Is there a possibility to evolve a predictive system to develop, implement and verify design solutions to direct and optimize the flow of visitors in large public spaces?

Through the preliminary investigations it was established that there is a denotative lack of guidance in public spaces. In customer-flow analyses we can identify the different needs of airport visitors that call for signs with an element of international comprehensibility. I conjectured a deficit in the understanding of international public symbols. During this time I became aware of a project by the Moholy-Nagy University of Art and Design (in Hungarian: Moholy-Nagy Művészeti Egyetem), the former Hungarian University of Arts and Design, which concerned a “Comparative Test of Public Symbols” using Public Symbol Systems involving designers and consultants from different designers and institutions. This project achieved similar results to my own in a comparative test of public symbols*: this test was launched in 2009 and continued until 2014. Of all 150 subjects, those tested came from all over the world, including Australia, Asia, America and Europe above Russia and Ukraine, two thirds of respondents were male and one third female, while in the age group 22-30, half had 60%, and in the over-30 age category, 32% had revealed quite interesting results about different public symbols and their recognition.** At that stage I found differences in international airport signage systems and came across many papers, former dissertations, books, artefacts, excavations and stories, all of which informed me on the subject matter in some specific way. I became captivated by the idea of explaining the world from my distinct point of view. I tried to dig deeper to find differences, where things looked similar at first glance.

What I have tried to do is a practice-based Ph.D. thesis centred around my personal interest in signs and signal systems. This doctoral research project refers to personal experience amassed from being involved in many different projects as a design practitioner. The knowledge and research practice accumulated through assignments in other fields may also have influenced my way of identifying and approaching this research/design problem.

The broad framework of my project was set during experience gained while working at the Düsseldorf Airport, involving the ‘non-aviation’ development of customer flow signage.

** Comparative Test of Public Symbols*

<http://www.tfaforms.com/139937>

This online survey was launched on 01/31/2010 to research the existing public symbols and pictogram standards. In the list of each topic or theme are four visual answers, the participants had to choose the most easily identifiable sign from.

***The aggregated view of the data with the reference period between 01/31/2010 and 09/08/2013 can be viewed here:*

http://www.airportsignage.de/Questionnaire_Results.html

This was the reason I became engaged with the subject more profoundly. The time and effort it took became the toughest challenge along with facilitating deeper investigations, creating new routines and finding a retreat in everyday life. This update enabled new viewpoints on the subject matter, suitable for my future progress. My weak insights pushed me to ensure that this would finally provide me with the skills of drawing lines to my presumed goals from any possible starting point. Reading Marc Augé helped me to describe the research interests and motivation underpinning the present study. In his intellectual framework for anthropology, Augé refers to the concept of super-modernity as:

...the movements of population and the multiplication of what we call 'non-places' in opposition to the sociological notion of place associated by miles and hold ethnological tradition with the idea of culture located in time and space. One of those installations for accelerated circulations of passengers are airport terminals. (Augé, 1995, p. 34).

Questioning these developments, we have to first ask ourselves: How do we communicate? and How has the development of international traffic influenced the ways we communicate? However, we have to proceed carefully, one step after the other, before the practical trials can be started.

1.3.3 Earlier Studies and Efforts: The Problem of Transnational Communication

Around the time of the change of the geocentric worldview, and at least at the beginning of the Age of Enlightenment, mankind figured out that the Earth is not a flat plane and people came to understand that there may be many more as yet unknown languages behind the contemporary horizon. Academics from Berlin to St. Petersburg or Paris had been faced with the same problem of transnational communication. Latin, as a scientific language widely known by everyone with a higher level of education, started to lack new expressions. French, as the language of education during the Age of Enlightenment did not meet all purposes and was also not commonly spoken by those with an ordinary level of education. The idea grew up in many countries and social classes to invent a new 'artificial' language "to overcome the curse of Babel" (Okrent, 2009, pp. 298-). Isaac Newton [Universal Language] tried to do so, as did G. Leibnitz [Arte Combinatoria], and Jan Komensky (Comenius) [Panglottie] as well as hundreds of others who were faced with the problem that our organic, spontaneous arisen languages were struggling

with the possibility of expressing important truths, important ideas and novel concepts. Johannes Kepler, for example, used musical notation to get better expressions about his discoveries on planetary motion. A certain scientific elite had always had the opportunity to engage with international contacts and in their circles languages like Latin or French had been very common, but industrialisation and developments such as the steamship, locomotive and telegraph made language barriers much more noticeable, also to regular people. As distances narrowed, the range of communication situations faced the problem that a language is not only for packing up thoughts, it is more the expression of a culture – the way we do things. The idea that picture-based languages may solve this problem, which began with the Egyptology craze of the Renaissance and focused on drawing vague religious, spiritual and magical meanings, grew in importance following the deciphering of hieroglyphics using the Rosetta stone (found in 1799). Symbols that would stand for ideas, instead of sounds converging to form words, are still understandable over the ages.

Knowing this, the following questions must arise:

- Is a pictographic principle representing concepts able to be understood internationally?
- Is it possible to combine pictographic symbols to make other concepts?
- Could the answers to the previous questions be important in relation to the use of signs and signals?

1.4 Research Methodology

As already described above, the original trigger for this study was a design task during an engagement in an advertising agency. The original description of the duties was aimed to solve a perceived marketing problem or communications problem of the shopkeepers and restaurant owners as a community of interests of airport tenants at Dusseldorf Airport. During my career as a designer, I had been assigned to similar tasks of design before. I had already prepared myself a sound professionalism in shop design, exhibition or event design and visitor guidance in public spaces. To detect the task in its depths, I studied similar problems and analyses (such as “Wegführung in Terminal 2 München Airport”; Nutzerstudie mit Blickanalyse, Prof. Dr. Harald Kolrep-Rometsch). I wanted to become more experienced with the phenomenon. To comprehend the system “airport” behind the excited crowd and in order to gain insight into the people’s belief, perspectives, and experiences I was using

qualitative research. So I spent some weeks visiting Düsseldorf Airport daily, tracked visitors and passengers by camera in a variety of situations, and tried to live with the phenomenon. For safety, as well as for cost reasons, it was not possible to use eye tracking (ET) or human movement tracking systems for observing and measuring activities of people in the airport. At the very beginning I was confronted with the situations that only little was known about the behaviour of the passengers/visitors in Düsseldorf, except quantitative statistics. The qualitative method helped me with generating hypotheses, and to identify the specific research question. For the first question about the understanding of general pictographic icons I was working the quantitative research tradition with an online questionnaire (“Comparative Test of Public Symbols”, <http://www.tfaforms.com/139937>). This quantitative method answered my questions in the way of ‘how many’ or ‘how much’, but did not help me to achieve the different viewpoints.

The qualitative research methodology in chapter 3.2 helped me to understand the different perspectives. The survey interviews were conducted by the doctors and the practice staff in 2009, the record of these concerns was conveyed to me. The visual saliency of signs (in chapter 3.3) was determined using the qualitative research methodology, the conspicuity method, which provided comparable statistical data. To hypothesize the research questions pursued in chapters 3.4 – 3.8 I have used qualitative research methodologies. The students were confronted with diverse methods including case scenarios, live recordings and role-plays. The results have shed a partial light on the complex process and patterns of behaviour or social phenomena. It was practicable to come to conclusions based on our observations and to generate explanations and understandings to come up with predictions. With the participant observation method, it was possible to give meaning to certain experiences by describing the human behaviour. To avoid falsified results by subjective perception, study groups were invited to take part in direct observation, for example, in chapter 3.4 as role-play in the park with predefined case studies. This, in turn, helped everyone involved to keep the bigger picture. This once again has brought input for developing the methods.

2.1 What is Said is Not Always Meant

All of us have surely been confronted with a similar situation: an idea or concept should be explained, but the audience understands something completely different to what was intended to be communicated or, in the worst case, nothing at all. That is the limit when spoken language fails. In order to overcome these limits, we have to learn to understand them. We must understand the necessary linguistic components of any human communication – the basic elements of human language. Precisely for this reason we need to focus on the specific platforms we find in every individual human body that are necessary for human communication: the cognitive, the physical, and the cerebral. These human abilities are the components that make communication possible. (Everett, 2012) Human communication can take many forms verbally and non-verbally according to the rules of human biology. Humans interact using language in verbal communication, signs, symbols, sound, and by paralinguistic means. To communicate and understand one another, humans developed the components of the complex formal system of language. However, humans, unlike animals, have cultural identities. The specific properties of language that enable communication should be the focus of our further investigation. Language has a lasting impact on our thinking and our behaviours. The applications of research findings or other knowledge from the field of semiotics/semiology must therefore be the important fundamentals and preconditions of our design considerations.

At the very beginning of all discussions about the functional requirements of language, there was the simple idea in the early part of the twentieth century from the Swiss linguist, Ferdinand de Saussure: the linguistic sign. Corresponding to Saussure's definition, each linguistic sign has a form and a function (he called them the signifier and the signified). (Everett, 2012) This simple idea was more targeted at the field of linguistics and originally not intended to explain visual signposting. But an example from road traffic helps to get an understanding of the theory. In the presented work the sign is to be considered as the significant surface of an image. Similar to Flusser's suggestion that invention of linear writing is a fundamental turning point of human civilization, we can consider the invention of technical images and the ability to perceive and interpret the message of signs as such turning point. A sign can also be seen in the perspective of a significant surface describing something 'beyond there.' The sign is therefore a visual presentation or appearance of a thing imaginable for us, by abstracting it, by



fig. 3 Traffic sign
 “STOP”- German traffic
 regulations (StVO) traffic
 sign no. 206

reducing its four dimensions of space-plus-time to the two dimensions of a plane, flat surface. (Flusser, 2000) This point of view will allow us to near the logical and scientific problem on a semiotic basis.

2.1.1 Starting from Scratch: the Semiologic Way of Looking at Things

Semiology (from the Greek Semeion, ‘sign’) can be traced back to the semi-otic triangle, reference to which can be found as early as in Aristotle’s “De interpretation”. Aristotle indicates three elements as being constitutive of signs: the things to which the sign refers [pragmata], the element that is in the voice [expressive], and the element that is in our thoughts (Wilson, Keil, p. 728). In our example (fig. 3) the road traffic sign is a red octagon with white lettering, mounted on a classic road sign pole two metres in height, at an intersection. The physical presence of the sign and its form can be perceived visually by every sighted person. But what does it mean? The sign is officially a commandment and a prohibition and should make it clear that everyone who drives a vehicle must stop and give way. The observer needs cultural knowledge to understand just what is meant (Everett, 2012). At the same time, in addition to the culture-specific communication and linguistic codes, we also have to take the collective understanding of these codes, and

their semiotic roots, into account. Humans communicate by transmitting and interpreting signs. The ultimate source of the signs is our own particular cultural history (Everett, 2012, p. 118). The processing of signs (semiosis) takes place within this cultural orientation. Saussure (1995) explains that language, reduced to its essential principle, is a nomenclature, that is to say, a list of terms corresponding to the same things. The world consists of objects, situations, events, etc. These are real

and determine everything that happens. When someone talks about these types of things, they use characters (usually audible, but sometimes visible or otherwise perceptible). These are words (or even numbers, names, symbols or similar). The symbol for an item is on the left of the semiotic triangle and means: word or ‘what is said’. Saussure refers to seven types of ambiguity in signs. He refined the idea by saying it might make things clearer if we referred to the concept as the signified (signifié) and the sound image as the signifier (signifiant). The signifier and signified coalesce into what we call a



fig. 4 If language is not
 correct, then what is said
 is not what is meant or
 understood.

sign. The linguistic sign unites a concept and an acoustic image. It is the psychological imprint of the sound, the representation that gives us the sensory material as opposed to the other end of the association, the concept which is generally more abstract. If this acoustic image does not clearly belong to the thing and/or the concept, the used word would not meet the intentioned concept, and so the communication will fail. Saussure describes his semiotic triangle with the corners: sign (meaning) = signifier (form) and signified (concept).

In the course of the 20th century, a divergent school of semiotics was developed by Charles Sanders Peirce along the lines of thought from philosophy and linguistics. He developed the notion of signs beyond de Saussure's original suggestions. For Peirce, the 'sign' assumes a triad of icon, index and symbol. Unfortunately, both approaches also use various terms and concepts to indicate the same object. The task of bringing light into this tangled undergrowth of problems concerning the theoretical foundations of semiotics versus semiology is an even greater scientific challenge and shall not be further discussed at this point. The controversy concerning whether signs belong to the sphere of analytical philosophy because of their production, or if signs belong to the sphere of hermeneutics because of their usage, is not an essential factor influencing this research. The fact, becoming apparent in our everyday work as designers, is that insights from semiotic theory can be applied to address visual communication problems (Salen & Skaggs, 1997, p. 8). Semiotics provides the theoretical tools for the analysis of signs and communication processes (Nöth, 1990, p. 476). We need, therefore, to clearly establish the distinction between the 'two traditions' of semiotics (de Saussure used the term semiology, and was followed in this tradition by Hjelmslev and Barthes; whereas Peirce used the term semiotics). Today, the term 'semiotics' is generally accepted as a synonym of semiology, which, as the more general term, includes the Saussurean term 'semiology' as one of its branches.

The differences between those semiotic branches are the different ways in which the sign processing is analysed. The linguist de Saussure was primarily concerned with words, so he was not interested in index signs, but the categorized iconic and arbitrary signs are very similar to the categories used by

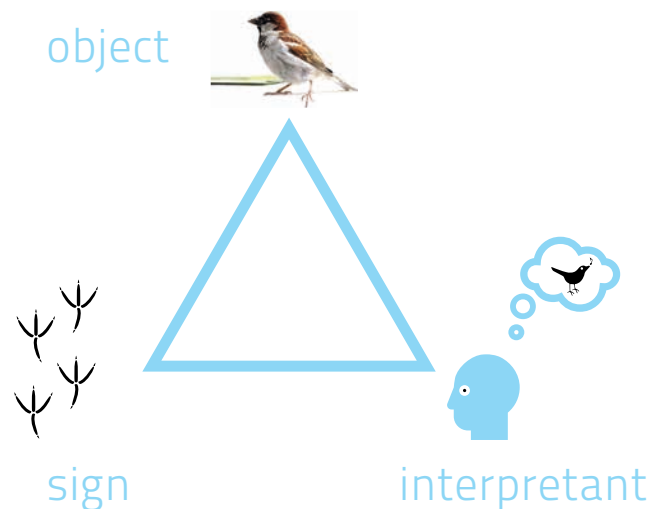


fig. 5 Peirce's triadic model

Peirce. While de Saussure emphasizes the social function of a sign, Charles Sanders Peirce made the logical function evident. These two aspects of the social and the logical function of signs are correlated, so we should also have a look at Peirce's triadic model (fig. 5).

Peirce identified three different logic elements needed to make a communication process evident: First, a sign: the signifying element which creates meaning. This sign stands for somebody or something in some respect or capacity. Second, the object: the signified, something real existing in our world. Third, an interpretant: the understanding we reach of the sign/object relation. Peirce refers the interaction between the sign, the object and the interpretant as 'semiosis'.

Peirce also defined three types of signs:

Iconic - or likeness – the physical resemblance of the sign to the object it stands for. A photograph of a person could be described as an iconic sign, it resembles physically that thing which it represents.

Indexical - or indicators – there is a direct link between the signifier (sign) and the signified (object), for example, smoke is an index of fire. Traffic signs are often index signs and have a direct link to physical reality (Crow, 2003). The relationship is concrete, actual and usually of a sequential, causal nature. In other words, it signifies the existential relationship to the phenomena it depicts, such as smoke, which is an index of fire.

Symbolic – the most abstract, and are just “vehicles” for the conception of objects. The signifier does not resemble the signified and relies on the reader having learnt the connection between the sign and its meaning. Symbolic signs can be words, numbers, gestures, flags, music etc., and the relationship between the signifier (sign) and the signified (object) functions through agreed (arbitrary) rules (Crow, 2003). A symbolic sign has no obvious connection to the idea it represents except by convention, agreement or rule in our culture that says it does. The relationship between signified and signifier is unmotivated or arbitrary and requires the presence of an interpretant to make the signifying connection. Words, colour and numbers are symbols. It is important to note that the use of symbols requires cultural interpretation.

Charles S. Peirce, in his theory of reasoning and cognition, also identified three 'levels' or 'properties' for signs. In his “Letter to Lady Welby” (Peirce, 1904), he identifies the “ideoscopy” of his phenomenology in which



fig. 6 Firstness: blue plate



fig. 7 Secondness: “Beware of the cliff”



fig. 8 Thirdness: A view of Lower Manhattan

he asserts that all modes of thinking depend on the use of signs: using the ‘categories’ or ‘modes of being’ which help to categorize all phenomena as objects of concepts of signs.

At first glance, the cognition of a sign is a mood or feeling. This sense of something Peirce described as “**firstness**.” The typical ideas of firstness are qualities of feeling, or mere appearances. (Peirce, 1904). The feeling of our “blue sign” (fig. 6) is harmlessness, that is, no danger.

The idea of “**secondness**” is the experience of effort, prescinded from the idea of a purpose. We can also call it the level of fact. It describes the physical relation. In this example, the sign describes the actual danger, which can obviously be seen (fig. 7).

The third level is the mental level. This level relates the sign to the object and brings the mood or feeling generated and the physical relation together. “**Thirdness**” is the mode of being of that which is such as it is, in bringing a second and third into relation to each other. It is the level of the general rules that we have learned and delivers knowledge-based insights. In our example (fig. 8), we see a US flag and row of skyscrapers, so we surmise it could be New York (that assumption is correct). The message we get from a sign can also communicate on more than one single level simultaneously.

The system of iconic, indexical and symbolic signs is restricted, so we have to develop more distinct categories of signs: similar, example, symbolic and arbitrary. It is a matter of fact that in nonverbal communication icons should help to clarify, direct and reduce our cognitive processing. Signs fulfil this task by condensing objects, actions and concepts into easily identified pictorial representations. (figs. 9-12)

Similar signs are relatively easy-to-understand instruction plates. The figure shows reality in a stylized way: the raised arm of a foreman on a construction site or a security guard shouts, “Access is prohibited here!” The translation is literal. In **example signs** the abstraction level is higher, because the viewer should have a basic understanding of the signified. In our example, a plane is the reference to an airport, because the simple logical conclusion is at an airport are multiple aircrafts. In other terms, this means that the viewer must have this knowledge gained in the past, and recognises the silhouette of an aircraft. And it assumes that the viewer will draw the right conclusions; the implicit assumption usually made is the sign indicates the way to the airport and not to a hangar or aircraft production factory (which, for example, would be possible in Bremen). A further increase of the capacity for abstraction can be observed in **symbolic signs**. As in the small anecd-

fig. 9 - 12 examples of sign systems



No entry for unauthorized persons
Piktogramm DIN 4844-2: D-P006



Airport
Unknown



Fragile
Unknown



Biohazard
Unknown United States, 1966

dote (Dreyfuss, 1970; p. 367) this sign of a broken goblet does not lead the dockers to handle the wooden crate especially careful in an Indian port; on the contrary, it was assumed the crate must be full of broken glass! The visual representation did not mean ‘fragile’ to them. It meant just what it looked like: a broken glass. Even more extreme is the level of abstraction in the **arbitrary signs**, which are not decipherable without explanation or acquired knowledge. The example of Biohazard is often misunderstood by students in lectures as being the sign for radioactivity. It will be generally recognized as a danger sign, because of the connection with the yellow/orange colour of warning signs, but this would draw the wrong conclusions for how to deal with the immediate danger. However, alternative suggestions, developed by human factor experts, graphic artists, and radiation protection experts (e.g. IAEA, Feb. 2007) are also not easily understood.

2.1.2. Trying to Build a Bridge Between the Competing Semiologic Systems

As described in the previous pages, the belief of Ferdinand de Saussure was that language functions as a symbolic system with a link between the sign as an entity that signifies another entity and the signified; the entity could also be a unit. A natural sign is an entity that bears a causal relation to the signified entity, for instance, the twittering of birds as the sign of birds in a nearby bush.

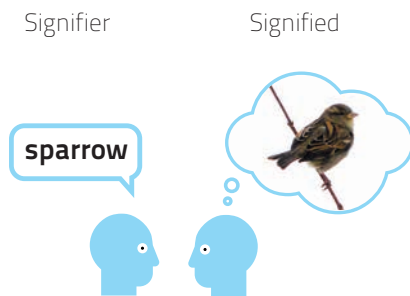


fig. 13
signifier-signified relation

Anything that represents something else is a sign. The word ‘sparrow’, as a signifier, points to the bird as signified. This basic model describes the dynamics of the causal connection to a single reference. Roland Barthes demonstrated that this signifier-signified relation can also serve more complex signs. In the case of sparrow as a simple

reference to the signified, the act of signification is called a “denotation”. However, if the signifier is a prior sign or a network of signs, the relation to the new signified is more complex and referred to as “connotation”.

There is disagreement about the scope of the general theory of signs focused on the social (de Saussure) or logical (Peirce) function (Guiraud, 1975). The term ‘semiosis’, for example, is used by Peirce in the sense of describing the act of transferring meaning or ‘signifying’ (Crow, 2003). Peirce is very reasonable in arguing that the meaning of a sign is affected by the background, education, culture and the experiences of the reader. This

will have a bearing on how the sign will be read. The circumstance will also explain the active process between the sign and the reader of the sign. In the mind of the reader, the “representamen”, representing an object, conjures up a mental concept, the “interpretant”, in the mind of the reader (Crow, 2003). The classical Saussurean schema: Sign = signifier + signified is missing an important connotative part (Barthes, 2010, pp. 257-) the second level of signification. In Barthes semiology system, the first-level signification is the denotation (meaning) of visual media, the second-level signification is the connotation (or association, as he called this myth). The Saussurean sign (signifier + signified, in the linguistic system) of the first level becomes the signifier in the second level. This triggers an infinite chain of associations. The first-level description (denotation) of a sign might be different to the second-level signification (connotation), which effects the observer’s personal abstract values, ideas, and concepts evoked by the image.

However, this means that there is, in the (theoretical) range of all possible significations, a stable metacharacter on the one side, whose denotative image is absolutely reliable, comprehensible and interpretant, whilst on the other side, in an extreme case, the image is connotatively ambiguous and not attributable at all (Salen & Skaggs, 1997).

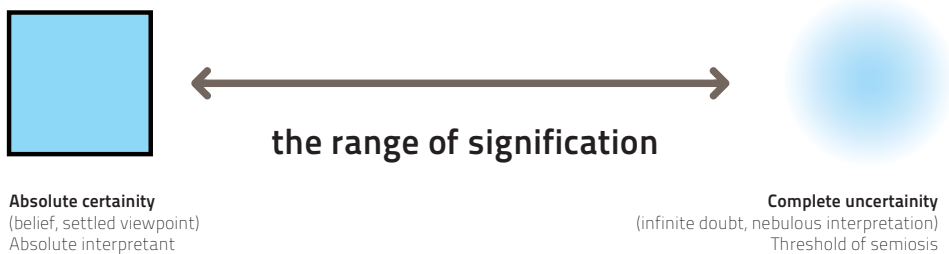


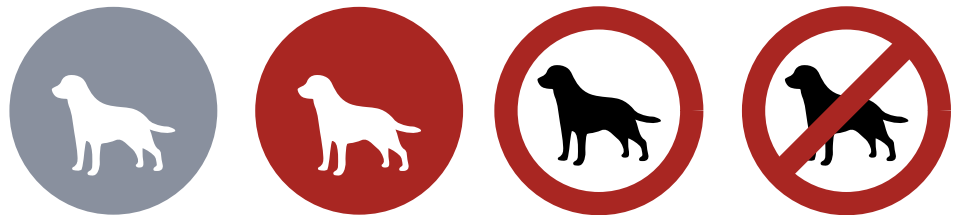
fig. 14
the range of signification

For Peirce, a sign is a mediator between the object it stands for and the result of its representation (interpretation). In Peirce’s outstanding contribution to the clarification of the nature of semiosis and systematizing the types of signs, we need to remember to understand his definition of the three different types of reasoning in sign systems. Firstly, deductive reasoning (later we will also talk about the similiar ‘top-down’ process) is a logical process in which conclusions are based in accordance with multiple premises that are generally assumed to be true. Logic is the process of reasoning from one or more statements developing signs. Secondly, inductive reasoning is the drawing of conclusions and can have part-to-whole relations, extrapolations, or predictions; that is, taking specific information to make a broader

generalization. Whereas deductive reasoning works from the more general to the more specific, inductive reasoning works from specific observations to broader generalizations of the sign. And thirdly, abductive reasoning is a process to understand connections in order to anticipate their trajectories and act effectively. It is an internal, personal process of sense-making, carried out by adopting a hypothesis as being suggested by the facts (Kolko, 2010). The process of semiosis, when an individual is interpreting signs referring to their objects, can move from abduction to deduction. In this process, each person individually creates a certain meaning from comparison and simple reconciliation to the usage of the scientific method of fixing belief.

Neither of the semiotic models was introduced for the purpose of developing visual design, but they may help to expand our understanding of visual displays. We can sometimes take for granted that every perception of a visual sign is the processing of a degree of certainty (belief) or uncertainty (doubt). This natural process governs the handling of all messages and is essential to each mental life. The process of belief and doubt is (according to Steven Skaggs and Gary Shank) a method to articulate a possible visual discourse between the strong positions of the theoretical foundations of semiotics, both in theory and in practice. The principles of the pragmatic difference between doubt and belief (formulated in Peirce (January 1878), 286-302) influence our perception, and thus influence our actions. We expect that this constant struggle between belief and doubt is a subsidiary aspect of every decision-making process. These two poles are mechanisms to support the development of one's own personality, thus instilling a personal worldview.

fig. 15
Sign examples for Junior Uni,
Wuppertal, 2013



When we discuss the difficulties in meeting the ‘tone of voice’ of information signs, the original intention: “no dogs are allowed on the upper floors”, (fig. 15) for example, only becomes visible after one has understood it. The signs on the far left, using grey and red, are neither an order nor a command and may give rise to doubts. The symbolic red circle, the symbolic part of the signs on the right, indicates an imperative to ban dogs, but the sign on the far right, which also employs the indexial bar, is a more severe prohibition and imparts greater confidence.

	Manifest	Manifold
Saussurian (Code)	Denotation	Connotation
Peircian (Inference)	Deduction	Synthetic (Induction, Abduction)

Every viewer enters into a simultaneous, immediate dialogue in respect to the viewed objects and assumes a particularly individual position in relation to them. This personal view of things is along a spectrum between absolute denotative clarity and complete connotative uncertainty. The position in this spectrum for images, icons or signs whose signifier bears a close resemblance to the thing they refer to, is more on the end of denotative clarity. The position of arbitrary images, whose basic meaning has to be learned first, is more at the position of connotative uncertainty.

From the viewpoint of semiosis, the significance threshold is easily shifted in this process to a manifold interpretation from the moment the observer is not able to understand the intended message.

The viewpoints of the competing semiotic traditions can remain out of consideration when we refer to the element of intention and effectiveness of the message. The aspects of interpretation from the viewpoint of perception of the coded systems, on the one side manifest, and on the other side, manifold interpretation, as impact of the received message is of more informational value. It is irrelevant for the signification process itself whether we use the view of the coded systems, as in Saussurean-based semiology, or the standpoint of logical inference, as in Peircean semiotics. On the basis of this viewpoint, a highly evident and, consequentially, manifest message content is, as referred to by Saussure, denotative, and from the standpoint of logical inference held by Peirce, it is deductive. The contrary position of an unclear interpretation allowing infinitely manifold possibilities of explanation is, from the Peircean semiotics, the synthetic inference (inductive and, in the event that the interpretation is still pending, abductive) and, from the Saussurean position, the connotative level (Salen & Skaggs, 1997).

This proposed synthesis provides visibility into a key factor of design as a form of communication and demands from the designers a creative and clear message according to their otherwise ambiguous, and therefore doubted, messages. Any representation generates a kind of discourse by the viewer and entitles the desire to achieve understanding by the resolution of doubt. The intention of a designer is not only to transfer a message clearly from a

sender to a receiver (how communication-models try to explain it), but is also, consciously or subconsciously, the search for a suitable position on the axis between an absolute shared understanding and total incomprehension. The framework of this investigation provides apt opportunity for purposeful excitation of doubt in visual communication. Other implications that may arise as results from these considerations would be beyond the scope of the present study and will not be pursued further in this paper. However, some of the points will be important to our philosophical model, so we need to get closer to the interpretation possibilities of signage. The similarities between de Saussure's signifier and Peirce's sign, and de Saussure's signified and Peirce's interpretant could help to understand the system behind it.

*fig. 17 detail of fig. 7
"Beware of the cliff"
fig. 18 the same image but
mirror-inverted lettering.*



Upon closer investigation of our signpost in fig. 7 "Beware of the cliff", it becomes clear that this warning label is extremely denotative (assuming a satisfactory knowledge of English) as a result, no one dares to move beyond the edge. The language code implies the 'energy' of these words of caution and this leads to the action. In our second picture we encounter the sign "ffilc eht fo eraweb" in the same context. A major effort is necessary along the lines of abductive logic in order to derive findings for guiding one's behaviour. During this process, the idea itself might suggest that the efforts are useless and the sign is a hoax. The viewer's attention span is typically very short, but the sign itself affects the interpretation. If the depicted image is unspecific or connotative, it needs several spontaneous cross-references and mental leaps (abductions) to come to a satisfying result. The interpretation of a denotative image is much easier and the learning process rapid, accelerated by the simultaneous use of the basic principles of visual perception, first elaborated by the gestalt psychologists.

The interpretation of an image may vary depending on the receiver and his or her culture. Semantic and cultural ambiguities exist in pictogram inter-

Latin, at the same time, coaching the scholar with repetitions based on this pictorial alphabet. Comenius worked with this modernizing 'method' in the 17th Century, through which knowledge was passed on by dividing a topic into easily manageable and functionally clear structured items: compared, surveyed, calculated or derived. He saw advantages in fields such as physics or astronomy. Comenius wanted to create an education running like clockwork and relatable to any phase of life, overtaking this scheme and developing into his method.

The proper education of sciences, arts, languages, conventions and godliness needs a golden rule: everyone should experience with all our senses to discover everything, wherever possible. (Comenius, 1960). At the beginning of acquiring knowledge, we have to start with the sole senses, because the intellect is empty. "Why shouldn't we start education with the closer examination of real things instead of describing them with words." (Comenius, 1960, p. 135). Impressions followed with interest will leave good remembrance, but the strongest memories you will get immediately from associating visual relationships with the objects. (Comenius, 1959).

The interwar period in the early 20th century was similarly marked by the traumatic war experiences following the First World War (1914 - 1918). After the collapse of the monarchy and the proclamation of the Republic of Austria, the Social Democratic Party gained the absolute majority in larger cities like Vienna. In this climate of liberty, equality and fraternity, the urgency of finding new ways of explaining important social, economic, political and scientific issues to everyone, regardless of education or social status was evident, especially for those who could not read or write. Otto Neurath (1882 - 1945) developed for those purposes a visual education system (the 'Vienna Method of Pictorial Statistics'). His solution was to devise a pictorial system of symbols, a visual language to help Vienna's municipal government to publicize its facts in figures. The Museum of Society and Economy (Gesellschafts- und Wirtschaftsmuseum abbreviated as GWM), founded in January 1925 and closed in February 1934, served as Neurath's base for formulating pictorial statistics and putting his visual education system into practice. Neurath and his team started to develop visual aids, such as wallcharts and posters, which combined images and statistics to communicate the issues clearly. They were sure that the consequences of even the most complex issues could be communicated in pictures more effectively than with words.

Numerous publications and exhibitions justified the importance of the constantly expanding museum. The GWM was set up as a teaching museum to raise awareness of developments in health care, housing, education and citizenship through exhibitions in Vienna and toured throughout Austria. Gerd Arntz, a German artist who specialized in wood engravings joined Neurath's team in 1929. He had already illustrated social inequality, strikes and economic instability before. He coined a uniform visual style, not least because of the linoleum cut technique and the possibility of serial duplication. The result was a universal picture language, Isotype "International System of Typographic Picture Education," one of the 20th century's most successful information design projects.

The international spread of the pictorial system of symbols began in the mid-1930s, for example, Rudolf Modley, a student of Neurath, blazed the trail in the U.S.. He founded the Pictograph Corporation in 1934 after working for the Chicago Museum of Science and Industry. Neurath himself was asked by Soviet officials to train Russian statisticians in his method of visualizing statistics. For two months each year between 1931 and 1934 he worked as a consultant to the Isostat Institute in Moscow.

After the rise of fascism in Austria, in February of 1934, the socialist working class movement was defeated by fascist paramilitary forces. Many of the leftist combatants were arrested, killed in action or even executed. Otto Neurath had been denounced to the police as a Communist, a left-wing intellectual, so he fled into exile moving from Moscow to The Hague in the Netherlands. That same year, he founded the International Foundation for Visual Education in The Hague, and the Mundaneum Institute. Only a nucleus staff of three others followed Neurath to Holland. With several book publications ranging from scientific monographs to picture pedagogical illustrations as well as numerous lectures, congresses and the successful Rondon Rembrandt exhibition, which showed objects of art in the context of their social background, Neurath established his work in the Netherlands and internationally.

When Nazi troops invaded the Netherlands in May, 1940, Otto Neurath was alarmed and escaped again to Great Britain. His contacts in Britain, established over many years before his arrival in England, helped to shorten the time in the refugee camp. He founded the Isotype Institute in Oxford and collaborated with the British Ministry of Information contributing animated diagrams. Until his death in 1945, Neurath pushed for the uniform visual style and influenced several countries, including

fig. 21 “The five groups of men” from *Gesellschaft und Wirtschaft* p. 99 Otto Neurath, 1931

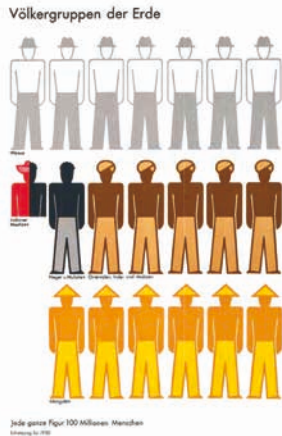
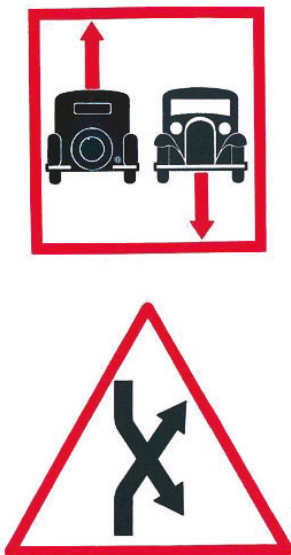


fig. 22 Neurath’s proposals for traffic signs 1936



Great Britain, The Netherlands, the US, and the USSR, along with all of our traffic signs. He gave a general outlook on the opportunities yielded by visualization.

Neurath originally intended Isotype to be used by the educators of young children, but it instead wound up heavily influencing modern public signage and information graphics. Visually, it owes a lot to the clean-lines of the realism aesthetic of the 1920s. “Words divide, pictures unite” (Neurath, 1936, p. 18) and “Who wants to mediate a quick and lasting impression, better use images” (in Hartmann, 2002) are two quotes from Neurath in which he expressed that pictograms as a figurative sign have the ability to share ideas with different cultures more effectively than written language. With the pictogram systems, Neurath escaped the inherent limits of language through mathematics to represent logic and choice. The “debabelisation” (Neurath, 1936, p. 13) is possible by using basic figures cut in linoleum and printing them in rows. Each sign stands for a certain amount in reality, for example, 10,000 or 100,000. It makes the viewer aware of the numerical ratio because the different quantities of numbers are easily countable.

The success and international recognition of the Isotype method for visual picture communication developed by Otto Neurath and Gerd Arntz suggests that this practice includes key elements that invoke a manifest signification of the element regarded in a denotative (Saussure) or a deductive (Peirce) way (as described on page 31). With a more detailed examination of the Isotype method, guiding principles or rules can be derived to help develop clear understandable information through pictorial characters with generally understandable significance, and therefore more stable and beyond all possible doubt to the observers.

An important element is certainly **Serialization**: A single sign is representative of a certain quantity; different or larger quantities are related through the serialization of a multiple of the first unit, not by showing a bigger size (this helps to avoid the “lie-factor” of Edward Tufte (Tufte, 2001)). Another factor leading to clearly understandable signs is **Pictorial quality**, which means the clarity of the signs themselves, no words as far as possible and a limited number of signs for international use. A third factor is **Clarity**, which implies that unmistakable statements should be made with a sign to provide a basis for other statements. Another is the **Consistency factor**, which has a similar structure to hot lead typesetting types, where each sign or group of signs are organized in lines and columns,

similar to the lead type and letterpress typesetting. Similar to characters in typographic fonts, each sign has an international fixed shape; a perspective view is not allowed. And, finally, the use of **Colour** is severely restricted, unless different divisions in a common group have to be emphasized to make clear that this special sign has a different meaning.

Undoubtedly, the most important prerequisite for achieving the ambitious goal developing clear understandable information was the pedagogical approach, whereby beside the visual designer an entire team was responsible for the development of the icons. This special team consisted of a 'teacher' with a visual leaning and the ability to research and interpret information correctly in visual terms, an 'artist' with an affinity for clearness and simplicity, and a 'technical assistant' with a technical skill for the exact repetition of symbols (Neurath, 1955).

The original approach of Isotype is a way of conveying quantitative information with social consequences. In it, the visual material must be understandable to the literate, and easily explained to the illiterate. This fundamental convention made worldwide dissemination easy for the Isotype method, and Neurath himself advised the International Road Congress, for example, when the international regulation of traffic signs was being discussed. French motoring clubs had agreed on four standard hazard-warning symbols: uneven road, sharp curve, railway level crossing, and crossroads. There was no standard shape for the plate at this time, it was often a disc. The First International Road Congress, held in Paris in 1908, agreed to use these four signs internationally.

The Nordic countries had agreed to use a red-bordered triangle as a general danger warning, at least partly inspired by the fact that the triangular-shaped letter A stood for Attention, and proposed its use internationally. At the 1931 European Conference on Road Transport, held in Geneva, the shapes: triangular, round, rectangular (for warnings, instructions and information, respectively) were successfully agreed upon for international use. It was additionally agreed that the colour red should predominate when it comes to prohibitions, the icons being suggestions of the Mundaneum Institute, Belgium (Neurath, 1936, p. 37).

Substantially all of our currently used systems of signs in public space can be derived from Neurath's ISOTYPE. Therefore he can be referred to as the forefather of our present symbols, because his proposed design principles still have their validity.

2.3 The Way to a Global Society

The reason why it was so important to develop an internationally comprehensible communication system certainly lies in the growing possibility to bridge large distances easier and faster. This was made possible by commercial aviation. As worldwide air traffic continues to increase, surpassing six billion passengers in 2013 (ACI 2013 World Airport Traffic Report), the world continues to become figuratively smaller. Worldwide airport passenger numbers are increasing, coupled with a rising per-capita income. The larger number of airports combined with a smaller number of services have led to the creation of large hubs to handle the great majority of air traffic, especially at the international level.

Giant airports have become key nodes in international trade and global traffic. The internet has accelerated the competition for the lowest air fares, meaning flying has moved to mass markets. Travellers become global citizens and the aerodrome in the sprawling suburbs, a hub. The pattern of the twentieth century with the city in the centre and the airport on the periphery has been turned inside out as the previously peripheral aerodrome has become a booming hub of air-based commerce. The aerotropolis with its ubiquitous air travel, round-the-clock (24/7) workdays, overnight shipping and global business networks starts to be the frontier of the next phase of globalization. Successful cities have always been founded because of trade, and the global economy is now defined by the possibilities of enormous airport hubs (FedEx, UPS). Air traffic announcements have changed to multimodal communications via voice portals, IVR, SMS, web, mobile web, USSD or Instant Messaging. Often in this patchwork of information the traveller is unable to cope. Stress and strain is quite a normal experience in giant airports. The problem of language barriers related to the lack of knowledge of the language of the host country may well accelerate these issues in the future. The evolution of the aerotropolis is in the early stages, because hundreds of millions of Chinese and Indian passengers have just begun to fly.

2.4 The Need for a Global Language

The idea of creating a climate of reconciliation, of respecting differences and of promoting the peaceful coexistence of different races calls countries worldwide to participate in sporting games in the tradition of ancient Greece. These games should be a challenge to achieve excellence, to share

graphic communication to transcend cultural and language barriers in a shrinking world. Human factors created problems in engineering when it came to designing languages, for example, “for machines to be used by persons of diverse nationalities” (Chapanis, 1965, p. 20).

There was a call for the need of “constructing a universal language” (Chapanis, 1965, p. 20), and a need for “new ideas, new methods, and new solutions to the language problems that arise when persons of one nationality have to learn to use, and to operate, a complex machine produced in some other country” (Chapanis, 1965, p. 20). This growing awareness of global cultures facilitated the quest for new media of communication (Breshnahan, 2011) requiring “new techniques of perception and judgement, new ways of reading the languages of our environment with its multiplicity of cultures and disciplines.” (McLuhan, 1995 [1953], p. 311) The use of ideograms for transcending national barriers to make communication between people who do not share a mother tongue possible was not new. Several people started working on invented languages seeking a “better, simpler system of pictural symbols that represent concepts, and a method for combining them to make other concepts.” (Okrent, 2009, p. 28). The idea was to combine characters in poetic ways to make compound characters. Hieroglyphics and Chinese writing were assumed to stand for such pictographic principles and academics became besotted with the idea of having discovered a potential universal language: “a logical writing for an illogical world” (Okrent, 2009, p. 162). Instead of the different attempts like Karl Janson’s ‘Picto’ (1957), John Williams’s ‘Pikto’ (1959) and Andreas Eckardt’s ‘Safo’, which were not used for anything, only the ‘Blissymbolics’ of Charles K. Bliss (1897–1985), intended as an international auxiliary language, was found a use for in a communication training programme for children with cerebral palsy, first used by the Ontario Crippled Children’s Center (now called Bloorview Kids Rehab) in Canada in the 1970s (Okrent, 2009, p. 153 ff.).

2.4.2 Development of a World Language

Others such as Rudolf Modley (1906–76), a former assistant of Neurath, promoted “worldwide communication by adopting two languages and a system of signs that will be universally understood” (Mead & Modley, 1968, p. 56). The graphic symbols he had in mind were more focused on the Neurath ideals, that is, high in concept and the principles of good design: effective in all sizes, unique in characteristics, distinguishable from other symbols,

interesting and well-functioning, as well as working in outline or in silhouette. With his company, Pictographic Corporation, like the North American branch of the Isotype movement, Modley was able to launch an international graphic symbols movement. The glyphs, as the signs for worldwide communications were called, should communicate visually, not requiring language knowledge at all. In his published "Glyphs newsletter" he presented international pictographic trends and compared the different image-related, concept-related and arbitrary symbols in their concept, design and testing method (Mead & Modley, 1968 pp. 58-59). Modley sought a lingua franca, a "world language without words" with a repertoire of graphic symbols to help us to overcome communication problems (Modley, 1974). Like Neurath before him, Modley pointed out that a single word can mean different things; a symbol instead shows "uniqueness and clarity of meaning, independence from language and cultural differences, and visual directness" (Modley, 1974, p. 60).

This idea was pushed forward by the President of the International Council of Graphic Design Association (Icograda), Willy de Majo, and his close collaborator Peter Kneebone in 1964. They promoted an international symbols project to communicate "across frontiers - with and without words" (Kneebone, 1964, p. 44) being of the opinion that a standardised and tested pictogram set for general traveller information should be developed "as an occasion for exploring the graphic designer's role in international communications" (Kneebone, 1964, p. 45). Students from 650 international art schools were invited to design a coherent set of 24 public graphic symbols to comprise a "Symbol language for directional signs in-doors and out" for transport and tourism (Bakker, 2013, p. 39) which was to include symbols for 'entrance', 'exit' and 'telephone' (Roukhadzé, 1992, p. 11). From the 100 entries from 15 countries that were received, only 76 met the required date for entry and these were assessed in April 1966. "Of these, only three were unanimously considered by the assessors to have reached a sufficiently high standard to qualify for an award." (Kneebone, 1964, p. 46). The entries showed a high degree of abstraction ensuring a clear visual coherence, but arguments had arisen about figurative versus abstract communication regarding the learning and intelligibility impetus. The general consensus was that only very few entries had analysed the problem and attempted to exploit it imaginatively, indicating a lack of understanding of the design problem and reflecting unfavourably on teaching methods.

Student project- sign system

"None of the entries could at this stage in any way represent ,an ICOGRADA solution, the assessors hoped that at least the winning entry would be studied further and developed to the stage of experimental application."

(Kneebone, 1964 p. 46)

The design assessors were Abram Games (Britain), Masaru Katsumie (Japan), Josef Müller-Brockmann (Switzerland), Ivan Picelj (Yugoslavia) and Paul Rand (USA).

Pictures from the article: Kneebone, Peter: "Communicating across frontiers - with and without words" in DESIGN, Council of Industrial Design N^o 214, p.p. 44-47, London 1966 Ed.: Council of Industrial Design (COID), 28 Haymarket, London SW1 (GB).

fig. 24 Designed by Rolf Erikson and Jan Olov Sundstrom, Konstfackskolan Stockholm (certificate of merit)

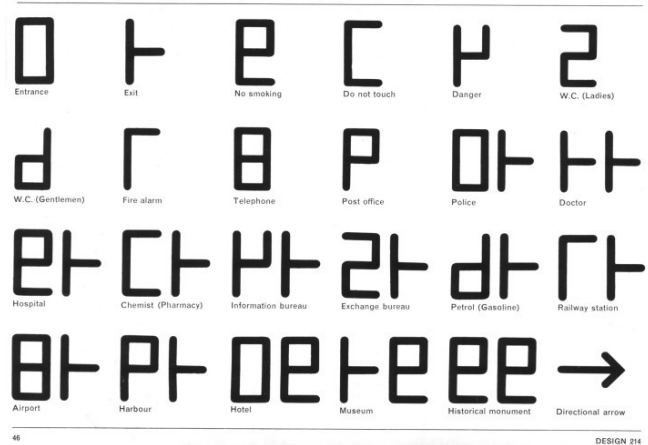


fig. 25 Designed by Jan Olov Sundstrom and Sunniva Keliquist, Konstfackskolan Stockholm (special certificate of merit)

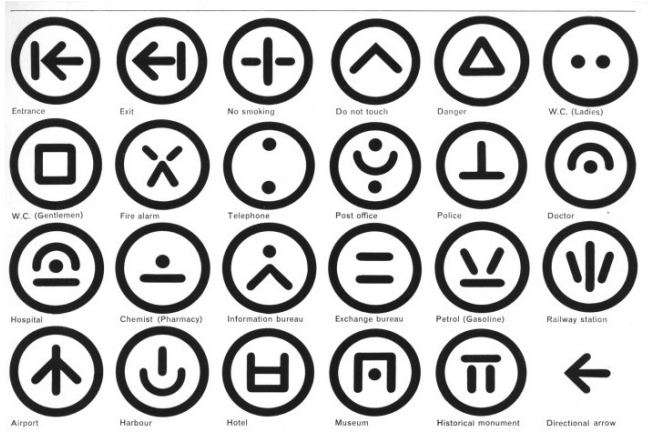
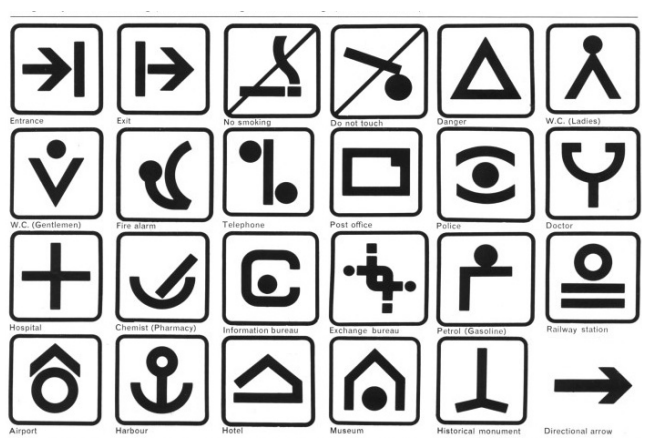


fig. 26 Designed by Jacobus Le Grange, Manchester College of Art and Design (certificate of merit)



2.4.3 Pictograms Became Political

As an unforeseen consequence of this international ‘Student Project No. 1’, dozens of organisations started working on similar pictogram design projects; however, according to the Icofrada aims, these were not very coordinated and were often missing the scientific base that guaranteed success, both in terms of design development and in their final application. Pictograms became political tools. An American organisation called The International Committee for Breaking the Language Barrier (ICBLB) sent a questionnaire to organisations around the globe with 38 listed expressions that travellers should be able to recognize. Each expression was illustrated by one or more symbols, the symbol deemed most suitable could be circled or one could submit one’s own proposal. The written goals of the ICBLB, such as “cooperation between organizations” and “symbol consistency”, were overridden by the activities of other relevant parties, for example by the Union Internationale des Chemins de Fer (UIC), the international organisation for railway companies in the Western world, which went about designing their own pictogram set for general traveller information (Bakker, 2013, p. 40).

It is shocking how carelessly symbol development was handled at the time. It was a “convincing demonstration of how drastically most of the ‘public’ symbols fail to conform to the objectives we have established” (Modley, 1974, p. 62). Modley pointed to the inflationary problem of the symbol explosion. There was a significant gap between the Tokyo pictograms and following ‘public’ symbols. The high proportion of error in recognition can be attributed to the symbols failing to correspond with the imaginations. The Tokyo pictograms are clear, dynamic, remarkable for their neutrality and simplicity, minimalist caricatures of reality and therefore many times better.

2.4.4 Failures of the Inflationary Symbol Explosion

Modley (1974) identified the most common failures of symbols intended for the public as:

- **Conceptual failure:** the symbol does not express the object or idea.
- **Poor draftsmanship:** the symbol is poorly designed.
- **Conflicting meanings:** several different symbols to convey one meaning or one symbol conveying different meanings.
- **Poor use of color:** selection of color with disregard of color blindness, disregard of widely accepted color meanings.
- **Failure to fully exploit available background shapes:** inconsistent use of background, failure to assign constant meaning to background.
- **Excessive symbol use:** use of symbols even when symbols cannot explain the intended meaning. (pp. 61-62),

Thus, a rethinking process had to be initiated. Symbols were no longer regarded as a universal language. Even Modley had to admit “it makes no sense to try to develop new universal picture languages – complete languages which are based entirely on graphic symbols. Historically, pictographs (pictograms) have always evolved into alphabetic or phonetic scripts.” (Modley, 1974, p. 62). Two decades on, Frutiger (1997, p. 342) noted, “The constantly revived notion of a return to a pictographic script for general purposes with the idea of overcoming the language boundaries... seems to us to be completely unrealistic, in view of all the existing differences.” (Frutiger, 1997) And any effort to add more than about 50 sharply limited graphic symbols for public communication doomed to fail. It was only a small number of concept-related or image-related pictographic symbols whose symbols are self-explanatory. Many pictographic symbols represent something they do not show, and are understood only because of the environment in which they occur. (Modley, 1974, p. 63).

2.4.5 The Way Towards a Cross-Cultural and International Pictorial Language

There was an obvious need to focus the development of knowledge of symbols more on scientific research.

Icograda only had a vague idea of how this should be carried out. On the one hand, they criticized existing symbol developments, but on the other hand, could not offer a viable alternative approach; this weakened their negotiating position with other organisations (Bakker, 2013, p. 42). Designers usually relied on their craftsmanship skills and their professional training when developing signs. In the 1960s and 1970s, the opinion was cultivated that useful information from the fields of ergonomics and behavioural science might be the essence of design rules, guidelines and checklists and that this knowledge should be made available to designers (Zwaga, 1999, p. 12). Martin Krampen assumed during his design works for Expo '67, the world exhibition in Montreal, that communication only took place if 'sender' and 'receiver' shared a "common stock of signs" (Bakker, 2013, p. 42). He used the event to test a scientific method "to produce elements of a self-renewing pictorial language which has maximum cross-cultural and international impact" (Krampen, 1965 quoted in Bakker, 2013, p. 42). Krampen adopted the theory of language components (Chomsky, 1957 and 2002) and the study of the importance of nouns explored with the method of "hierarchical cluster analysis" (Miller, 1967) to extract a semantic field of nouns. It is possible to identify the factors or clusters in terms of concepts in a semantic way. This method easily identified five major clusters named, quite intuitively, "living objects", "nonliving objects", "quantitative concepts", "personal concepts" and "social concepts" (Miller, 1967, p. 62) This result can, in turn, be divided in a list (or dendrogram) with objects and non-objects. The visual representation of objects are similar, for example, symbolic icons. The image of "non-objects" is always arbitrary and, therefore, it is more difficult to perceive the meaning of the sign. This method of cluster analysis seems to work rather well, providing a solid theoretical basis for preferred pictorial representations over others.

Before Krampen became an assistant professor in design and communication at the University of Waterloo, Canada, he had studied Visual Communication at the Hochschule für Gestaltung (HfG) in Ulm, Germany. Ulm at this time was a hotspot for international design developments. The ideals of its founders, Inge Scholl, Max Bill and Otl Aicher, was to overcome the nationalist past with an international design school where young design

students would have the chance to release themselves from old constraints and thus to develop something unthinkable and new together with their international lecturers. Aicher himself was head of the Entwicklungsgruppe 5 (Development group 5) at HfG Ulm, where, for example, the corporate design for German airline Lufthansa was developed (Kneidl, 2011). In 1967 Aicher was tasked with designing the visual identity for the Olympic Games to be held in Munich in 1972. He surely studied the pictograms from the Tokyo Games and found out that the degree of stylization and concentration would enhance the legibility of the pictograms as well as that figures in movement will translate with one characteristic detail the particular category of sport in question.

Aicher established the following rules for the creation of graphic symbols that represents ideas or concepts (pictograms):

- The pictogram should have the characteristic of a signpost not of an illustration;
- The pictogram should be independent of a particular culture and be understood by people from different cultural backgrounds around the globe;
- The pictogram must not offend against taboos;
- The pictogram should be independent of an educational standard and be understood by people of the most varied educational levels;
- The pictogram should be readable and make information accessible without difficulties;
- The pictograms should be developed according to uniform rules of design comparable to grammar in a language.

(Roukhadzé, 1992 p. 12-13)

Aicher's pictograms have since become a reference point for the development of infographic design in general, not only for the development of Olympic designs. His set of rules has probably fostered the rational development of pictograms in a standard form. He formed the language of public information. While the reduction in consistency of Neurath's international pictures heightened their alphabetic quality, the sign system designed for the Munich Olympics was the semiotic climax of international pictures: a geometric body alphabet deployed on a constant grid. "In contrast to Neurath, who claimed that his symbols were never meant to replace verbal language, Aicher expressed the intent to develop a language based on pictorial symbols." (Rathgeb, 2006)

Countless governmental and non-governmental organisations were quick to recognize the value of Krampen's and Aicher's methods. Before then, the

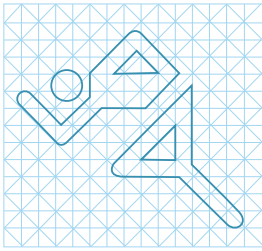


fig. 27 Otl Aicher's geometrical schema for Munich Olympics (1972) Full human body design template, side view

graphic designer's role was primarily seen as that of problem solvers, able to meet the challenges of 'visual communication' with scientific insights. Both Krampen and Aicher changed the misconception that the designers' role is a purely visual or purely 'aesthetic' one. The Icoграда managed to establish an International Committee for Travel Signs and Symbols (ICTSS). In a second Icoграда-Ulm project, tests were carried out in which 63 verbal expressions were tested with 3,000 international air travellers, and additionally with university students and military men in Germany. Other independent organisations, apart from the HfG in Ulm, discovered the impact of symbols and signs for communication and paved the way for the integration of symbols within the existing channels of communication. Signs were developed to carry a certain message, for example at international airports. The German Airports Association (ADV) changed the previously purely text-based signs and issued a study on the international requirements needed. The outcome, which was the manual of the sign system "Guidance at commercial airports", 1969, by Herbert W. Kapitzki, was more or less completely accepted and adapted by the IATA (International Air Transport Association).

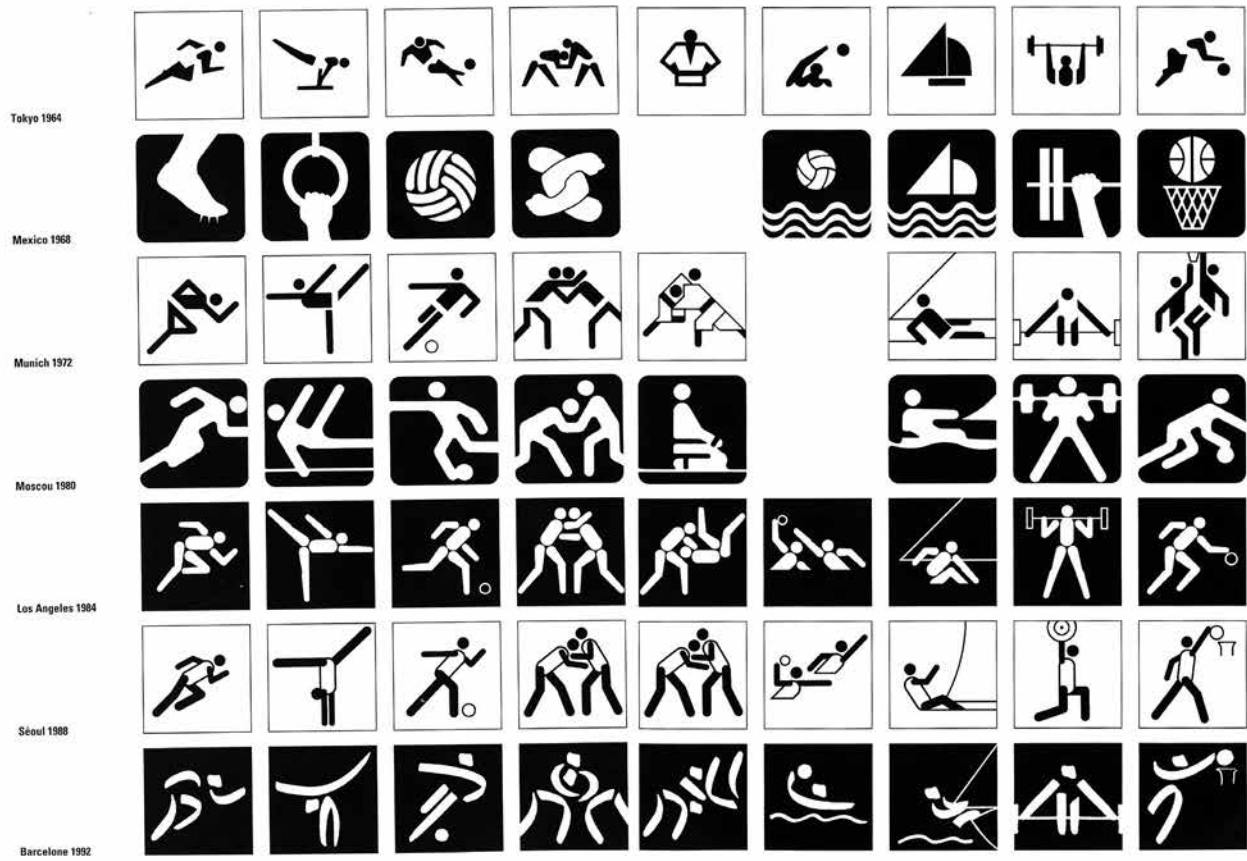
Kapitzki followed the fundamental guidelines to ensure in its opinion the optimal solution for a graphic presentation:

- Bold lines and shapes for emphasis.
- Minimum line weights to insure legibility at reduced sizes and under adverse viewing conditions.
- Self-contained symmetrical or non-directional shapes.
- Most effective use of black and white, relying on colour only as a supplement.
- Simplified to its most representative elements free from extraneous detail.
- Clearly and accurately reproduced by standard techniques.

A late insight from the former ideologists Modley and Mead was that languages themselves must be reformed to strive for simplified communication. They both reached the conclusion that pictograms could not replace, but only supplement, verbal languages. (Bresnahan, 2011)



fig. 28 Title from: ADV - Arbeitsgemeinschaft Deutscher Verkehrsflughäfen: "Piktogramme zur Orientierung auf Flughäfen", Stuttgart 1974



*fig. 29 Comparison of
Olympic Icons from
1964 - 1992*

2.5 The Development of Internationally Recognised Symbols

After the evolution of development tools for visual pictographic communication (by Krampen, Aicher, Dreyfuss and others), the problem of the unrestrained explosion in the number of worldwide symbols remained unsolved. As already mentioned, several independent international organisations, like Icoagrada's International Commission for developing standard symbols, Henry Dreyfuss, Glyphs Inc. and the International Committee for Breaking the Language Barrier, tried to standardise their favourite design. It was impossible to establish the international integration of a unified picture language, because symbols were used in practically every department of human knowledge from Agriculture to Zoology. Other international groups concentrated independently on their own visual problems relating to their own specific discipline, like the automotive industry or chemistry.

The power of icons is to inform, to explain or to instruct in a non-verbal way. A picture or map gives a more detailed and correct interpretation than the elaborated story of a skilled narrator about spatial information. A map or even a hand-drawn sketch has a much greater power to elicit an accurate mental representation. Pictorial graphic symbols (icons) that represent an idea or concept look like a valuable form of communication. Symbols can enhance text comprehension and facilitate the top-down processing of a message. Pictorial representations are also perceived better than text even in degraded conditions, and will be perceived more rapidly than words. However, the citizens of the world are multi-ethnic; highly mobile; have different cultural, social and educational backgrounds; speak with all possible accents; and possess different reading and word comprehension skills. Every single one of them looks and dresses differently, and has different points of view and beliefs. While people with a low level of literacy, for example, may have difficulties in understanding safety notices and warnings in text form, they may have a higher level of comprehension when it comes to symbolic information. All these factors complicate the effectiveness of communication with graphic symbols (icons) (Zwaga, 1983).

Technical organisations, with quasi-governmental status, were involved in developing industrial standards for signs. Specific methodologies for designing and evaluating symbols have been established by the same institutions. Foreign symbols do not usually fulfil national standards in terms of comprehension testing and design criteria. A national standard for a comprehensive set of symbols in one country is mostly not accepted in another. The wish to

promote a worldwide understanding through visual communication again seems to fail.

2.5.1 Visual Communication as an Ambassador

Since the Tokyo Olympics in 1964, each time the Games have been held, the various sports disciplines have been represented on the official programme through individual iconic graphic symbols that are intended to reflect the culture of the hosting nation. Pictograms were also used as an instrument for politics and economic interests. The 1980 Olympic Games in Moscow, for instance, presented their own set of invented pictograms instead of purchasing the rights to use Otl Aicher's pictograms from the Munich or Montreal Olympic Games. One of the reasons for developing new sets of symbols is the protection of the new pictograms of an Olympic host under the copyright laws of that country (Dewar, 2004). The contractor usually enjoys exclusive usage rights to the graphic symbols. This has even led to the situation that within the same country different institutions developed different symbols on information signs for one and the same item. Users get confused. "Even in the highly literate Netherlands more than half of all rail travellers did not understand most of the 'standard' pictographic symbols dealing with baggage (lockers, check-in, etc.), and a full one-third failed to correctly identify 29 different pictographic symbols in a survey." (Modley, 1972, p. 63) (Details to the survey: Zwaga, 1983).

Internationally, the problem was even more extreme. One might assume that the development of signs is an orderly process, regulated by the governments and handed down to their administrative staff. This may be true in some circumstances (as was the case for example with the €-sign by Arthur Eisenmenger, graphic artist in the Office for Official Publications of the former European Economic Community), but, in general, such projects while official are usually handled by means of professional open tendering processes. As a result of the design competition for the 1968 Mexico Olympic Games, the winner, the New York based designer Lance Wyman, made a meaningful visual impact and managed to set up a brilliant system understandable by foreigners and the illiterate by avoiding characters as far as possible.

As each individual design solution is a visual ambassador for the respective host country of the Olympic Games, it is far from the spirit of a united world nation. The simplicity of the Tokyo pictograms makes them so special.

They are known for their clear, dynamic, minimalist caricatures of reality and their remarkable neutrality. This simplicity adds to their utility; it is possible to reproduce them in any media, at nearly any size.

Comparing the different pictograms, it quickly becomes evident that the graphical reduction of the basic forms and shapes will lead to better results in communication by relying on the perceiver's intuitive knowledge. The absence of details serves to strengthen their message. The pictograms represent objects, people, and motion in an effective way as well as the relationships between all three. The monochromatic (black on white) pictograms used to relate the intended ideas, employed simple shapes (circles, rounded rectangles, lines), silhouettes, and negative space. All Olympic pictograms before Tokyo look more like illustrations and less like signs. Those signs relied on synecdoche, and used vivid and condensed images: for example, rowing is represented by crossed oars, swimming by a set of waves, and so on. The pictograms in Mexico aimed to serve a more global communication purpose. The corresponding sports are not symbolized by athletes but by the equipment used for the respective sport. The designers Manuel Villazón and Matthias Goeritz used the method of 'pars pro toto' to point with just a part of the equipment used in the event to the whole sport. For the viewer, it required a greater mental effort to understand the desired information. Until 1972, that is when the characters became more elaborate when the German graphic designer Otl Aicher designed the pictograms for the 1972 Munich Olympic Games. Aicher followed the examples of Tokyo and waived an individual and distinctive visual language. The forced stereotyping and systematization aimed to reduce the motifs to an almost idealized degree of abstraction, without cultural specificity (Abdullah, 2005). The pictograms were a visual trademark, developed with the intention to replace the word as the predominant carrier of information in a supra-nationalist manner.

2.5.2 Signs for Visual Communication and Guidance

In the more and more globalized world, English had continued to be the most important foreign language. Standard phrases for safety precautions and instruction manuals were written in the English language. The role and meaning of language in an internationalized world was questioned, because the values of pictorial communication had also been observed in a large number of other public sectors. Indeed, it was established that signs are almost more easily understood than plain words. Insurance companies started to



*fig. 30 Exit plate by
Yukio Ota DIS6309*



fig. 31 Soviet Exit signage
Знак “Выходить здесь!”
 (“Leaving here!”)



fig. 32 German (west)
emergency exit signpost
photoluminescent DIN
4844

develop protocols for property preservation and had demanded that criteria for emergency-exit signage must be developed.

In the late 1970s, the Japan Association for Fire Science and Engineering (JAFSE) launched a contest to design a new national emergency exit sign. The competition received 3,300 entries and after a period of rigorous testing to determine whether each symbol could be readily understood also in a smoky environment (Jin, 1972), the design, submitted by the designer Yukio Ota, with a figure on a green ground, running out a door was settled upon. Although the design was selected, the Exit sign was re-worked in over 58 variations for fine-tuning in consultation with the Japanese fire safety commission and the government. Lengthy discussions were held about the angle of the legs because the figure ‘looks like it is sprinting out the door’. The clear intention was to suggest that people should ‘run slowly’ (Yukio Ota quoted by Turner in Slate, 2010). The ‘running man’ was submitted to the International Organization for Standardization (ISO) for consideration as an international exit symbol. It became the standard emergency sign in parts of the Asia-Pacific region, in variations also in Europe, Canada and New York City. However, the sign encountered large resistance in the republics of the former Soviet Union and other eastern bloc states. A main argument against the sign was this: the door is missing. A different proposal was developed with a man running out of a door. The running man is used mainly in Europe, but with changing doors and directions.

In other areas, the power of visual communication and guidance with signs was recognized. Above all, a project group was formed with a focus on pictograms under the auspices of the German Airports Association (ADV - Arbeitsgemeinschaft Deutscher Verkehrsflughäfen). Under the leadership of Martin Krampen and Herbert W. Kapitzki they submitted a recommendation for the use of pictograms in information systems in airports. These systems were extended for use in municipal transport, public transportation and long-distance services at a later date. In the field of science and engineering, the value of such symbols was already very much appreciated as a convenient method of communicating complex information quickly, accurately and consistently. Henry Dreyfuss, the collector of the first encyclopaedia of international graphic symbols, stressed that

Entire new systems of symbols are being devised to communicate a variety of messages to virtually every man, woman and child in the world. These include identification for the operation of cameras, forklift trucks, sewing machines, computers, farm machinery, dictating machines and automobiles; warnings

against the hazards of radiation, poisoning, electrical shock and biohazard contamination; and information and direction at airports, railroad stations, recreation facilities, international expositions and sporting events and along highways. (Dreyfuss, 1970, p. 364).

Every kind of object or every action can be expressed through a graphic illustration for visual communication. This has also been noticed in many other areas of daily living. Companies operating internationally recognized the opportunities which pictograms offer to inform, warn or to give orientation. A symbol possesses certain inherent characteristics: the simple, quick comprehended form or colour (or combined) is perceived by the brain far faster than a written word. Those milliseconds of saved reaction time in the event of an emergency or panic can save a finger, or even a life (Dreyfuss, 1972). Driver response times are a key factor for traffic engineers when developing new road designs or dashboard icons. Those values from traffic engineering designs can be used for all other dangers in life. The typical perception-reaction time is 0.70s from signal perception to an appropriate reaction under optimum conditions of visibility and driver alertness (Triggs, 1982). To achieve this perfect rate of reaction with icons, the relevant pictogram must be clear, prominent and readily understandable.

2.5.3 Effective Sign Perception

The effectiveness of an icon could be explained as a 'human created figure for the purpose of rapid and unambiguous verbal- and/or non-verbal communication to indicate something or to point out something' (Abdullah, 2005). The different tasks of a pictogram can be simplified in that – and in view of the fact that a pictogram is created artificially by people – the content of the sign must be defined between the transmitter (the designer) and the receiver (i.e. the person looking for information). To achieve a general understanding of a pictogram, it must be largely self-explanatory. The syntactic questions about the identity, delineation, distinctness, compositionality and well-formedness of the icon requires, therefore, an idealized representation of the figure to achieve the needed associative power of the symbol.

This also means that the sign must be in an idealized manner of representation and associative form so as to be quickly and clearly recognised and understood. This should work without the need for additional written explanations, language-specific characters or culture-specific peculiarities: it should be comprised of generally associable and culture-independent sym-



fig. 33 Stylised representation of a lit cigarette



fig. 34 Julius Bogar at the smokers terrace

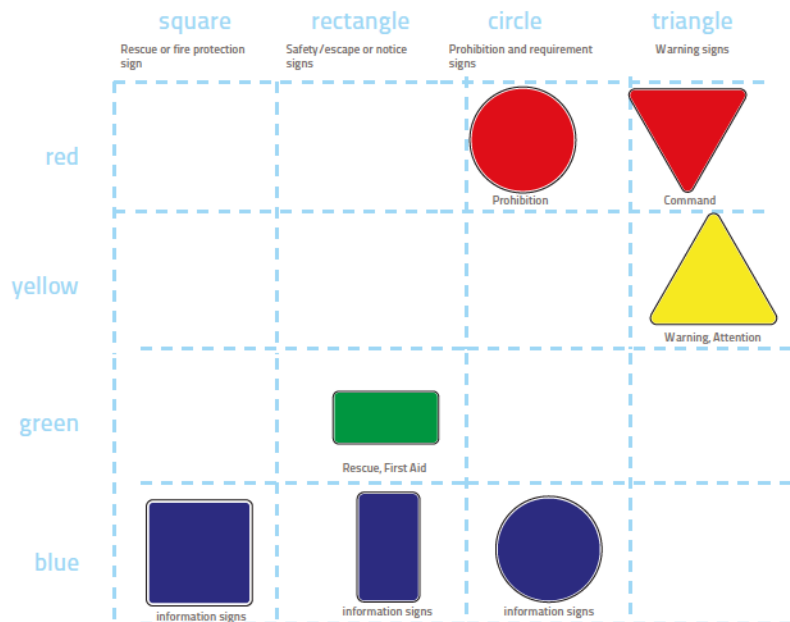
bols. The pictogram is not able to explain complex issues, but it can be useful in specific circumstances, providing relatively simple pieces of information, providing guidance or expressing prohibitions and/or controlled or banned behaviour. In more complex situations that require an explanation, this cannot be displayed in a single icon. In such a scenario the sign has to be extended to include several pictograms belonging to the same system of icons, that is, with the same type of display, line-width, colour etc. The sign always interacts with its environment. The intended meaning of the icon (fig. 33) is not “lit cigarette”, as one would assume by denotative meaning, but, in the context of being used as a sticker on the door, means that smoking is allowed on the terrace. (fig. 34)

The pictogram consisting of an icon (characters), a symbol (arrow) and the appropriate environment, yields the information: “here is the meeting point” (fig. 35). The type of characters is secondary. In the different versions of the “meeting point” sign of the IMO (International Maritime Organization) – still in use on ships – the icons are strongly reminiscent of the work of Otto Neurath and Gerd Arntz. The connotative meaning in this case is not ‘group’ but ‘meeting point’.

In the extension of the sign we have to examine the distinct elements, such as icon, shape, colour and environment. For example, a red square plate with the icon of a fire extinguisher is mounted on a door to explain that in the case of fire, a fire extinguisher is behind this door.



fig. 35 Meeting Point, International Maritime Organization (IMO)



The pictogram consists of the elements: icon, symbol, shape, colour and environment. The icon of the “running person” stands for escape, the icon arrow and the direction to the left, toward the door, points to the escape door. The shape of the character (rectangle) is for reference and the colour green indicates the case of a rescue situation. The environment here is a public building, and here on the left is the escape door.

The shapes and colours are borrowed from the conventions regarding road traffic. These were internationally determined over the course of three major conferences. As early as 1903, four main types of traffic signs had been determined: speed limit (white disc), prohibitory signs (red disc), warning signs (triangle) and others (squares). At the first International Convention Relative to Motor Traffic held in Paris in 1926, five signs for hazards were recommended and these were ratified three years later by Britain (Froshaug, 2000). At the 1931 Convention Concerning the Unification of Road Signals in Geneva, additional signs were introduced and divided into three categories: danger signs, signs giving definite instructions and signs giving indications only. At the most important of these three conferences, the 1949 UN World Conference on Road and Motor Transport, held in Geneva, a protocol on road signs and signals was proposed and was adopted by thirty countries (mostly in Europe and Asia). These signs influenced all later work on motorway signage. The characters were defined, according to their importance and significance, in both form and colour:

Forms in combination with colours

		C	M	Y	K
	RAL 1023 Verkehrsgelb · Traffic yellow	0	10	90	0
	RAL 2009 Verkehrsorange · Traffic orange	5	70	100	0
	RAL 3020 Verkehrsrot · Traffic red	0	100	100	10
	RAL 5017 Verkehrsblau · Traffic blue	100	20	5	40
	RAL 6024 Verkehrsgrün · Traffic green	90	10	80	10
	RAL 9016 Verkehrsweiß · Traffic white	3	0	0	0
	RAL 9017 Verkehrsschwarz · Traffic black	100	90	100	95

fig. 36 Conventions in shape and colour concerning the Unification of Road Signals.

according to Froshaug, 2000

- Signs giving detailed instructions: mandatory ('do') (circles, blue, red) action to be taken by the driver
- Signs giving definite instructions: prohibitory signs ('do not') (circle, red) traffic prohibition, classes of vehicle, measurable limits/restrictions (e.g. dimensions, weight, speed)
- Warning signs (hazards) (triangle, red framed)
- Informatory signs (squares, white, blue)

Until 1970, the United States used a signage system consisting mainly of words. The Department of Transportation (DOT), working with the American Institute of Graphic Artists (AIGA), developed a standard symbol system that has become the basis for many different signage programmes throughout the world. A further task was the creation of a family of images. Some of the developed symbols are easily identified and can be memorized more readily than others. The pictograms that are easier to commit to memory have more positive connotations - emotional suggestions related to the image. The unmemorable pictograms are, for the most part, concept related, arbitrary or abstract. The image in those cases often has no relationship to the referent. The graphical symbol is a pure abstraction with no connection to the message.

2.5.4 Symbols for International Purposes.

The beginning of the jet age in the 1960s triggered a drastic rise in international travel and corresponding rapid development in global containerized intermodal freight transport. Simultaneously, symbols started to become prevalent in international communication. Travellers, freight forwarders, dock workers or foreign subcontract workers were faced with similar problems, that is, feeling illiterate when it comes to written indications in a foreign language they do not know and whose alphabet they may not even be able to decipher.

For the passenger, a graphic symbol can lead to the nearest restroom, can help with finding the correct baggage claim area or with locating an elevator. In an international task force, symbols can convey the message to those who do not speak the language. International aviation organisations, such as the Western European Airport Corporation (WEAC), the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA), adopted the German proposal from ADV (based on the work of Martin Krampen and Herbert W. Kapitzki) and started to develop their own pictogram systems by establishing working groups. Other organisa-

tions, like the International Union of Official Travel Organizations (IUOTO), got an idea of the benefits to be derived from effective and standardised symbols worldwide, so at the World Conference on Transport and Tourism in April 1966 they launched a joint-venture with the International Council of Graphic Design Associations (Icograda) in the 'travel signs and symbols' session.

At this time, a proposal was presented for the scientific research needed to develop pictograms (Bakker, 2013). A first US national standard for a comprehensive set of safety symbols took many more years to result in internationally standardised pictograms (hazard symbols). The large amounts of money involved in exporting highly evolved machinery and electronics made the development of creating symbols for the operation of machinery necessary. The use of symbols rather than text in the manuals meant less space was required for descriptions and legends and that instructions must not necessarily be translated into other languages for the international market. Henry Dreyfuss (1904-1972), one of America's foremost industrial designers, became interested in symbols for the operation of machinery. Not only in the context of international airports but also with regard to the dashboards of cars or machines, the intent is to provide information accurately and quickly without using words. Dreyfuss initially approached Icograda in 1968 asking for their help in developing a symbol dictionary, but ultimately completed this catalogue alone by publishing the now-famous *Symbol Sourcebook* in 1972 (Bakker, 2013).

With this collection, it became apparent that there is no uniformity in the design and implementation of symbols. The idea of a common set of 'international' traffic sign symbols is a fallacy. In Europe alone there exists a number of widely used agreed-upon signs, but each country also has a few unique symbols, and the European system is not accepted worldwide. Every airport, train station or other public node was designed by different architects and interior designers. The planning of signage is often seen as a necessary evil that must be carried out after the completion of the main design work. This task was often left to subcontracted sign makers. A prime example of the commercialization of icons is the symbols Otl Aicher developed for the Munich Olympics. On behalf of the luminaire manufacturer ERCO (Lüdenscheid, Germany) further signs were developed after 1976 and this process is still continuing. With the aid of surveys and research carried out at world exhibitions of internationally common characters, the original system from Aicher will be expanded to meet the actual demands of a guidance system developed and established by ERCO worldwide.

2.5.5 Standardized Symbols

As early as 1964 the United Nations (UN) in New York issued a resolution demanding ‘cooperation in expanding the use of symbols’ in connection with their upcoming ‘International Cooperation Year 1965’ (UN:GA: Committee for the International Co-operation Year, 1964) (Bakker, 2013). It sounded logical to involve the UN in this process as they had managed successfully to set worldwide standards for the most successful standardised symbol system yet: the international road signs. Outside the UN was another international non-profit federation capable of setting international standards: the International Standardization Organization. The ISO was founded in 1946 when 26 delegates met to establish an organisation to eliminate technical barriers to trade through the “coordination and unification” of industrial standards. The purpose of the ISO is to develop standards that represent the “the specifications and criteria to be applied consistently in the choice and classification of materials, the manufacture of products, and the provision of services” (ISO 14000).

These standards are intended to facilitate trade, exchange, the development of technology and to eliminate (mostly technical) barriers. The ISO typically develops product standards; therefore, the ISO had initially to assess the possibility of limited proposals of symbols and reject them if necessary. It was in 1971 that the ISO established Technical Committee (TC) 145 for Graphical Symbols (ISO/TC 145, 1972-1974). Dreyfuss represented the American National Standards Institute (ANSI) at this first meeting of the International Organization of Standards Technical Committee (ISO/TC) in Berlin in 1971 at which international standards for 145 signs and symbols were set. A Subcommittee (SC 1) for ‘public information symbols’ started in 1975 and introduced the international standard for public information symbols ISO 7001 in 1980.

This set of pictograms and symbols for public information is a copyrighted standard that has to be purchased from ISO. It actually contains 79 public information symbols, icons developed using the same procedure as defined by the psychologists Ronald Easterby and Harm Zwaga in 1989 published as a standard: ISO 9186 “Graphical symbols · Test methods”. To include new scientific insights, this standard has been updated several times since. It contains, for example, a checklist for the designer to demarcate the meaning of the sign, so that the intended message is clear, unambiguous and generally well defined from the start of the design process. This standard is also copyrighted and has to be bought from ISO.

The close cooperation of designers from Icoграда with the ISO-initiative in standardizing graphic symbols was a driving force in designing test symbols. During the Icoграда student project 'Graphic Symbols for Public Information: Design of Test Symbols' (1977, Lausanne (CH)) over 1,200 symbols were produced, many of them finding their way into ISO 7001:1980 meeting the standards for effective public information (Bakker, 2013).

In the mid-70s the American Institute of Graphic Arts (AIGA) began examining numerous international, national and local symbol sets (pictorial devices, pictographs and pictograms) used in facilitating passenger and pedestrian orientation in transportation-related facilities or at large international events. Some of those organisations that had developed the symbols had given themselves the power to establish these sets as international standards, even in the face of massive criticism against the pure graphic quality of the drawings or of the concepts. Other sets of icons achieved graphic excellence, but were in use only for temporary events such as the Olympic Games or World Fairs. The conscious effort of the designers who gave their symbols a unique graphic character, unfortunately, cannot be used for anything else as a result of the licensing requirements. With the explicit goal of developing their own original system of symbols for the needs of transportation-related facilities, the American Institute of Graphic Arts in cooperation with the U.S. Department of Transportation started with an inventory of international symbol systems (Geismar, 1981).

Within a certain message area (see also "cluster analysis", Krampen) the symbols based on the same fundamental concept were grouped. Each AIGA committee member could rate the symbol privately using a scale from 1 (weak) to 5 (strong) in the categories semantic, syntactic and pragmatic as dimensions. During the evaluation of the symbol systems, the vocabularies of legibility, readability, and clarity were indicated to reflect only realistic concerns, but were deemed too inaccurate to evaluate the symbols. The three distinct dimensions of communication seemed to be a more objective basis for the board to evaluate the strengths and weaknesses of symbols in relation to the basics of communication. The semantic dimension refers to the meaning of the visual image. Here, the questions arising from the sign concern the representation of the message in meaning and form. Is there a failure in denotation or the possibility for misunderstandings by people from various cultures or of various ages? Is the sign too difficult to comprehend or the information density too high to be widely accepted? The syntactic dimension refers to the relationship to one visual image in combination to

others, or in the consistency of other signs of the same symbol system. There, the designers' focus was to examine the construction of the sign in the use of figure/ground, solid/outline, overlapping, transparency, orientation, scale, format, size, texture, colour and recognition. Is there a hierarchy of elements recognized first and suitable for a systematic development of interrelated signage concepts? The pragmatic dimension refers to the practical point vis-à-vis the end user. Is the sign visible at normal distances? Is recognition affected by certain viewing angles, poor lighting or other practical considerations such as scaling or possible vandalism?

2.5.6 Problems with Unification

It is an obvious point to make that the ratings were subjective from an American point of view, but were, however, based on the professional and personal experiences of skilled designers with the goal of finding satisfactory symbols among the existing systems. The attempt was to establish a unified set of symbols using a single graphic vocabulary. The messages of the conventional symbols were based on a general education to receive international acceptance. More complex processes needs more intricacy in the design of the symbol. On the one hand, the AIGA committee would not have gone so far as the Technical Committee ISO/TC 145 with respect to the visual design criteria for the development of public information symbols (ISO 7239), for example, regarding the definitions of minimum dimension and minimum line thickness for significant details (1 mm of significant detail and 0.5 mm of line thickness for every meter of viewing distance (D)). On the other hand, the AIGA used an optically consistent line weight to create unity and eliminated unimportant features to create consistent bold and direct symbols functioning in busy confusing environments. The AIGA symbols were all drawn to function as dark figures on a lit background and the reverse, white on a dark surface. The complete set of 50 passenger/pedestrian sym-

fig. 37
woman + hat + crescent =
nurse (?)



bols developed by AIGA are available to use, free of charge for everyone. The signs are available on the internet in common Encapsulated PostScript (EPS) format, a PostScript image file format that is compatible with PostScript printers and vinyl cutting devices. This policy of ‘easy to use’ icons was adopted in the development of public safety symbols by the American National Standard Institute (ANSI) and the Society for Environmental Graphic Design (SEGD). Following an evaluation process of existing international safety colours and safety signs, the SEGD came up with an individual safety symbol system which leans towards the graphic symbol matrix established by the ISO’s Development and Principles for Application of Public Information Symbols (Olgyay, 1995).

Many other symbols follow in the footsteps of the popular symbol matrix like the well-known modern handicap-accessible wheelchair symbol (Roger Whitehouse, Peter Reedijk) or the outstanding achievement in tourism signage for the US National Park Service (Donald T. Meeker, Meeker and Associates). One of the ultimately most needed developments, from a global, non-verbal standpoint, is the redesign of the US Manual of Uniform Traffic Control Devices (MUTCD). The U.S. Department of Transportation (DOT) is still complaining of too many word-based messages, for example ‘exit closed’, which are precarious for non-English speaking foreign travelers (according to Mies Hora in “Navigating Today’s Signs”: An Interview with Mies Hora by Steven Heller, AIGA December 06, 2005).

2.5.7 Means and Tools to Address the Solution to the Problem

Adapting a functional and tested grid for developing signage is only half the battle if the sign itself is still misunderstood. The primary problem is that each image carries its own cultural baggage with it, mostly relating to the conventional ideal and image from the designer. The symbol, as a connotative image, refers to a referent - but what may be an obvious association to



fig. 38 Six individual symbols interact to form a single icon to represent Medical Services. Rovaniemi, (FIN) (Iconelements from Nelli Immonen, Iines Partanen, Ravi Poovaiah, Markus Schröppel)

a member of one culture can be totally opaque to someone from another. For example, different countries have different symbols for similar objects, similarly icons can become redundant and the end user will fail to recognize what it is supposed to look like.

Arbitrarily assigned, non-representational symbols like images/glyphs have to be learned in connection to a referent. Iconic images are easier to understand, because they require no special or additional leaning. However, what if the icons are used to represent actions that do not have an iconic representation in other cultures or generations? This is again the constant struggle between belief and doubt as a subsidiary aspect of every decision-making process.

Most pictograms are a combination of symbols and/or icons (and/or glyphs) to explain and to show the concept of an important or complex matter in combination with a colour code to construct a meaning. Out of the AIGA/DOT icons, 70% (i.e. 35 of the 50) use more than one symbol. This combination of multiple symbols to construct meaning is the norm (Zender & Mejia 2013). In practice, however, this repeatedly presents problems, because even minor points of confusion can destabilise the entire symbol system.

A woman in a white hat with a red cross on it represents 'nurse' in the context of 'health services'. The same woman with a white hat featuring a red crescent on it may cause confusion and overshadow the information with doubt, because we are not used to seeing the crescent employed as a symbol for healthcare providers. (figs. 37 & 38)

The designer's intention was to develop a sign for 'health services' in a hospital signage system. The man carrying a stethoscope represents a doctor, the woman in a white hat with a cross on it represents a nurse, while the desk represents an office or workstation. The combination of these individual symbols were designed to express: 'nurses and doctors (medical personnel) are at this desk to give information (but not to treat patients)' and shall define the referent, 'health services'. The intended meaning in this case is easy to grasp if the perceiver of the sign is able to decode the different elements and is aware of standard practice in hospitals. Symbol usage in health care settings becomes more complicated for people with limited or perhaps no language proficiency at all. The results of the project Aid for Speech-disabled, in which display panels for aphasia or stroke patients were developed at the Fachhochschule Augsburg (University of Applied Sciences, Augsburg, in the lessons of Prof. Dieter Urban, 1988), show the difficulties

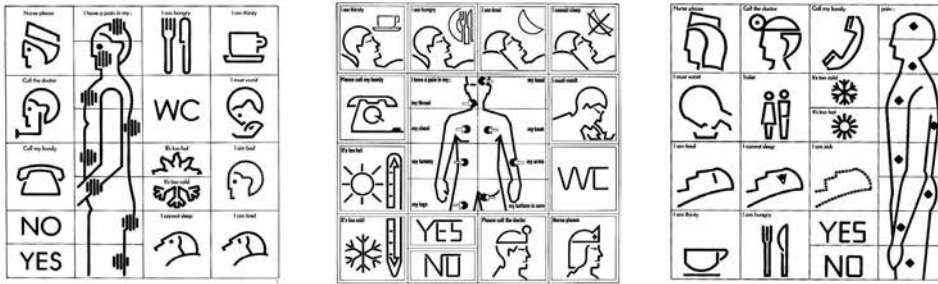


fig. 39 Picture board for aphasia or stroke patients.

left: Bernhard Weiland,
mid: Thomas Vormstein
right: Cordula Schaaf
all at FH Augsburg 1988

designers are faced with when developing a serious signage system can be understood spontaneously and instinctively by everyone, regardless of background, socioeconomic circumstances, gender or age.

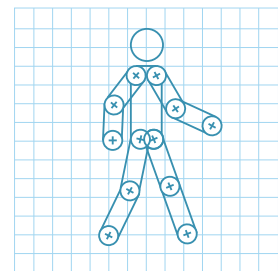
In order to meet these requirements, the guidelines for the design and development of verbal and visual messages can be seen as a set of design principles: from lexivisual communication with text and pictures, audio-visual, as well as multi-visual messages.

The designer, as sender, should (according to Pettersson, 2006, p.46):

1. Adapt the verbal and visual message to human attention and to human perception in order to facilitate interpretation, understanding and learning.
2. Edit the verbal and visual message for better comprehensibility and easier understanding. An important point when editing for the selected target group is including the depth of the subject matter, structuring the message as a method of achieving clarity, simplicity, consistency, and unity of the symbols.
3. Secure the quality of the verbal and visual message.
4. Respect copyright, ethical rules, and media-specific ethical guidelines.
5. Use the appropriate tools for information design.

Each activity in the design process, including analysis and synopsis, production of draft, production of script, and production of original and master, includes a design sub-process, documentation, and review (Pettersson, 2013). A functioning communication system that bridges the language barriers is indispensable where rapid recognition and understanding of the different situations is vital. Therefore, designers should first of all consider the local situation before they set about using the appropriate graphics programs to develop visual characters on their computer screens. A further sub-process involves the transfer of variables and situations of reality into a model in order to adjust the dimensions accordingly. These methods are also suitable for the subsequent implementation of an orientation system in existing areas. The use of a design grid does not decide whether a symbol is internationally

fig. 40 ISO/DIS 22727
Graphical symbols
Creation and design of public information symbols
Full human body design template, profile view



perceptible or makes the orientation easier or more difficult, nevertheless, the consistent planning of a sign system developed together within the prevailing architecture can point the way.

2.6 The Problem-Focused Theoretical Background

In the previous chapters we have remarked not only upon the development of and the need for transnational communication, but have also established that the ideal of pictograms as an international language is difficult to achieve. Communication is a human activity that everybody can easily recognize, but only few can define satisfactorily (Fiske, 1988). Signs and codes are involved in communication. Signs are artefacts referring to something other than themselves. Moreover, signs signify constructs organised in systems (codes) to determine how they might be related to each other. In practice, communication forms the base of all social relationships by means of the transmitting or receiving of signs/codes. We can assume that communication is essential to all beings and central to any culture. As a consequence, we have to assume that the investigation of communication therefore also needs to involve the study of the culture in which it is integrated (Fiske, 1988). In the study of communication, two main schools of thought were represented and it seems that the contributions of the two main schools of thought (school of semiotics by Charles Sanders Peirce and the school of semiology by Ferdinand de Saussure) are not comparable to one another at all. (Lotman, 2003)

We previously touched on the models employed by the doctrine of semiotics and the doctrine of semiology in the first chapter because at the centre of semiology is the sign. The different views of signs indicate the two most influential models from a philosophic and logic point of view (C.S. Peirce) and a linguistic point of view (F. de Saussure). Peirce, in the 'semiotic' view, focuses on the sign itself, the variety of codes to meet the needs of a culture and the culture in which these codes and signs operate are central (Fiske, 1988). Here, the sign is physical, perceivable by our senses and refers to something other (the interpretant), which is created in the mind of the person perceiving the sign but is referring to its object.

A set of signs, such as the set of the shapes of road signs, in de Saussure's definition form a paradigm. The combination of the chosen shape (from the set) and a chosen symbol he calls a 'syntagm'. In language, for example, the vocabulary is the paradigm, a formed sentence a syntagm. For de Saussure, and other following structural linguists, the key for understanding signs was

to understand their structural relationship with other signs, both paradigmatic: in the question of the choice, as in which shape is used for the sign; and syntagmatic, for instance, which elements are combined within the sign and how the sign is in combination with other signs or in conjunction with pictorial elements.

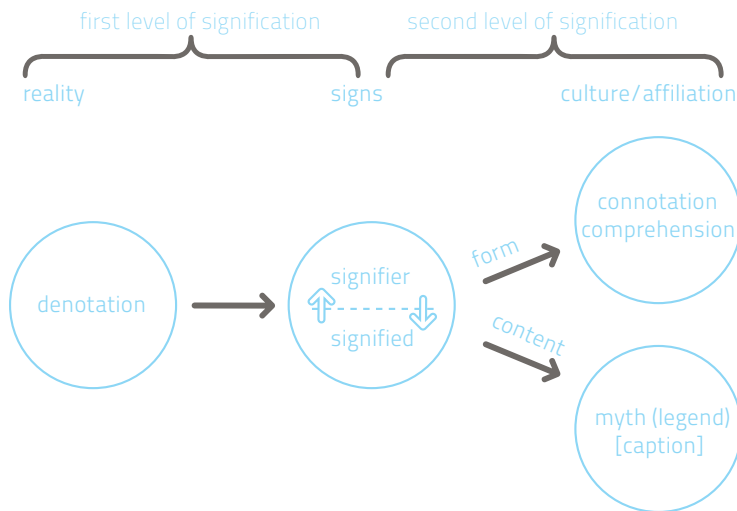


fig. 41 Barthes's two orders of signification

With the aid of a semantic differential, for example, we can identify what features of an iconic message are significant in order to identify the “smallest signifying unit” (Fiske, 1987, p. 70) in a code. Codes rely on convention and use, on explicit agreement or on clues within the content. It is based upon an implicit agreement amongst users; however, if the same message is read by members of different cultures who are used to different codes conveying different meanings, this may result in an aberrant decoding. The classical sender-message-addressee/ receiver diagram of communication neglects the ideological patterns, behaviours or value systems effecting communication in people’s minds. (Eco, 1995, p. 123)

Due to international conventionalization, codes are adopted and/or shared by the majority of different cultures. These common codes help us to understand foreign social behaviours and we are able to participate in visual communication because we understand the denotation or the relationship between the signifier and the signified. In practice we can explore the coexistence of many possible meanings for a single sign and, therefore, we have to apply the linguistic model of semiotics to the cultural aspect: signs are polysemic and also have a connotative potential (Barthes, 2012).

In the process of signification (when the meaning of a sign is produced), to the general rule of the Saussurean schema: Sign = signifier + signified, has to be added a second level of signification, that is, the level of cultural affiliation and descent. Roland Barthes as a follower of de Saussure set up the semantic model with one level of ‘denotation’ or ‘what is visualized’ and another level of ‘connotation’ or ‘how is something visualized’. The first-order signifier is the sign of the connotation.

Connotation itself is mostly discretionary, very specific to social affiliation, and works on the subjective level; we are usually not consciously aware of it (Fiske, 1987, p. 92). A sign also works at the level of a myth [in the meaning of mythos, μῦθος as opposed to the logos] in the way that a culture is conceptualising or understanding a sign (Fiske, 1987, p. 93). The myth (or legend, caption of the sign) is a pure ideographic agreement between its users. Possible intended representations can fail because of the deterioration or the incomprehension of the tacit understanding (Barthes, 2012, p. 273).



fig. 42 Use of surface mounted traffic spikes; the warning is written on the road surface “Dikkat! Kapan var!” (transl.: Attention! there is a trap/Stop)

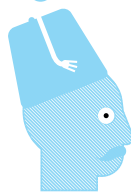


fig. 43 Intension of communication

2.6.1 Creating Understandable Icons

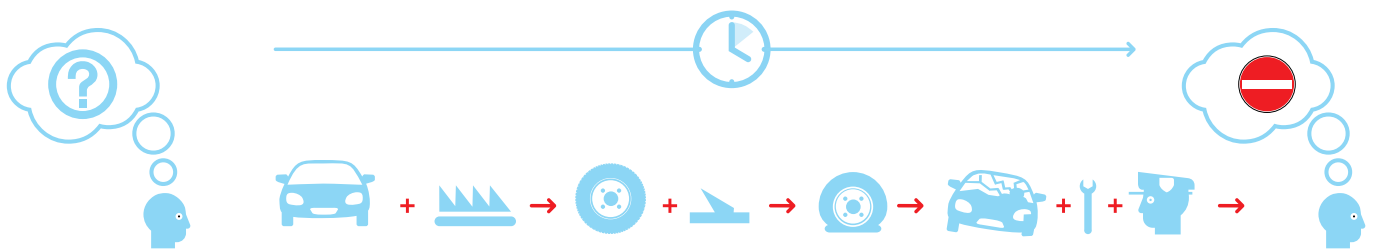
A mythos is a form of cliché and indicates the ambiguous meanings of an icon. When we have a closer look at advertising images we will find the metaphorical use of iconic signs in their visual language.

The idea of visual thinking might create better and more understandable icons, transposing values of properties imaginatively from one plane of reality or meaning to another. The visual mental imagery is limited to the personal, cultural and visual-ideological aspects of the individual. Each sign

can carry embedded systems of values and ideologies and shape the personal perception of the world and of one's self (Durante, 2014).

The swiftly changing production, circulation and consumption of images, signs and symbols dominate our world and transform our urban spaces. What happens if a sign has no common international ideographic agreement and cannot process any signification such as the “Dikkat! Kapan Var” sign - found in Turkey. Here, the intended instruction by the road authority is a prohibitory one: “No Entry” or “Do not drive in this direction”. Perhaps the signs as recommended first in Geneva in 1931 (Sign N^o 202) (Froshaug, 1963) did not result in the desired adherence, so the city planners decided to install surface mounted traffic spikes equal to a common speed bump, but with heavy-duty, spring-loaded blades which can extend up to 4.5 inches (11.5 cm) above the road surface, as a one-way road traffic control system. The international sign was replaced with the local version (sometimes only a hand-painted metal plate), often resulting in a lack of sufficient attention being paid by foreign drivers. The cost of ignoring or misinterpreting the sign is the loss of a set of tires, ruined by the blades.

fig. 44 Possible 'sensory' information samples and a possible causal chain according to already learned contextual or top-down effects.



2.6.2 Limitations of Communication Models

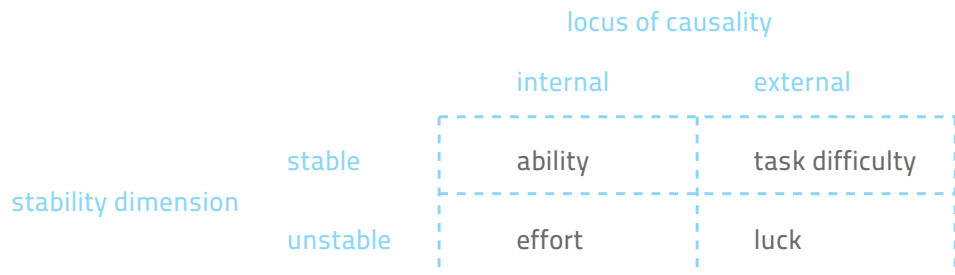
The models of communication we examined previously are formed from a linguistic point of view. In our case, we have the phenomenon that the linguistic ability to perceive the information correctly is only possible by someone who grew up in this area where almost everyone speaks Turkish and the concept of using spike barriers to allow vehicles to travel in only one direction is known. All others, in particular foreigners, have a different phenomenon of perception. Perception itself can be defined as an ongoing

process involving a moving organism involved in the active exploration of its environment (McCauley, 2006). In this central cognitive process, psychologists often distinguish between top-down and bottom-up approaches to information-processing.

Our case can be described as a bottom-up approach, our individual is piecing together data until a bigger picture is arrived at. In top-down approaches, knowledge or expectations are already given and used to guide the information processing. The already existing knowledge penetrates the perception, for instance by filtering the visual input. The observation is theory-impregnated and is subject to revision (McCauley, 2006). The first impression of an environment by an observer is direct and not mediated by visual sensations or influenced by higher cognitive processes. The person in the periphery is sampling sensory information and building up a connected set of observation points. Due to the fact that humans are not able to enjoy a wholly panoramic vision, perceived information is the successive sampling of the ambient array (Gibson, 1972). The internal system is building up a causal disposition made of the sensory appearance in addition to the perceptual exploration behaviours (Matthen, 2012).

The next time the individual should be aware of the sign and the visual sensation causes a contextual or top-down effect (Peterson, 2006). A perceiver's past experiences, intentions, expectations, and attention are now influencing their present visual perception. The products of the seeing process in the past are now memorized and effect the current perception, for example, the figure assignment arising from previous exposure to the object, the role of past experience in determining the parts of the object or how the visually perceived object is ordered in relation to its context. The perceivers' intentions and goals result in effects on perception and can influence the observer's depth of two-

*fig. 45 Attribution diagram
based on the work of Bernard
Weiner.*



dimensional and three-dimensional vision (Peterson, 2006). Both bottom-up and top-down processes are involved in our perception and help us to understand information even in the case of transposed letters or signs.

“Adncirocg to rceesrah” from Graham Rawlinson: “The Significance of Letter Position in Word Recognition”; PhD Thesis, 1976, Nottingham University, “it deosn’t mtater in what oredr the leretts in a wrod are, the only imnproat tnhigh is that the fisrt and lsat lteter are at the rihgt plcae.” In different tests, Rawlinson proved that the permutation of letters in a word does not have such an intense influence on the reader’s word recognition, as one might surmise. A first language speaker is able to handle the encoding of the transmitted information more fluently than a non-native speaker because of the ability to recognize words in their environment by comparing their representations of those objects with templates stored in the reader’s own memory. This kind of top-down process can also be established in sign recognition.

Humans want to understand their environment and, therefore, they strive to understand why certain events happen. When an achievement-related event occurs (for example, the tires are flattened), especially if the outcome was unexpected, Weiner proposes that persons undertake an attributional search, trying to understand what happened. The subjective perceived cause of this happening is extremely important for the involved person, irrespective of any objective explanation. Whatever the individual perceives as being the cause of this event will affect its future motivation toward preoccupations with similar tasks. The basic assumption of this “model of attributions” (Weiner, 1985) is that individuals are affected by both environmental factors (e.g., characteristics of the perceivers surroundings) and by personal factors (e.g., prior experiences and prior knowledge: top-down process). These background variables affect the types of attributions that a person is likely to make (Anderman, 2009). We can identify two types of attributions people tend to use: the internal attributions (within a person), which affect behaviour based on a person’s feelings and personal dispositions; and external attributions (external to a person), which shows behaviour based on external situations.

One important dimension is the scene (locus), as it will affect the future motivation of the individual. It refers to whether the cause of the event is perceived as internal or external to the person. In our example of the traffic-sign (Dikkat! Kapan Var), on the one hand, the driver, let us call him Mr. D, might believe that the car accident happened because the traffic planning authority in Turkey is incompetent. The cause is thus external to the person. On the other hand, Mr. D could also believe that he himself is responsible because he

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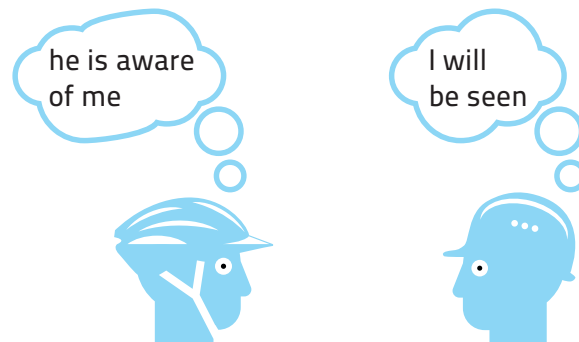
failed to abide by the instruction on the sign or lacked the ability to navigate. The reason is internally attributed because the driver is in doubt about his own ability. The other axis is the stability dimension, which refers to whether the cause is stable or unstable across time and situations (Anderman, 2009). If our driver believes that he lacks driving experience and ruined the car on the surface-mounted traffic spikes because of this, then his cause is stable, especially if he believes that his lack of driving skills is a permanent quality. Instead, if Mr. D believes that he missed the 'No Entry' (Dikkat! Kapan Var) sign because he was irritated or blinded by the sun, then the cause is unstable, in which case the irritation is a temporary factor.

These psychological processes lead to behavioural consequences and the consequences of attributions ultimately affect the individuals' future behaviour. The different types of attribution influence the subsequent behaviours of the individual, but attributional patterns can differ among individuals. At this point, it is also important to consider the complex relations between gender and ethnicity (Anderman, 2009). The attribution (stable/general) of our individual can generalize the original situation to all similar situations with a sad feeling of helplessness and the consequence never to drive again (in Istanbul).

2.6.3 The End of Cause and Effect

Those results collide with the mechanistic world-view of a number of philosophers – such as Hobbes, Descartes, Leibnitz or Spinoza, and the necessity of a relationship between cause and effect. The laws of the connection between cause and effect are inoperative and do not tell us what effect will necessarily take place if some cause occurs or, as in our case, what reaction should be induced by mounting this sign. The interconnectedness and systemic co-evolution

fig. 46 Picture according to the research project: "Study and improvement of the perception of traffic signs and situations" dangerous situations in the crossing transition · problems of visual perception · 'Blind spot' for trucks



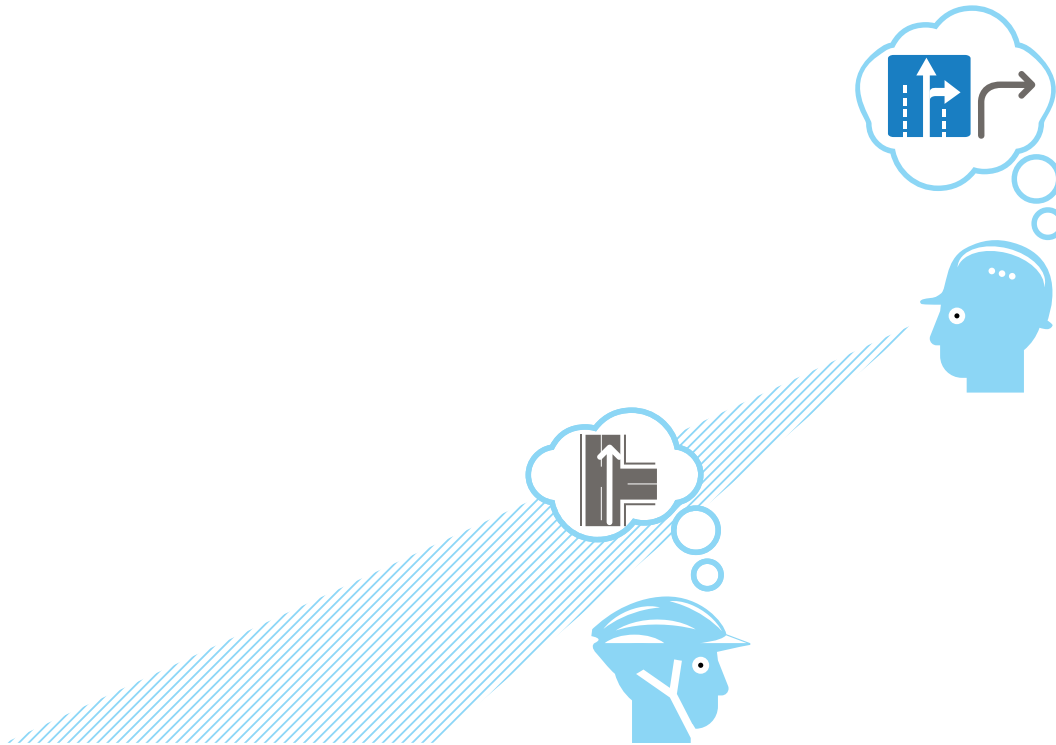


fig. 47 The 'Blind spot' for trucks is causing danger.

of life and its environment contradicts the statement of a mechanistic world. The cultural and visual-ideological aspects of orientation I alluded to earlier should be observed more from a systemic point of view. For our observer, perception is a personal, individual phenomenon. The surrounding is 'sensed' by the perceiver – the 'sensation' is a unit of experiencing the state of every being. This perception also depends one's "own point of view upon the world" (Merleau-Ponty, 2002; p. 27) compared with the own perceptual history.

We can see this kind of personal perception horizon in everyday situations. A truck driver, while driving his truck, has a different perspective and different relationship to the surrounding objects than a motorcyclist. Both should abide by the traffic rules they have learned (for example, to pass the test required to receive a driving license), but each of them has a different personal perception in their actual perceptual experience and the resulting horizon.

Multiple experiments have proven that a specific part of the brain, called the hippocampus, plays an important role for the orientation of living organisms. The information of the spatial representation is stored by a unique subset of neurons, called place cells. These cells signal the current location and aspects of its locomotor trajectory. Every attraction perceived with any sense by a higher life form is reflected in a neural representation of the spatial information in the hippocampus. The environmental perception forms a cognitive map of space shaping an environmental memory. Human cognitive

processes are dynamic and information active. The proceedings can change from moment to moment, focused on the impact of attention (Spitzer, 2006; pp. 26-). The perception received from a personal angle may differ extremely from the imagined sense experience of another person. Thus the expected view of the trucker, as supposed by the bicyclist, is physically not the perception the truck driver actually has. This misbelief is responsible for over ca. 250 fatal accidents or serious injuries per year in Germany. (Müller, Olav: *Unfälle zwischen rechts abbiegenden Lkw und ungeschützten Verkehrsteilnehmern. Analyse der Ursachen und Bewertung von Sicherheitsmaßnahmen*. [translation: *Accidents between lorries turning right and vulnerable road users. Analysis of the causes and assessment of safety measures*], Diplomawork, Technische Universität Berlin, 1999).

2.6.4 Changing Perceptions

If we agree with the theory in neurological science that the hippocampus forms a cognitive map of space that reflects environmental memories and is therefore engaged in navigation (Fenton, 2010), we have to survey the kinds of perceived elements that form this mental map.

An important element is the perceiver's movement trajectory. Channels along the journey can be, for example, streets, walkways, transit corridors, canals or railroad tracks. Humans tend to observe the environment while moving, so other environmental elements will be arranged and related to this path (Lynch, 1960, p. 47).

Linear elements, which are not used or considered as pathways, are edges. They are linear breaks or boundaries between two phases. A river, a shore, walls (such as the Berlin Wall) are lateral references like coordinate axes. Edges help people to organise or outline areas and cities (Lynch, 1960, p. 47).

A two-dimensional section in a medium-to-larger size is a district. It has a common, identifying character which structures a city in a mental framework of 'belonging to' or 'outside of' a certain geographic area. A district can be visible from the outside with the aid of physical boundaries, but it can also be just the concept of the individuals who live in the area or identified by small, local differences – the result being that neither the edges nor paths which demarcate the district are immediately recognisable to an outsider or foreigner (Lynch, 1960, p. 47).

Strategic spots in a city such as junctions, the crossings of transportation lines or moments of a shift from one vehicle or one structure to another

are nodes. They might be simple concentrations in traffic or indeed physical places such as enclosed squares or a street-corner hangout hot spot, because it is the focus and epicentre of the district. The concept of a node with paths is like a hub with its spokes. Nodal points will be found in almost every received mental map (Lynch, 1960, p. 48).

Urban details or elements typically visible from a distance and from many angles, including over the tops of smaller buildings, and providing a good resource for orientation, are typical landmarks. Landmarks can be structures within a city or features on a landscape, like a church or television tower; notable roof designs - such as the golden dome of the New Synagogue on Oranienburger Strasse, Berlin - or a remarkable mountain silhouette. There are also innumerable local signs like shop fronts, murals or other urban details, which fill in the memory with perceived elements (Lynch, 1960, p. 48). The quality of the imageability of the physical objects indicates whether a strong spatial representation can be stored in the perceiver's memory.

The mental-spatial problem-solving process that turns travel goals into decisions, actions and behaviours is also referred to as "wayfinding". It is a permanent decision-related process of determining and following a path or route between an origin and a destination (Mollerup, 2005). Mistakenly, the term is often also used for the development and the design of signs, maps, and other graphic or audible methods with the goal of informing travellers about location and directions. Consequently, the communication to aid travellers in getting to their favoured aims, making decisions and taking appropriate action should, in fact, be correctly referred to as "wayshowing" (Mollerup, 2005). Hence we can state that navigation equals wayfinding along with two components: direction and path added to travel or the actual motion. Wayfinding, taken for itself, means an individual solving a spatial problem. The wayfinding process is to make, structure and execute decisions. At a later point in time, when the same way has been travelled several times, former decisions will result in a pattern of behaviour.

2.7 Structuring the Decision-Making Processes

The planning phase for decision-making can be structured in several steps. Firstly, it is important that the individual has a precise cognitive map of their own current location and the decision to move. The process is initiated by the seeking of information; the checking for internal and external information will provide a possible route outcome completed with possible alternative

routes. The selection and evaluation of eligible routes, by comparing them with different chosen criteria, will lead to a final choice being made. The mental scenario comes up with an imagined routing that has to be followed. In the execution phase, the individual has to find the entry point and the aimed direction. A process of evaluation starts immediately after the first move, the track will be monitored and corrected if, and as soon as, the situation makes it necessary. This process is typically ongoing until the physical goal is reached, that is, the journey is completed (Mollerup, 2005). In this process, place cells will store the spatial information of the track in the hippocampus (bottom up). If the route is not travelled again, and/or the journey and/or the scenery itself was uneventful or unremarkable, the memories might be overwritten by new, more exciting, spatial experiences.

At a later date, if the journey was repeated, albeit differently, the singular neural representation of the locomotion once remembered will become a habit, that is, a behaviour. The route, spatial locations and trajectories, first stored in the place cells in the hippocampus area of the brain, will be transferred to a long-term memory representation in the cortex by adding remarkable events and navigable environmental details such as landmarks and links, places and paths (O'Keefe, 1978). This cerebral cortical space hosts the mental model of objects' spatial configuration, external representations, pictures and maps and serves as a cognitive aid with its individual memories for information processing. Those memories are pieced together from a variety of kinds of experience: perceptual, from actual navigation, or cognitive, from maps or descriptions, and help to evaluate and correct the current journey (top down) (Spitzer, 2006).

Various methods for evaluation and decision-making can be identified during a single journey. One effective method is to follow lines, arrows or other tracks. Travellers in this case can base their activities upon their own experience and the experience of others, assuming, of course, that the tracks are perceived as trustworthy. A similar method is following a route on a map. This map can be solidly mounted, a pocket-size version like a foldout tourist map easy to take along, or an electronic (GPS-based) version. The important feature is the ability to locate the current position, that is, to correlate the environment to the map. If the goal is not a physical place, but a general quest for a specific item, the use of an educated search employing the basic underlying logic of the syllogism may be more effective. We can use a major premise, for example, 'most supermarkets stock bread' and a minor premise, 'this is a supermarket' – to come to the conclusion that 'bread is

stocked in this supermarket'. Closely related to this logical search is systematic searching, for instance, for a gas station if the fuel gauge indicates fuel is running low or indeed looking for quick shelter as a thunderstorm approaches. City dwellers have learnt to find the destinations by reading the address including the street name and the sequential house number, with an exception: in East Berlin the numbers are ascending numerically on one side of the street and descending on the other, in West Berlin the numbers are split between straight and odd figures ascending numerically until the end of the road.

2.7.1 The User Involved

Another phenomenon can be witnessed in public urban places: a pronounced social navigation. To stand in a long queue and assume that the entrance to the museum or theatre must be situated around the corner might be not clearly understood by everyone, but the shortcut through the footpath in the park, indicating a socially navigated urban place, is evident. The power of ordinary people while creating their own surroundings by trails of social navigation was impressively demonstrated during the development of the University of Oregon campus. Using public trails for the guidance and routing system shaped a human-built environmental design and the whole campus was a testing ground for this idea in 1970 (by Professor Christopher Alexander, Eugene, Oregon, USA). Two other alternative strategies for navigating through a complex environment are aiming, that is, using a visual target (a landmark), and compassing, for example, using the directions from the arrow pointing up in the compass rose (classic or electronic) or using the orientation of satellite dishes (in the northern hemisphere always pointing towards the south because of the equatorial position of the satellites - in the southern hemisphere this phenomenon is precisely reversed).

2.7.2 What is Not Taught at Design Colleges

Being aware of the perceiver's motivation and emotion, one might wonder why the wayfinding strategies in large common spaces often fail. Human spatial orientation and – based on this – decision-making is a sensitive, dynamic process with many different factors involved. During the design process, many of those influences are largely ignored, so the main design research must be: how to address the missing prevalent human emotions

(Weiner, 1985). Semiotics and/or semantics played a minority role in the graphic design process. The classical sender-message-addressee/receiver diagram is mostly enough to explain a new sign to the customer. More important is the emotional ability of an icon to overwhelm the audience. Peircian semiotics and Saussurian semiology seem incompatible to the designer's heart and soul and produce antinomies or contradictions. "Most people think that signs, like money, are made by civil servants, not designers." (Paul Mijksenaar in "A Ray of Hope for Air Travelers Following Signs", Patricia Leigh Brown of The New York Times, New York, June 7, 2001).

There is a bridge required between the theory of visual or sensory communication and graphic design skills. Designers are largely averse to theory in general and to semiotics and semiology in particular. However, the theories enjoyed a great deal of international attention in other scientific fields, because diagrammatic thinking has made possible the comprehensive understanding of the principles behind visual and spatial thinking. The longstanding and close relationship to the visual fine arts formed a tradition of studio/atelier lecturing with instruction by apprenticeship.

The efficiency of such programmes depends on only a few outstanding lecturers who had created their own ways of thinking from Bauhaus, HfG Ulm, HfG Offenbach to the Schule für Gestaltung Basel (SfG Basel). Exercises in the introductory courses in visual design were primarily focused on syntactic, at best presemantic, problems. The lessons are devoted to topics such as the transformation of characters to develop variations of manifestations of a visual character in relation to figure / ground or different values of brightness shades in colours to develop a range of figures based on discontinuous elements (grids) to geometric and coloured fibrillation, etc.

A large part of this kind of programme of exercises was developed, for example, in 1955 by Tomás Maldonado and practiced in the foundation course at HfG Ulm (Bonsiepe, 2003). However, the "vocational and atelier models are a non-intellectual approach to education, in which the knowledge acquired is largely tacit and not available for examination." (Storkerson, 2003 p. 8). Scientifically verifiable models and their written evidence is mostly missing in this young discrete academic discipline of 'art and design sciences'. There is still a relatively controversial discussion going on internationally about whether designers can confirm the standards of scholarly knowledge or continue discussing successful graphic design in colourful books and going back to work after that. Contemporary designers have to integrate the growing complexity of our changing social, economic, environmental and tech-

nological conditions and opportunities. Design-thinking and -acting enables a problem-oriented integration of changing processes with varied factors, stakeholders and cultures. Collaborative design skills are not just a sort of magical, spontaneous event, they are much more the result of a close and fruitful cooperation in terms of planning, optimization, and implementation.

Although as Storkerson, (2003, p. 17) notes, semiotics and “semiology present obvious difficulties for graphic design...”, their influences can be seen in the semantic iconicity, in the systematisation of sign systems and visual languages, encouraged by internationalization, and in the use of rhetorical tropes. The development of semiotic principles, which are translatable into design terminology, are extremely important for the subjects of visual communication. Applied design demands precise and eloquent communication with visual signs and thus the elimination of doubt (Skaggs, 2010).

2.7.3 Interest in Outstanding Signage Solutions

The operating companies of airports, exhibition and congress sites or of other forms of civic centres have an increased interest in coming up with outstanding signage solutions. This is because improving passenger flow indirectly increases capacity and thus contributes to obtaining higher numbers of visitors (Fewings, 2001). The key motivating force of designers is communication. In terms of wayshowing, this simply means making the human environment as usable as possible, by as many people as possible. It begs the question: Why not combine the mutual interests to emphasize the significance of design?

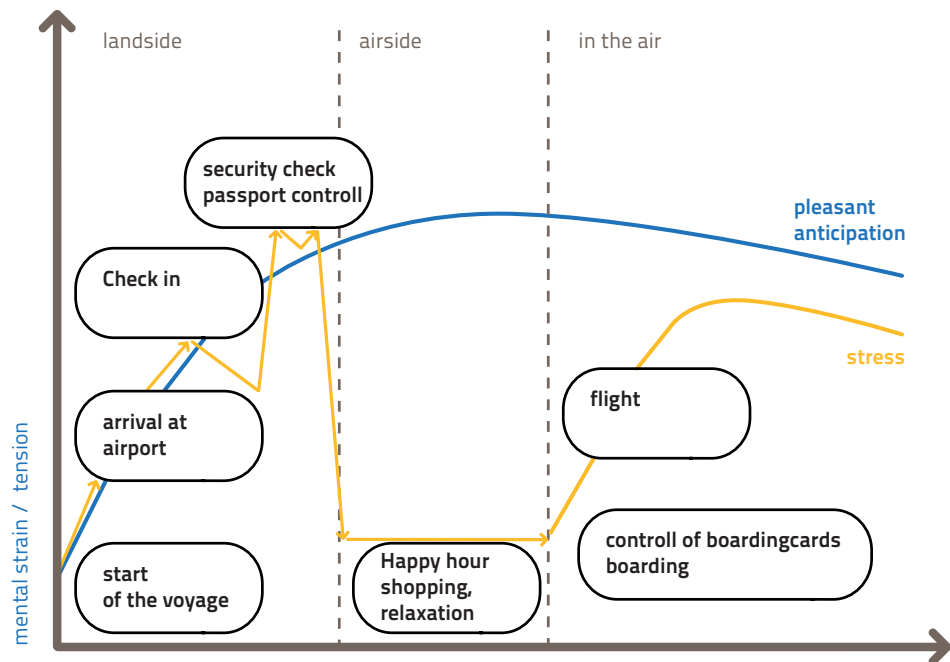
The standard practice in public spaces to date has been to consider signage elements as somewhat of an afterthought. In most cases, only basic layouts of directional and facility signs have been installed for financial reasons, usually after everything else has been completely finished.

For many architects, signage will ruin the design aesthetic of the building and represents a necessary evil. It was taken for granted that circulation was no problem (Passini, 2004). Additional follow-up signs were only designed when necessary, to limit the consequences of confused and lost visitors. The possible use of a modern wayfinding system for passenger movement inside airport terminal buildings and other environments was impressively described in Fewings' Journal of Navigation article, “Wayfinding and airport terminal design” (Cranfield 2001) and has often been cited. Nevertheless, even Fewings had to recognise that the design element is more than an additional item to meet the criteria of the multiple aspects. It is the purpose of a successful way-

finding system to meet the needs of multicultural passengers with different wants and needs, by taking those aspects into consideration before the completion of the building. Conflicting interests and opinions often prevent the clarifying of sloppy signage: maintenance workers want signs which are easy to clean; energy efficiency as a criterion wants signs without artificial lighting; and airport executives want signs that are easy to see, guiding passengers through the building quickly.

It makes sense that designers would already be involved in the project planning at the earliest possible stage, when the design process starts with the project and problem definition. Through research and the analysis of the research, key insights can be identified. The synthesis of different concepts will finally lead to the creation and realization of designs. The design process is linear: it begins with definition and ends with realization, but it is also highly iterative and sometimes requires a few steps back before moving forward. The goal of user-friendliness leads on to the aspect of the human factor. In the previous section we established that individuals from different cultures will perceive signage differently, and that how individuals orient themselves varies.

fig. 48 psychology diagram of an airtrip



2.8 How to inspire and influence personal choices?

The highly complex cognitive abilities of humans are often the main difficulty in assessing wayshowing processes. Dynamic human decision making, the ability to form patterns with other elements (Gestalt), the possibility to form a holistic picture of the environment, comprehending the significance of physical objects and events (Endsley, 1995) are far beyond a simple human information processing model (Wogalter, 2004). These factors represent only a glimpse of the interconnectedness of our daily lives with our present environment and the process of decision-making. In a completely different field of research, scientists and strategists conducted reliable studies about decision-making behaviours at a much earlier stage. Furthermore, John R Boyd (1987) made the important observation that studies of human behaviour reveal that the actions we undertake as individuals are closely related to survival. Success in war, conflict, competition and even basic survival hinges upon the quality and tempo of the cognitive processes (Osinga, 2005). Moreover, Boyd (1987) indicated two ways in which individuals can develop and manipulate mental concepts to represent observed reality: the person can start from a comprehensive whole and break it down to its particulars, or one can start with the particulars and build towards a comprehensive whole. This is close to the top-down and bottom-up approaches in information-processing discussed previously in the present study.

In modern (Western) strategic theory, decision-making is based on four elements arranged in a simple sequence: observe, then orient, then decide, then act. The observation is sensing the individual and the surrounding world. The second element, orientation, involves this information being evaluated by a complex set of filters like genetic heritage, cultural predispositions, and personal experience and knowledge. The third step is decision, when a review of alternative courses of action and the selection is made of the preferred course as a hypothesis to be tested. Finally, there is the implementation of the tested decision in action.

Individuals use their experience in the form of a repertoire of patterns to make decisions. Typical forms of reaction in a certain type of situation can be identified as a pattern that describes the primary causal factors operating in that situation. "The patterns highlight the most relevant cues, provide expectancies, identify plausible goals, and suggest typical types of reactions in that type of situation." (Klein, 2008, p. 257). When an individual needs to make a decision he/she can quickly match the situation to the patterns they have

learned. If a clear match could be found, the individual can carry out the most typical course of action. This is the reason that extremely rapid decisions can be made.

2.8.1 Understanding Human Behaviour

The same elements helping military strategists to develop patterns for successful operations (Boyd, 2005) can be used to understand the factors of human behaviour (Zwaga, 2004). A simple basic task comprises the use of the human senses (seeing, hearing, etc.) for a simple activity, such as sitting or standing, and evolves a simple pattern of movement. A complex task is a combination of all kinds of basic tasks, performed according to a plan including patterns of planned and purposeful behaviour. In complex tasks, cognitive (sub-)tasks such as decision-making, problem-solving, recalling and learning play the important roles. The cultural and visual-ideological aspects as well as the physical or perceptual human abilities and limitations can be used to develop guidelines based on exactly these design specifications.

For the development of a user-centred design it is important to know the abilities and limitations of human cognitive or task performance and to understand the perceptual, cognitive and behavioural process in this situation. This knowledge and understanding is best applied to the solving of a design problem with regard to usability when the solution is developed in cooperation with the users themselves (Gulliksen, 1999). Understanding the cognitive processes of people will help to build perceptual, cognitive and behavioural models of these processes both as a starting point for any further design guideline development and for the evaluation of existing wayshowing systems. Using such a model already during the design process will support new ideas and allow the designers, while working with prototypes, to get an idea of what the signage system would be like and to give rapid feedback if important elements are missing, or if a different perspective has to be met. Making a decision is, however, a more complex chain than the simplified cycle from Boyd would suggest. This is because orientation shapes observation, shapes decision, shapes action, and in turn, orientation is shaped by the feedback and/or other phenomena coming into our sensing or observing mind. When no effective action is available, explicit decisions are needed. However, explicit decision-making and reorientation (learning) is time consuming.

A better way to accelerate this process is training and the use of learned patterns. In the competitive decision-making environment of a battlefield, it

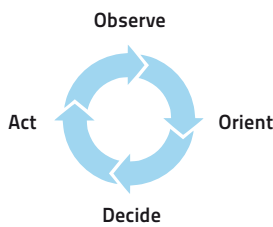
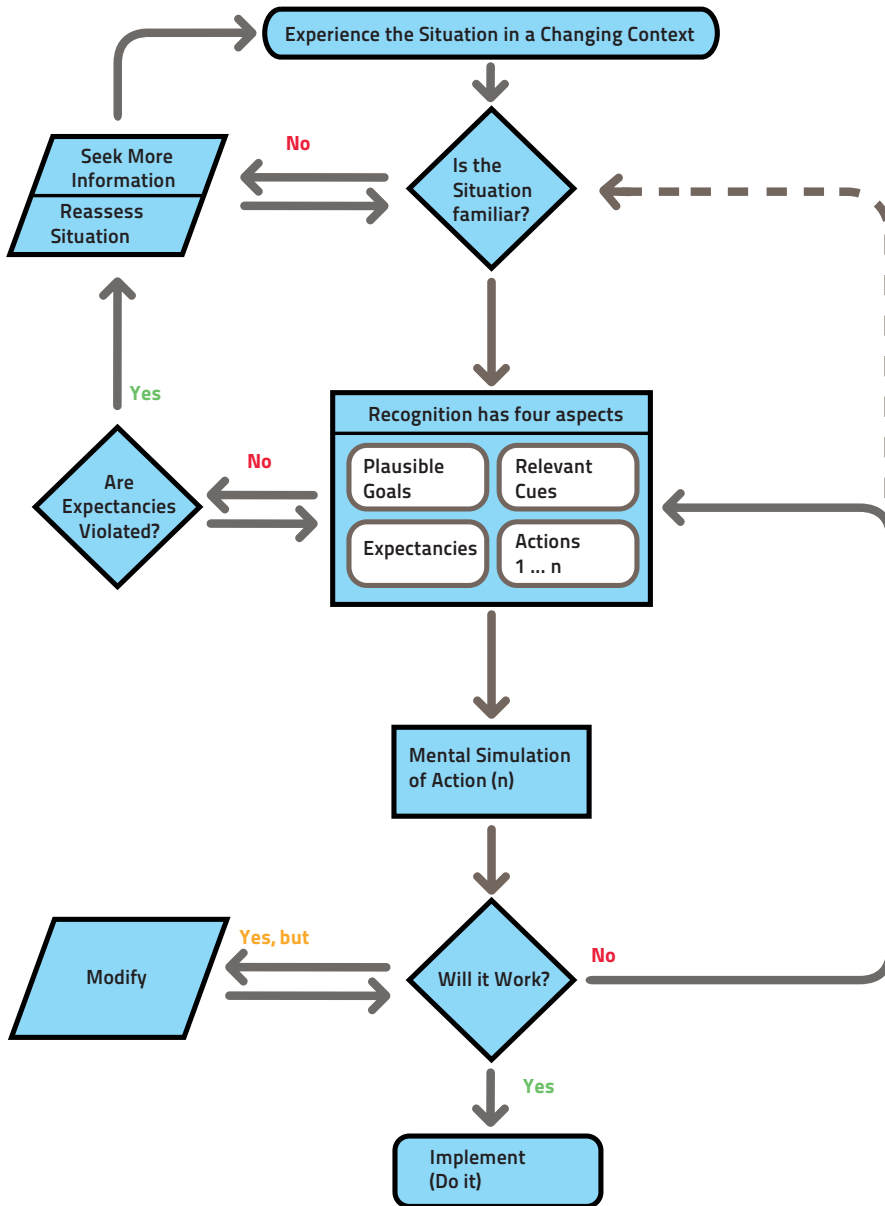


fig. 49 The OODA loop model or the Boyd Cycle in simplified form.

fig. 50 Reworked model of recognition-primed decision making



is important to get all dimensions of the ‘big picture’ of the military strategy quicker than the enemy. The aims of professional military education programmes are to train the development of ideas and actions for winning and losing in combat while getting into the decision cycle of the enemy (Osinga, 2005).

This model ties cognition to action and provides a general description of how a designed system performs functions to operate. Understanding the

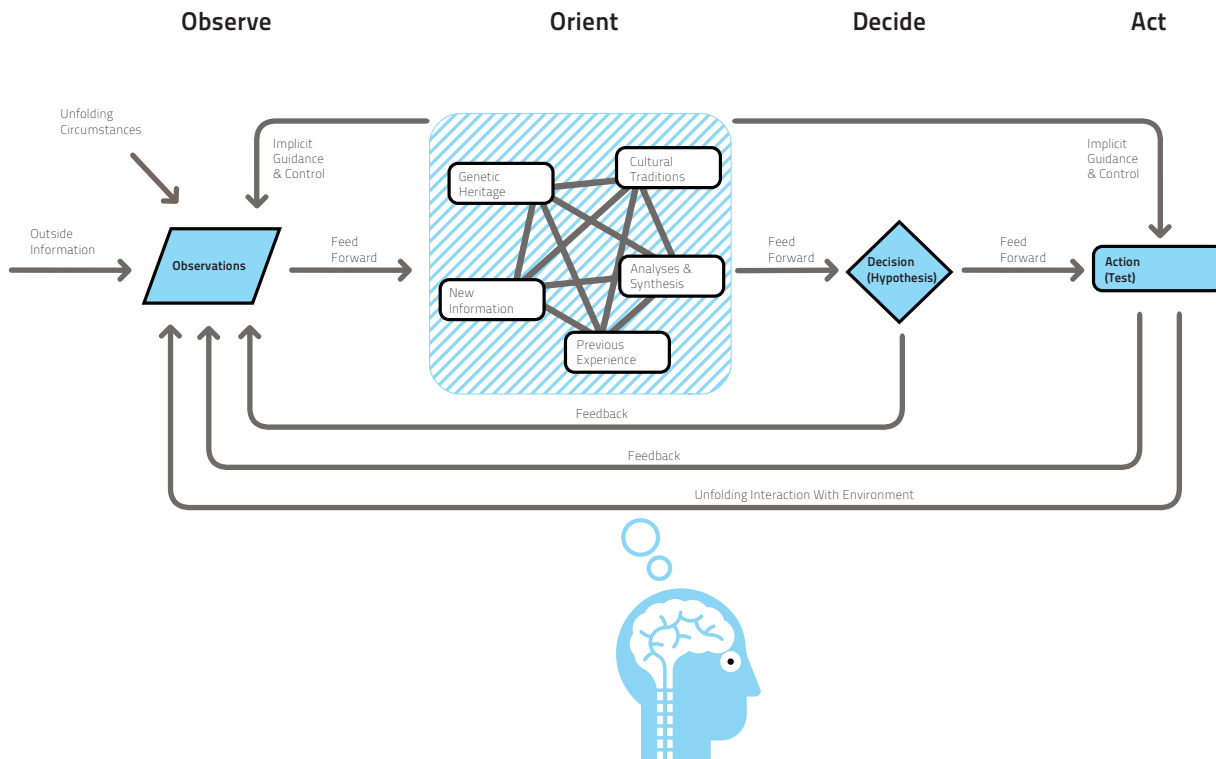


fig. 51 Model of “The real OODA loop”

organisational agility of decision-making can help us to develop more effective signage systems in public areas. As designers and planners, we have to be aware that genetic heritage, cultural traditions and previous experiences give every individual an implicit repertoire of psychological skills shaped by their environments and that this will influence the actual experience. With the ability of analysis and synthesis, information can be perceived differently across a variety of domains or across a variety of competing/independent channels of information (Osinga, 2005). Unfamiliar phenomena or unforeseen change can require an attributional search to understand what is going on or what happened. Every individual needs, for his/her own analysis and synthesis, the many-sided, implicit cross-referencing process of projection, empathy, correlation and rejection. Understanding the complicated, comprehensive, richer and deeper decision-making process will help us to shape understandable guidance.

2.8.2 The Ability to Make Decisions

Observation is the primary source of new information in every behavioural process, but without the context of orientation, most observations would be

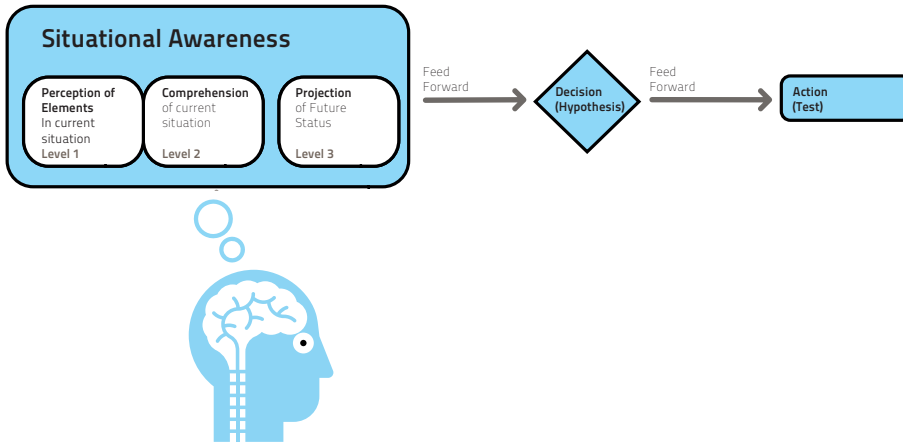
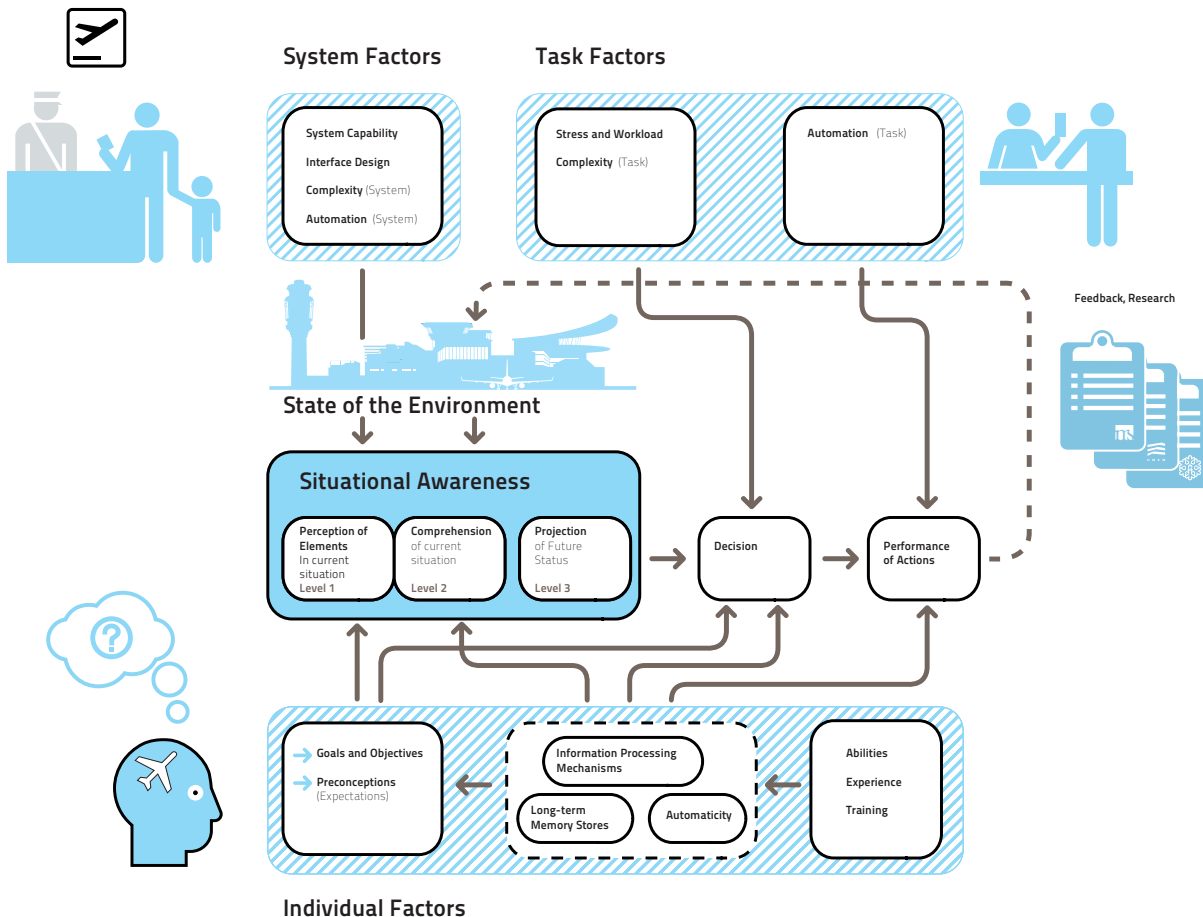


fig. 52 Model of the 'decision making process' with a focus on 'Situational awareness'

meaningless. Our fictional individual is examining the world from a number of perspectives in order to generate mental images or impressions that correspond to the world. Those mental images are shaped by one's personal experiences, genetic heritage and cultural traditions, but is also always measured up

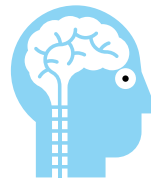
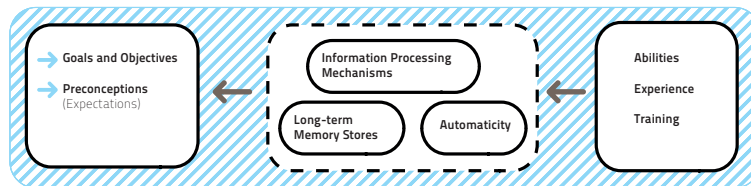
fig. 53 Model of 'Situational awareness in dynamic decision making.' hereby with the example of an airport.



against new incoming information and validated to existing schemata. The learning process is, therefore, a double-loop process.

In the orientation phase, the person generates action alternatives. An individual's mental patterns call for certain decisions and actions. This model describes the individual process of evolution and adaption much better in analogy to our non-linear world dominated by change, novelty and uncertainty, than the simple sequence from Boyd. The perception of one's environment is called situational awareness; that is, being aware of what is happening with environmental elements with respect to time and/or space, the comprehension of their meaning and the projection of their status after variables have changed in the striking distance. The misunderstanding of how information, events, or one's own actions will impact goals and objectives has been identified as inadequate situational awareness and is one of the primary factors in accidents attributed to human error. In situations where information flow is quite high and a wrong decision can lead to serious consequences, situational awareness is a predominant element when focusing on usability in a user-centred design development process. It is impossible to know exactly what to build from the outset. Usability goals and design criteria should control the development of the informational design. The behaviour, reactions, opinions and ideas of the user can be observed, recorded and analysed – critical activities and reactions, even to paper sketches or mock-ups, can be registered and used to influence the development of the system (Gulliksen et al., 1999).

fig. 54 'Individual factors' from the model of 'Situational awareness in dynamic decision making.'



The status, attributes and dynamics of relevant elements in the environment, as perceived by an individual, are key elements in the individual's personal situational awareness (Level 1). Once becoming aware of the elements that are present, the decision-maker must comprehend the significance of objects and events (Level 2) to form a holistic picture of the environment.

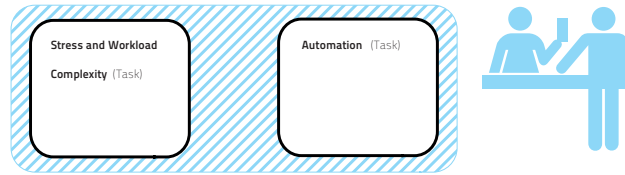
The third level will be achieved through knowledge of the status and dynamics of the elements, and the comprehension of the situation (in Level 1 and Level 2) to project from this point future actions of the elements in the environment. The availability to project the future in the environment, to receive valuable information for decision-making, is based on the firstly perceived elements about the environment and it also includes the comprehension of the meaning of this primary perceived information, comparing this input with one's own personal goals (Endsley, 2005, p. 37). Several major factors influence this process: the ability to perceive data input can vary from individual to individual; the information-processing mechanisms are not equal, because they are influenced by innate abilities, experience, and training; as well as the individual preconceptions and objectives that filter and interpret the environment in a subjective way (Endsley, 2005).

By expanding the model with a focus on individual perception and the relevant elements influencing the decision-making process, we will get a model that includes the individual factors, the task factors and the system factors. Action selection and performance are shown as separate stages, as a direct process from the situational awareness. The situational awareness is itself the sum of the cognitive processing activities, from “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future” (Endsley, 2005, p. 36). The degree and form of every situational awareness is influenced from outside of the system; the needed information is provided, on the one hand, and its compatibility with the human information-processing abilities, on the other hand.

2.8.3 Individual Situational Awareness

Individual mechanisms and constructs that play a relevant role in information processing, thereby influencing the personal situational awareness, were discussed previously in the present study. Findings in neurobiology have indicated the relevant structures and identified specific functional areas of the human brain that are involved in the learning processes in question, such as perception, attention, association and memorization. It has been identified that the working memory is our most immediate form of memory. The working memory takes in perceived information via our senses from the surrounding world. The working memory also pulls the stored information from our long-term memories that we currently need for decision-making

fig. 55 'Task factors' from the model of 'Situational awareness in dynamic decision making.'



and for action (Spitzer, 2006). What we are paying attention to, or what is in our current situational awareness, is stored in the working memory. A new stimulus or idea can displace the important information presently in one's working memory. The result is distraction and forgetting what was being paid attention to.

The memory system can also be divided into two main and different parts: the declarative memory, or “knowing what”, which stores the memories of facts and events and the non-declarative memory, or “knowing how”, which includes the memories for skills and habits. The declarative (explicit) memory is mostly shared across individuals in a given culture. The scope of this long-term memory is dependent upon the history of our individual experiences. The ability to engage in the selective processing of information from different sources simultaneously, results in attention changes during a given period of time or in varying environments. People with stronger working memories tend to have better control over their attention span than people who have a weaker working memory. A weaker working memory, for example, as a consequence of health problems or as a result of advanced age, stress or unfamiliarity, will lead to numerous difficulties with organizing. If difficulties are encountered remembering all the relevant factors, then the comprehension of the significance of objects or events becomes more and more difficult; it gets more complicated to form a holistic picture of the environment to generate an effective organised decision.

The complex process of perception and pattern matching is also greatly limited by working-memory and attentional capacity. Working memory capacity can act as a limit to situational awareness. The limited amount of attention to take in and process environmental information for selecting actions and executing responses can quickly be exceeded in complex and dynamic environments, with the result that the amount of information taken in will overload the attention capacity and the task becomes too complex. A lack of situational awareness can result in poor decisions leading to undesirable outcomes. If the situation makes it necessary that

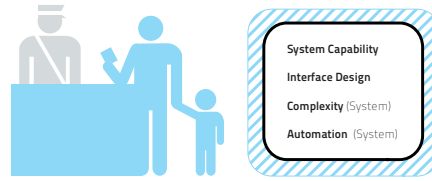


fig. 56 'System factors' from the model of 'Situational awareness in dynamic decision making.'

new information be combined with existing knowledge in order to develop a composite picture of the situation and enable a subsequent decision, then unknown situations are limiting the working memory. (Endsley, Jones, 1997).

This limitation in the decision-making process can be overcome by storing learned and trained patterns in the long-term, non-declarative memory. Knowing the facts and events beforehand or having trained in how to behave in such situations and environments will form schemas (situation prototypes) or mental models. These mechanisms of “knowing how” will provide guidance and security, and the situational awareness is not limited by the task of orientation because the individual is able to react and cope with the situation. This is possible because the individual did not have to know how to move, the person is skilled because they were acting instinctively according to previously trained patterns. Pattern recognition caused by automaticity in the system process is a possibility for quick decision-making and orientation (Endsley, Jones, 1997).

2.8.4 Consideration of Individual Attention

The human brain is able to process many different incoming stimuli at once (Scholl, 2001). Given that fact, the attention span itself seems to be an extra processing capacity and has its focus on spatial attention like a spotlight (see spotlight model of the Spatial-Cueing-Paradigm from Posner et al. 1980), a zoom lens (see, zoom-lens model of visual attention by Eriksen & St. James, 1986), or a like a Gaussian gradient (see, Gaussian attention gradient model, Downing & Pinker, 1985), which enhances the processing of visual stimuli in a fairly limited scope of visual attention (Cave & Bichot, 1999). Attention influences the selection of the stimuli of most interest. As a high number of tasks or a wide variety of information will have a major impact on the attentional capacity, the scope of the visual perception will be focused while irrelevant information will be ignored. Attention is the key to the process of filtering the relevant information from the irrelevant visual noise. Decision-making

fig. 57 Capacity of the working memory



and orientation will be distorted in situations with a vast amount of environmental information and additional stress factors, such as fear, anxiety, uncertainty, importance or consequences of events, self-esteem, mental load and time pressure. Sometimes a certain amount of stress may actually improve performance by increasing attention to important aspects of the situation, but a higher amount of stress can have extremely negative consequences by limiting the attentional capacity (Endsley, Jones, 1997). Experienced people are usually more resistant to stress because they have developed mechanisms to overcome the limitations. They have clear knowledge and expectations, have shaped mental models and schemas, have developed a goal-directed process for the possible situations and have evolved an elemental automaticity in certain tasks.

The passenger journey through an airport can be broken down into several simple steps, from the arrival at the airport, to the issuing of a valid travel document through to post-flight analysis. The tasks of the passenger, and the possibilities to carry them out, are clearly defined in such public areas. With the arrival of user-centred design, it should be possible to develop clearly defined units of automatism for these various steps in the passenger journey. Each of these sections can be described and detailed in its settings and is very similar at almost every airport worldwide. Of course, one has to respect the local, architectural and geographic conditions. The standardization and harmonization of such procedures, with the goal of helping passengers avoid the stress factor and to better understand the passenger experience and mindset, will help to develop a simple walkthrough strategy as a chain of conditioned patterns to avoid painful experiences in such crowded, noisy places as airports where disorientation is easy. The time factor, usually coupled with such situations, is a relevant pathway for unnecessary stress. Providing passengers with all the information they need early enough, can help to ensure the journey is a happy and successful one. The technical potential for this guidance is available and has already been proven in practical applications in routing travellers in a safe and relaxed manner, using clearly structured itineraries through an airport from arrival until departure.



fig. 58 The assumed drop out of items in the working-memory replaced by new thoughts and items.

2.8.5 Systemic View of the Problem

The more complex a system is to operate, the greater the increase in the mental workload required (Endsley, Jones, 1997). Independent of the previous remarks about stress as a factor in the reduction of the cognition capacity, there are also age-related differences in working memory. Working memory tasks of orienting in large public spaces often require the simultaneous processing of incoming perceptions and the storage of the holistic picture of the environment as well as the product of the decision of that processing. All of these aspects can vary in their complexity. The working memory system is used to hold information actively in mind, to manipulate that information and to perform a cognitive decision.

The capacity of the working memory is difficult to estimate in terms of the number of items that can be remembered, because the task of the working memory is also to forget features independently in order to facilitate the receiving of important new inputs. The number of items that can be remembered differs, ranging between three to five items. The research in this field has shown that as the number of items remembered increases, the precision with which each one is remembered decreases (Brady et al., 2011).

It is easier to remember objects of categorically different colour (a low-information load) than perceptually complex objects, for example objects of similar colour (a high-information load). There is an overall limitation to the information load per item. Therefore, the more information that has to be remembered from/about an individual object, the fewer the total number of objects that could be stored (Brady et al., 2011). Adding additional items of information will displace older information, because there is an information limit in the working memory. The ability of perception needs the possibility of ignoring irrelevant information. This selective process makes it possible for the individual to attend to and interpret the perceived important elements and allow it to selectively process the vast amount of information, prioritizing some aspects of information while ignoring others (Carrasco,

2011). However, the performance of the working memory depends on age; less information is retained, that is, remembered, by the elderly, and the ability of processing information held in short-term memory while carrying out further cognitive operations also shows age-related deficits in memory functioning (Gick et al., 1988). To overcome these limits of situational awareness, accuracy of the objects is more important than the speed of perception.

2.8.6 Limitations in Perception

Attention affects perception – this is a well-known aspect of early visual processing (Carrasco, 2011). An important factor leading to attention is visual attractiveness. The severe limits on our capacity to process visual information make selective attention necessary. The ability of an item to catch one's attention, or conspicuity, should not be confused with either the visual quality of the element or with visual quality, even though it is often difficult to make a distinction between the two. For a designer/information provider it should be a necessary skill to know how attention affects perception. With the aid of the perceptual template model (Carrasco, 2011), three major possibilities for increasing situational awareness can be identified. Firstly, improving performance through amplification of the signal. In practical terms, this can be achieved by promotionally effective solutions such as increasing the quality of the display and improving the clarity of the presented symbols, enlarge the size of the signposting and/or the use of eye-catching colours. A second possibility is the exclusion of outer (visual) noise to reduce the negative effects of external, image-compromising elements. The resulting effect is that the peripheral markers cannot attract the spatial attention in the typical automatic, stimulus-driven manner and thus the attention on the elements actually displayed increases (Carrasco, 2011). Thirdly, the reduction of internal noise will also positively affect the perception, assuming that the perceptual filter for the current task has a Gaussian shape centred on the fixation point in the middle of the perceived item. Internal noise in the characteristics of mental disorders, affliction or disability will process inefficiencies in the visual system and will limit the performance of orientation (Doshier, Lu 1998). Forward-thinking designers need to take catering for children, support for older people and support for people with disabilities into consideration when developing a guidance and routing system in order to avoid creating the illusion of a second-class status of those groups.

Today, many examples of user-friendly wayfinding can be found in airports, hospital settings, commercial malls, museums and other large public settings. During the design process it is expected that the graphic display would be carefully considered in order to achieve the wished-for level of visual attention that would match the semantic dimension. How these targets can be achieved is often laid down by the designer(s). The development and design process of a complete orientation and signage system itself is mostly linear. Often, the formal, syntactic qualities of the design are influenced by the architecture of, for instance, the airport terminal or by, for example, the airline companies as its prime tenants. They often have wishes and requirements relating to the design of the airport signposting. The denotative (in the strict dictionary definition of the word) and connotative (the emotional and imaginative association) aspects of the graphic messages must often be subordinated to the interests of the prominence, loudness, impact and/or sheer presence that the message should have (Skaggs, 2010).

2.8.7 One Way Forward in the Development Process

In the previous chapters it was shown that the development of public symbolic systems was encouraged by internationalization, and the increasing use of technological systems has led to the need for standardised visual sign systems. It was found that models of semiotics and semiology are perhaps more appropriate as methods for critique rather than for improving communication, orientation or mobility. Semiotics and semiology's tendency to reduce everything to language does not offer new insights, as a language-based analysis is inappropriate for images: Images do not have the same structure as written language (Storkerson, 2004). A thorough knowledge of human factors is more apt for applying a broad set of methodologies that will enable designers to deconstruct communication problems and to design and evaluate solutions for guidance systems. The majority of all designers follow a (hidden) methodology when designing (Cooke, 2008). It is usually far beyond any of the conventional practices to formalize a structured design methodology and test their effects on the design process, because it is the designer's fear that simplicity and spontaneity will get lost. However, a structured approach could help the design-development to deliver a more effective piece of 'signaletique' or signage. Throughout the development process of an orientation system, right up to its implementation, and also for existing guidance systems, it is now possible to make

detailed and multifaceted statements about the usability of the system with the aid of the situational awareness of the different groups of users. The index of the situational awareness can be used from the first idea, through the planning phase, right up to completion and can act as a connecting and corrective element.

2.8.8 Process Towards Development

The planning stage of a wayfinding system usually starts with on-site (local) considerations regarding architectural and environmental features. Sometimes there are already certain requirements to bear in mind, such as landmarks, namings or existing signage or other additional factors that have to be respected. The development of a usable guidance system is an iterative process whose goal is to gather knowledge from the general and non-specific user-centred design process. This principle takes the Scandinavian tradition of participatory design into account (Kyng, 1995), which invites users to be involved in the development process. This point of view has as its focus the question of how to develop tools, techniques and theories to support major aspects of different roles of users, including cooperating with professionals, like designers, architects and operators, in the guidance development to manage personnel and resources in order to design and build an information system that enhances the quality of life (Kyng, 1995).

When developing a guidance system in airport terminal buildings it is also important to look at how the placing of the signage will influence passenger flows under different conditions and how automaticity can be formed in this flow. To avoid stress and disorientation, it is necessary to already provide passengers with pre-visit information before they enter the building and/or area. There are many options from online orientation maps, brochures and information films or the technical use of online services such as Apple Maps, (© Apple Inc.), Google Maps (© Google Inc.), Bing Maps (© Microsoft), Here (former Ovi Maps and Nokia Maps; © Nokia OY), Baidu Eye (© Baidu) or Google Glass (© Google Inc.).

The next step is to define the major needs of the terminal and transport interchange facilities with a focus on the demands for the population, and the needs for scheduling the airline traffic. Start by defining the design problem and prove its significance. If visual communication cannot contribute to its reduction: define the design problem again. A good design-description will point to the solution (Mollerup, 2005).

Intermodality between all forms of transport is critical to consider in terminal and interchange design, because safety and security are key components. Airports are often the point of entry to or exit from sovereign areas and have to meet the needs for security, immigration, and commercial purposes in an airport terminal environment. Terminals are also places of massive movements of people. This requires a special consideration to prevent dangerous situations and manage them effectively, implying segregated access and emergency escape routes for both the public and the rescue forces. The overall design has changed over time from resembling a type of Victorian railway station to a kind of a shopping mall. Terminals and interchanges are designed under security considerations to meet the needs of checking passengers and their possessions so that no passengers evade or avoid the checking procedure and to ensure a minimization of discreet locations where suspicious packages and baggage can be hidden. The requests and requirements of the transportation operator are going in another direction. They want to get the passengers through the building as quickly as possible. As developers we have to ask: What are the causes of the problems, what is the real bottleneck, and are there related problems? Is there something specific to this special environment? There are also problems similar to those that occur in other projects to solve, such as deadlines to meet, or ecological and economic aspects to integrate into considerations. The result of this first brainstorming will be a problem description that serves as a job assignment for the planners (Mollerup, 2005).

An often-underrated factor is the composing and choice of an appropriate team. To leave the planning to professionals will prevent discussions later. It has to be examined whether or not the team has the necessary qualifications and if the team members are available (when needed). The optimal group size and the areas of responsibility have to be determined based on a variety of factors, including complexity of the task. The result is a description of the organisation and the decision competencies of its members (Mollerup, 2005).

By taking due account of the problem description from the start of the planning stage of the guidance and routing system, we can start comprehensive information gathering. On the basis of our objective, that the usability goals and design criteria should control the development, we have to gather quantitative and qualitative data to enhance the design problem. Questions about the intended circulation and expected pathways will suggest the complexity of the task. To meet the human factors in our examination we must also include different defined target audiences and special groups needing particular attention (like special language requirements or assistance provi-

ded to disabled persons and persons with reduced mobility) in the analysis. This survey will be constructed using the elements of situational awareness to gain sufficiently valid information about the requirements of the informational system. Practical questions need to be answered such as: When will the site be used? How will the site be reached? It is desirable to develop an overall design concept that combines architectural, media and graphic elements, where building patterns can be seasoned with landmarks and in which corporate branding or other commercial considerations can influence the media. It would, therefore, also be useful to meet the special requirements of tenants and/or security specifications. At this point, the question of the need for permission from public authorities should be clarified. Expert inspections and a user testing method might be applied in order to find out whether or not the places and functions are understandably named. Experience and know-how can be gained from similar comparable properties in order to obtain comparable results. The final results of the survey will influence the wayshowing development (Mollerup, 2005).

An assessment of the findings of the previous survey should make apparent how the estimated users read the environment. It should have been clear which special audiences have problems in wayfinding and the reason, mostly directly caused by object-based attention between objects and locations. The time factor and nodal points for critical situations have been traced and described as problem areas. Names for places and functions of the system components were examined for their descriptive indication, consistency and their degree of comprehensibility for the user. The result is a task description of requirements tangible for all user groups. This report results in the setting of goals that are essential success factors in enabling one to navigate safely through our formerly indicated problem areas.

In the subsequent parts of the process a comprehensive wayshowing strategy is evolving to meet the requirements defined before. These stages will deal with the questions of fundamental wayshowing strategies, such as markings or directional signs, y-a-h (you-are-here) maps or directories, information desk with staff or dynamic monitors/electronic mobile devices, as well as all questions about pre-visit information. This also establishes whether the planning is fulfilling all requirements and covers all groups. The outcome is a strategy for the complete orientation and signage system including a list of pre-visit requirements. It should be ensured that the responsible persons receive comprehensive and timely feedback on the intended processes at this stage.

The following section sets out the specification of the messages, graphics, sign types and positions based on the wayshowing strategy. It will deal with the puzzle of what kind of messages should be provided, at what precise place, which type of signs are needed and how they should be mounted, dimensioned, positioned, lit, etc. It will also give an answer to the question of if ad-hoc (short-term) signage might be needed or if dynamic signs and monitors can also fulfil the task. This part deals with the typical questions of the process of communication, that is to say: **what, in which channel, to whom, with what effect?** (Laswell, 2007). The planner of the communication chain as the 'communicator' has to look closer at the factors that initiate and guide the act of communication. It is the first analysis of the effects on the audience and a proof of whether or not the agreed channels are an affordable and effective way of reaching the target audience.

The result is a flow chart (see example on page 98) with the essential steps for architects, designers, and consultants to develop creative concepts for a sign plan, and it also serves as a starting point for graphics and physical designing of prototype graphics. The process methodology will help to keep track of the goals of the guidance and orientation system and at the same time serves as a comprehensive resource for planners, designers and providers. Important questions will be answered and statements will be made in the control loops where the examination methods, like the situation awareness, cover such elements as positioning, identification, or even the quantity of the signs, their basic elements, typography, sign elements and the use of colour. The results of these findings can be used to clarify and broaden the basis for the drawings of formats and grids of the signage in an efficient and very clear and readable way.

With the aid of the specifically developed methodology in the flow chart, the hardware of the signage can be developed and specified very easily, that is, the right amount, the needed types of mounting, lit or opaque, for external or internal use and so on. The result of this step is a manual in which models of all types are included. This first layout of the guidance and orientation system evaluated can be examined by the situation awareness method to ensure goals of the way-finding and orientation system.

This is followed by a preliminary test, featuring members of the target groups in a small-scale environment. The results of the test will lead to slight modifications of the graphic. If the result is a successful test, the responsible person can start implementing the plan and engage in a full-scale roll out. If the test was not successful, then the designers have to re-evaluate the design objectives and restart the test. The different perspectives of the situational awareness with the

help of various methodologies are a technique for decision-making in an uncertain orientation process, and a way to achieve an evaluation of already-established guidance systems that seem to have vulnerabilities. The case studies from practice, presented in the following chapters show that the different ways of addressing a problem with the methods of situational awareness are clearly established and applied. (Winter, et al. 2000) The examples also underline that situational awareness is a great support to apply a helicopter's perspective towards priorities in order to master the challenges of a constantly changing environment during the various stages of the development process of a guidance system in public spaces up to the final implementation.

Situational awareness is a fundamental method of looking at things and can therefore be used for every user-oriented consideration. In the theoretical analysis of a design process, as described in the adjoining fig. 59 (page 98/99) and shown in the following example (chapter 4.5, p. 219) is displayed how and where the help and application of situational awareness can be identified. In the first definition phase, the situational awareness serves to define more accurately the chosen target audience and to identify the real communication problem of the orientation system to reach a clear working hypothesis for the next steps. In the divergence phase, the next step of the design process, the situational awareness supports the preparation of an accurately aligned profile for the users of the forthcoming guidance and way system. The possible different types of applied methods will help to keep hold of the big picture in the work process, and also to identify groups who need special help or information. In the third phase (transformation) the types of examination of the situational awareness can contribute to meet the defined targets. Hereby it is possible to establish rules of decision-making and to take the different perspectives of individual factors, task factors and system factors into consideration. This makes it possible to counteract according to the results obtained case by case and to find appropriate solutions to eliminate disturbing influences in the orientation system. In the convergent phase the different perspectives of the situational awareness can also review the effectiveness and efficiency of an already established guidance system and help to uncover potential problems in the final application after the implementation and completion.

After a period of use, the effectiveness of a guidance system should be measured in an evaluation with the different perspectives of the situational awareness by visitors and staff alike. Mistakes and omissions can be detected and corrected. With the view of the situational awareness we can learn from past actions to recommend improvements for future projects. (Mollerup, 2005)

2.9 Design is a Journey not a Destination!

The umbrella of methodologies of situational awareness with its different perspectives offers tools and pathways to derive the goal by triangulating. It is therefore suitable as a predictive technique for the process development for passenger/visitor flow management and will assist the designer during the planning phase, preventing unpleasant surprises and the need for costly countermeasures at a later date. General orientation and guidance as a valuable system in public life has to become increasingly manifest.

With the different simulation tools of situational awareness, we will achieve sufficient predictive accuracy for processing methods to improve visitor guidance at the planning stage and also to assess the post-processing long after the completion of the project. The application possibilities of situational awareness in assessing the actual behavioural situation of an individual – and defining the desired future behavioural situation – in the environment is an invaluable tool to achieve the goal of clever visitor guidance. This avoids negative connotations and removes any doubt. The following chapters with examples of particular cases will show how the methods help to offer a working solution and demonstrate the predictive validity on the basis of the findings.

The groups of persons are illustrated exemplarily and may vary from case to case. The process chain will take into account all the customer specifications and will be customized, adapted and perfected to also respect local parameters.

*fig. 59 next page:
predictive support in the
design process.*

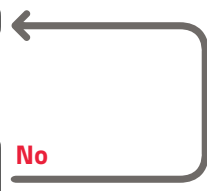
Definition Phase

define the guidance problem
What is the real bottleneck?



is the problem significant?
can visual communications
contribute to its reduction?

No



Yes

define causes
of the problem:



define personas



Situational Awareness
to define the target group

begin divergent search



gather quantitative data



enhance design problem



wayshowing strategy
process of communication:
orientation and signage system
incl. pre-visit requirements

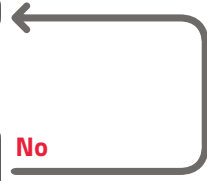


graphic and physical design
of prototype graphics



are the agreed channels an
affordable and effective way
to reach the target audience?

No



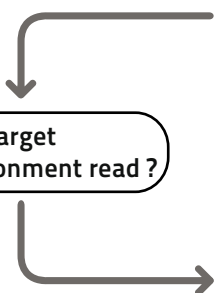
Yes



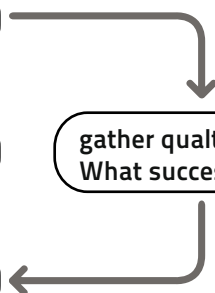
Situational Awareness
to get a 'big picture' of the tasks

Divergence Phase

visually research target
How will the environment read?



gather qualitative data
What success criteria?



Transformation Phase

design specifications manual

exhibition to members of target

are graphics appropriate?

No

Yes

test in small-scale environment

was the test successful?

No

re-evaluate design objectives?

Yes No

designer blithely disregards the fact

Yes

roll out full scale

measure effectiveness

is the guidance effective?

No

Yes

recommend improvements

Convergence Phase



Situational Awareness
for testing the results



Situational Awareness
for testing existing systems



3.1 Early Contact with the Infrastructures of Public Guidance Systems

The impetus to conduct research on public wayshowing systems was practice driven. The various forms of doubt of different visitor groups and their associated disorientation in a public area appeared during the investigations at the Düsseldorf International Airport [DUS]. It was my first introduction to airport terminal signage, in terms of their effectiveness as universal pictograms and/or as a useful strategy for evaluating the visibility of signs at all. I had the opportunity to play a role in an investigation at the Düsseldorf Airport in the autumn of 2008. My responsibility was to find design solutions while working as Creative Director for Benning, Gluth & Partner, Gesellschaft für Kommunikation mbH, Oberhausen, Germany. The project was initiated by Patrick Croonen, Head of Retail Activities, Department of Non-Aviation, Düsseldorf International Airport. Düsseldorf is the third largest airport in Germany, with 17.8 million passengers in 2007, but had experienced shrinking numbers engaging in retail activities like shopping or visits to restaurants. The questions were raised: How is this possible and how could Düsseldorf International Airport be improved in order to make it a delightful and enjoyable place to start a journey from, to stay or to meet and greet?

The initial findings of my investigations at Düsseldorf International Airport made obvious that the locations of all the shops and restaurants are difficult to find; spatial guidance is hidden for inattentive passengers. A possible reason could be that it is a result of the turbulent transition period following the devastating fire of April 11th, 1996.

The development of the Düsseldorf signage system was a gigantic undertaking completed in just six weeks in 1996 by a team of designers from MetaDesign, based out of one of the airport hangars. The airport had to be reopened just a few days after the tragic Düsseldorf Airport fire, with an inoperative terminal. The main task was to reassure passengers and airlines that order and safety would be quickly returned. The designers had developed new directional and security signage for the airport in just six weeks before vacation traffic was set to quadruple. After mapping and analysing the existing system, the content and position of new signs were quickly defined, tested and established. There was very little time for experimenting with different typefaces or colours, the MetaDesign team built on their experience and created rapid, tactical solutions based on lower cost systems. All 2,500 signs were completed and installed within six weeks. After the reopening of the new Terminal Halls A, B and C, a series of workshops with the manage-

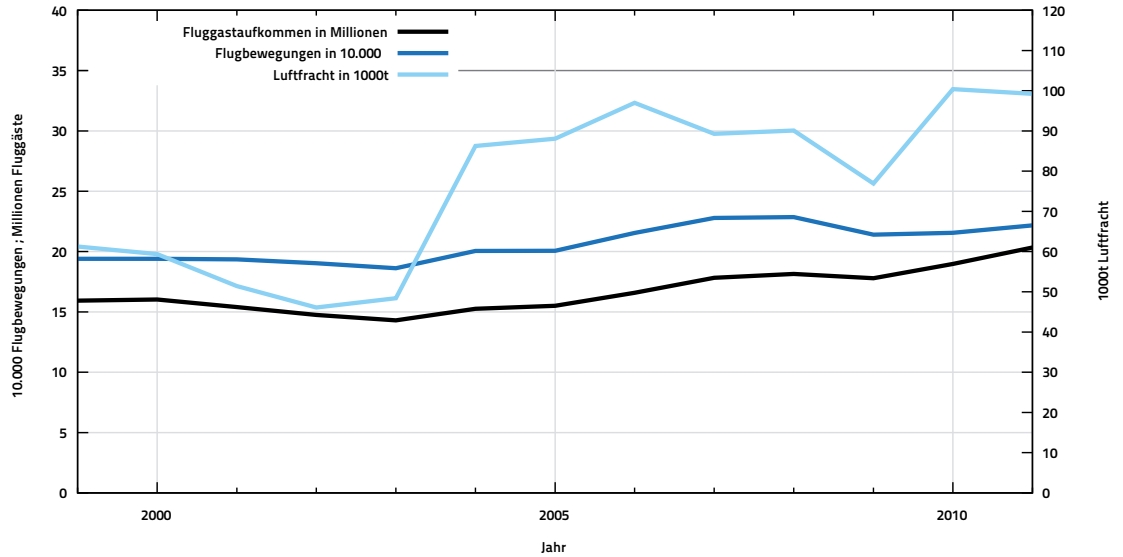


fig. 60 Düsseldorf International Airport, statistical data

data from duesseldorf-international.de

ment of the airport were held in order to establish a common vision for developing the final logotype. Another important duty concerned providing a visitor guide with a consistent reinforcement of location and direction with the aim of helping customer orientation and providing a sense of security. In early 1997 an architectural competition decided on how to redesign the damaged terminal to reopen. The new terminal design highlighted architectural clarity and a striking glass roof was designed by architects JSK, Frankfurt. A joint venture group was established - consisting of the Hochtief, Bilfinger + Berger and Philipp Holzmann companies - to build this terminal, named "airport 2000 plus". It was completed in the summer of 2003. It was one of Europe's largest construction sites during this operation. The new terminal had the ambitious goal of making the airport one of the safest in the world. The area is designed for 22 million passengers, with check-in terminals A / B of Pier B and airport parking.

In the earliest stages of my investigations at Düsseldorf International Airport, it was obvious that the brilliant clear and open space of the check-in hall made the locations of all shops and restaurants difficult to find. Spatial guidance was hiding behind architectural guidelines. Inattentive passengers had problems in finding the security gates, toilets or the recreation areas. I also figured out that there were more different groups involved in the quest for spatial information for guidance purposes than just "PAX" (travellers or passengers). Also, those travellers have different modes of behaviour that affect their reaction to and interpretation of pictorial representations.

The highlighting architectural clarity aspect of the building made it somewhat impossible to position clear signs at nodal points. Exits and pathways were hidden behind the check-in counters. From a passenger's point of view, the needs are very clearly structured. The various steps of an air trip are mostly similar in most of the airports worldwide:

The primary goal of a journey by air is a safe and quick arrival at the airport. In Düsseldorf, there are several different possibilities: travellers can arrive by car, in their vehicles or a rented car. Good parking facilities support both opportunities. It is also possible to arrive quickly and safely by public transportation, such as by taxi, bus, metrotrain or long-distance train (German InterCity-Express ICE).

A suspension railway connects all arrival points. This railway has stops at the train station, the parking lots and the departure concourses of Terminals A, B and C. After arrival at the Terminals, check-in counters are easy to find,

fig. 61 "user-specific general sequences of start and end points of the fundamental passenger route"

Primary and Secondary Goals of Airport Passengers at departure

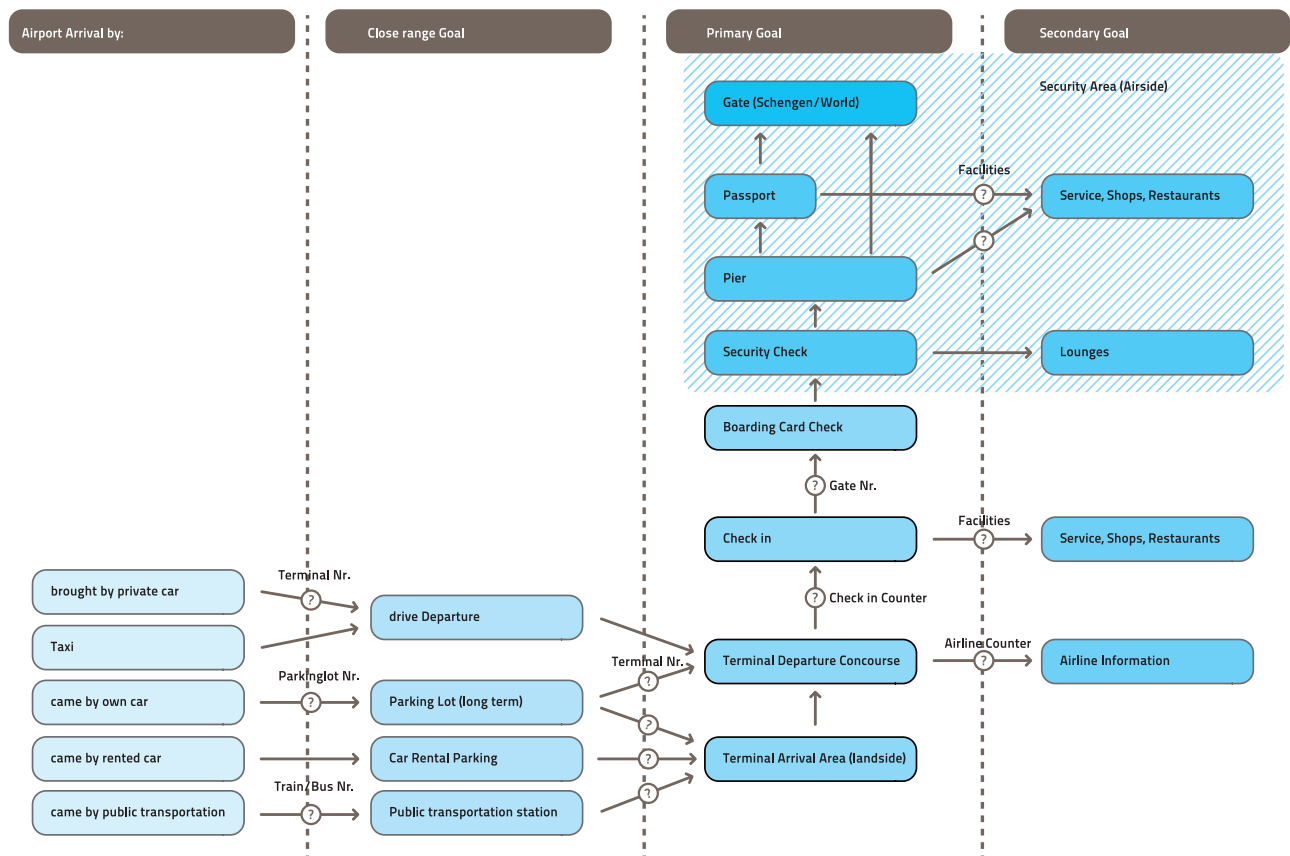
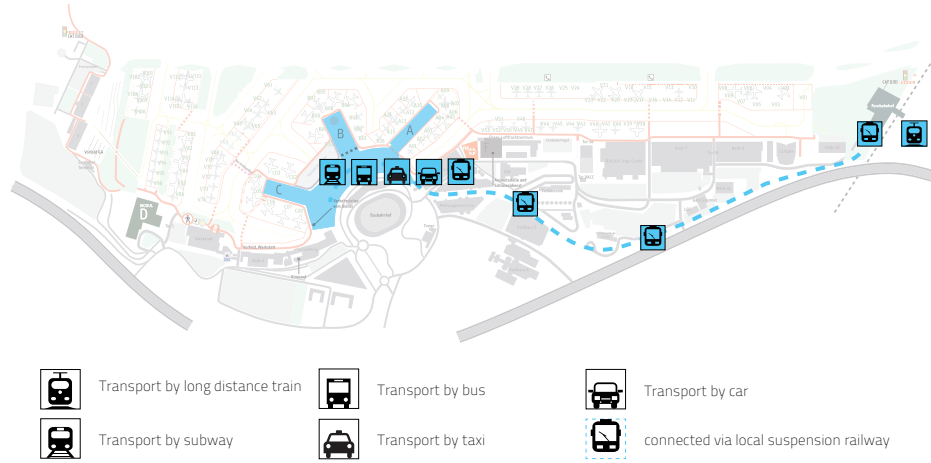


fig. 62 Connectivity at "Düsseldorf International Airport" terminals A, B, C (blue) by public or private transportation is very good.

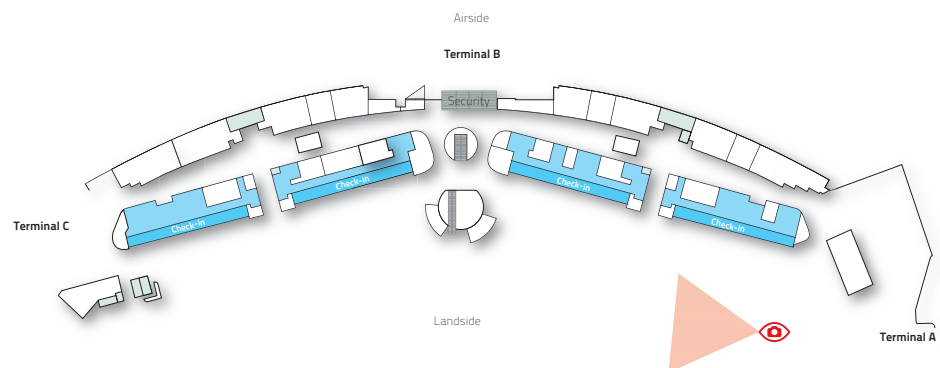


they start sequentially from 1 to over 300. Large displays show the right desk for each flight. A task that usually occurs simultaneously with check-in is baggage drop off. After that procedure, the passenger has been relieved of all duties in the landside concourse until the boarding procedure starts with the boarding card and security checks. The passenger has to enter the airside concourse for final boarding of the plane at the gate. This moment will cause

fig. 63 Typical passenger view in check-in terminals A / B / C Düsseldorf International airport



fig. 64 Camera position terminal A, to check-in terminals B / C Düsseldorf International airport

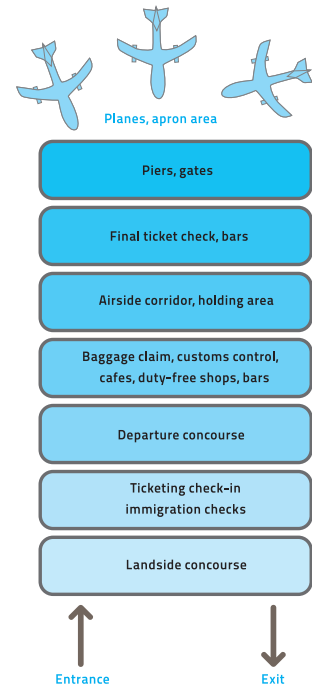


the greatest irritation to the most travellers. The typical feeling experienced in Düsseldorf is the sense of being lost in a large hallway.

Signposts are not readily visible, and when they are, they are often more confusing than clarifying. Important facilities for human needs, such as toilets or cafés etc., are hard to find. The schematic structure of the Düsseldorf airport is identical to many other airports. “Airports” in general “have been conceptualized as the archetypal ‘space of flows’ in an emerging network-based global economy that values process, speed, improvisation, and organizational flexibility.” (Knox, 2007, 265-284). Susceptibility to stress and an aversion to consumption mark the mood of many passengers during departure and arrival. Due to poor signage, complicated handling systems and opportunities that are not communicated, as well as the poor networking of different service companies operating, it is often difficult even for skilled people to find their way through the jungle of an airport.

Countless studies confirm the difficulties passengers often find themselves experiencing when confronted with aiding signs or text-based signage systems in a strange and busy environment. Discrepancies with the usual orientation strategies employed by or familiar to the passengers, coupled with fatigue, stress and time pressure, can quickly lead to frustration and discomfort. My first insight was that there is a complete lack of an “airport culture” in Düsseldorf. An airport, as a public space, is not only a waiting room; it needs an emotional landscape. In order to satisfy the greatest possible number of people and to inspire passenger confidence, the airport operator has to meet multidimensional demands. These include recreation, food, entertainment as well as the interests of the passenger concerning each individually planned trip. The second insight was that there are more groups, or stakeholders, involved, not only the ‘PAX’. I called them “push” and “pull” audiences. “Push” visitors, as potential consumers, are already at the airport, either as a passenger or accompanying one (i.e. seeing someone off on a flight, or welcoming someone arriving). “Push” visitors just need to be awakened and informed. “Pull” customers, on the other hand, can be lured to the airport. This group includes, for example, planespotters, weekend shoppers, wanderlust addicts, jet-set nerds and so on. Special events could strengthen the maelstrom. Both groups require different attention, and both react differently to all kinds of signage. A rushing traveller, pressed for time, is often not able to see the surrounding signs clearly. Their behaviour could be described as fuzzy and disoriented. Orders, therefore, must be clear and easy, meaning signs should be clear, visible and understandable.

fig. 65 Schematic plan of a terminal building



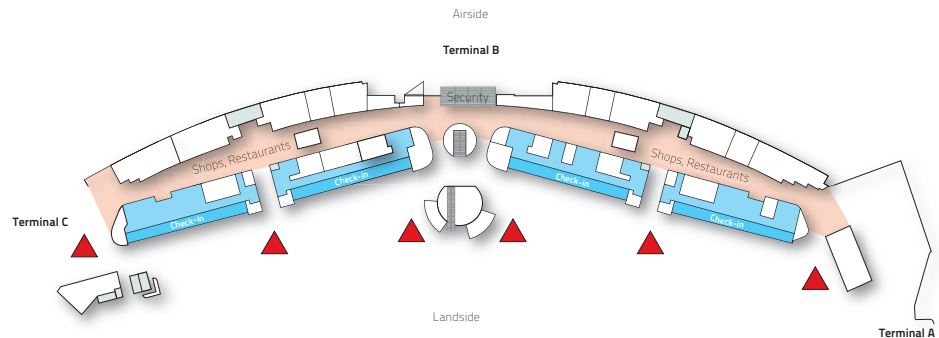
In Düsseldorf Airport, the delays in traveller flows arose through architectural parameters. The gates were too small and often hidden while the recreation and security facilities were not easily found at first glance. To meet the informational point requirements, I began with large and visible design proposals first:

fig. 66 Terminal with promoting flags



fig. 67 Terminal Plan with entrances from the check in hall (blue) to the restaurants and shops (red)

Schröppel 2013



Another proposal was to use floor- and wall-projections for guidance. Both of these ideas were not well received by the airport management as they were deemed not to meet the needs of passengers. These proposals are more confusing than helpful. They might work better in a shopping mall for example than in an airport as a major nodal point. The solution eventually adopted to resolve this communication problem was a printed brochure, handed out to customers at the information desk. In retrospect, when a test run was carried out, it was found that the brochure also does not match the needs of confused travellers. Another ultimately unsuccessful idea, for printing a map on



fig. 68 Foldable map

Benning, Gluth und Partner;
2008



the back of the boarding card, failed because travel agencies and airline carriers were concerned about missing their corporate branding opportunity. A rather more unusual idea of mine was, however, received very positively

fig. 69 Ticket case

Benning, Gluth und Partner;
2008



and translated into reality. A piano was placed in the restaurant area and a pianist played well-loved and widely known pieces of music from a variety of genres. Attracted by the sound of music, which is in a way infectious, more and more people found the way to the restaurants, cafés and shops. The use of music was an internationally accepted and unifying concept which worked much better than any present visual signage system.

fig. 70
Idea: permanent piano



3.2 Signage without signs: Krefeld Hospital

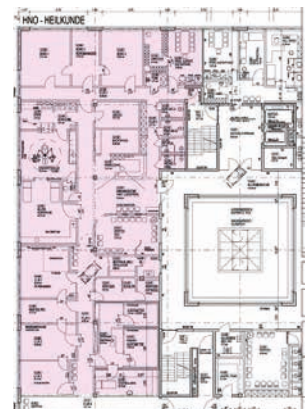
The assignment was to eliminate uncertainty when patients are visiting doctors or emergency rooms. Simultaneously, consisted the task the creation of a greater reliability of the guidance system at the Ear-Nose-Throat doctor surgery; FAZ Krefeld, Germany: Facharztzentrum · Specialist medical centre. The owner/builder and property developer was Alexianer Krefeld GmbH, belonging to the Roman Catholic congregation called the Alexian Brothers. The building was designed and constructed by KFP Architects in Krefeld, from 2008 - 2010. The new building has a volume of more than 29,345 cubic meters in total, with a total constructed area of 4,500 m².

The Maria Hilf Hospital created a specialist centre for doctors in 2010. The four-storey building was built on park-like grounds in direct connection with the Maria Hilf Hospital itself. This new medical centre, the FAZ Krefeld, combines nine specialist medical practices and a pharmacy under one roof. The goal of the medical centre was to promote the cooperation and optimization of medical and organisational processes and to enable a closer integration between inpatient and outpatient providers. The ENT (Ear-Nose-Throat doctor) practice-oriented partnership (Hals-Nasen-Ohren-Praxispartnerschaft Krefeld) of Prof. Dr. Chr. O. Greven, Matthias Buß and Prof. Dr. Claus Bachert, doctors for Otorhinolaryngology, speciality phoniatics and pediatric audiology, all decided to move into this new medical centre building.

As early as the development phase of the corporate design for the practice-oriented partnership, it became very obvious that the key visual element has an important role in the guidance system of the whole medical specialist centre in order to distinguish the different services. As professional designers, both my wife, Natascha Kelka, and I developed the new logo and the new appearance of the practice-oriented partnership as part of the corporate design. The corporate design elements included business stationery (for example letterheads and business cards), advertising (flyers, brochures) and the internet launch.

The advantage of the efficient and serial construction of functional modern buildings can develop into a disadvantage, because visitors are confronted with the difficult task of orientation in multi-storey buildings with a monotonous spatial structure. The functions and space partitions in such buildings often do not satisfy the expectations of the visitors, that is, by being related to a logical route through the building. Wayfinding is, for the

*fig. 71 and 72
The ENT (Ear-Nose-Throat doctor) practice in the FAZ medical center building, Krefeld, Germany.*



most part, not a major factor in hospital architecture due to commercial interests. However, architecture is an important factor for easy wayfinding. To prevent anxiety in patients, visitors, suppliers and staff, the standard cure for wayfinding problems is usually more signage (Mollerup, 2009). Visual impairment, reduced mobility or reduced mental capacities can result in or intensify wayfinding problems in such complicated built environments. To counter this, it was planned that standardised signposting systems would be installed in the Krefeld public health centre. KFP Architects followed the practical rules; that is, rules on the use of pictograms, rules on the exact location of signs, and rules on the redundancy of signs were directly included into the planning of the signage system. The human dimension of wayfinding as a combination of old habits, fundamental characteristics and newly awakened assumptions was not questioned.



fig. 73 The logo as key element of the corporate design for the Otorhinolaryngology practice partnership.

On the basis of a profound study performed with staff and patients, my wife Natascha and I developed the logo of the ENT practice with the intention to represent the doctor's surgery as a trademark. With a clear structure and a strong colour, the logo can also act as a landmark for orientation both outside and inside the building. The design takes account of the different strategies for orientation that human navigators have developed for orientation. Directional signs with arrows help the visitor to go from the entrance to the medical centre to the specialist medical practices. To avoid monotony in the corridor, and to gain the attention of the patients, the task of the logo was to act as a source of wayfinding information, both outside of and inside of the building. Numerical and Alphabetical information on doors help the visitor to understand the direction.

In our doctor's practice, we have three different specialist doctors, each with a different scientific background in their specialist fields. Those manifold special studies in diverse medical fields can be poorly visualized. The question arose of how to convey this difference to the patient without the use of misleading signage. For spatial orientation, people use similar mechanisms as have been detected in experiments involving animals (Spitzer, 2006, 2014). Along a real executed movement in space, were salient points with the intention for patients to use them as elements for a personal cognitive map. If a path is taken several times, it will be memorized more strongly. Starting from the very first initial discovery, leading to a dim reminder to a routine movement with a good memory, until a habit is formed with very good memory abilities.

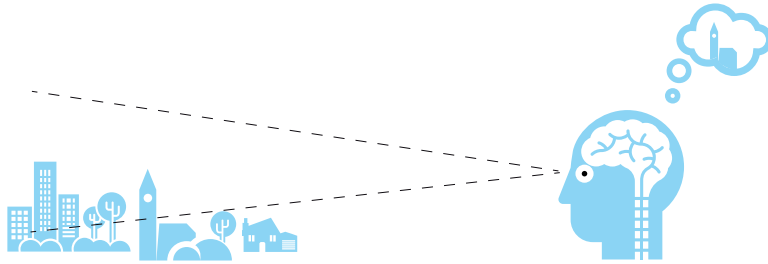


fig. 74 bottom-up process in the working memory to get one's bearings in a new environment

The points are an integral part of the initially learned, and subsequently internalized, route. In the beginning, it is clearly a cognitive bottom-up process. Later, when the habits become repetitive behaviours, it turns into a top-down process. However, to develop such a mental map, landmarks must be visually present. In nature, as in our urban world, such landmarks are easy to recognise (except in social housing projects).

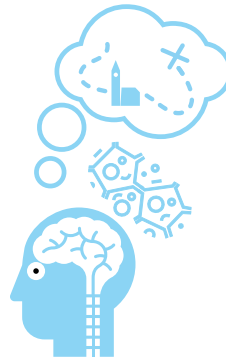


fig. 75 bottom-up process building space cells for the new environment

Through this, place cells can be configured in the hippocampal area of the brain. This area stores the place, distance and location of the memorized visual mark according to one's current position as a point of reference.

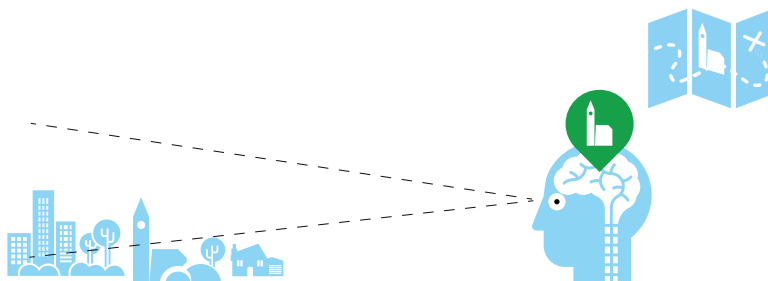


fig. 76 top-down process in the working memory remembering the environment

If the memorized location point is fixed, time-independent and visible at all times, the memory-based information can be remembered, with the result that our visitor can recall the once learned route or way. Further repetition of the same journey will return the stored images to mind and also question the validity of the memorized elements in order to adjust them, if necessary.

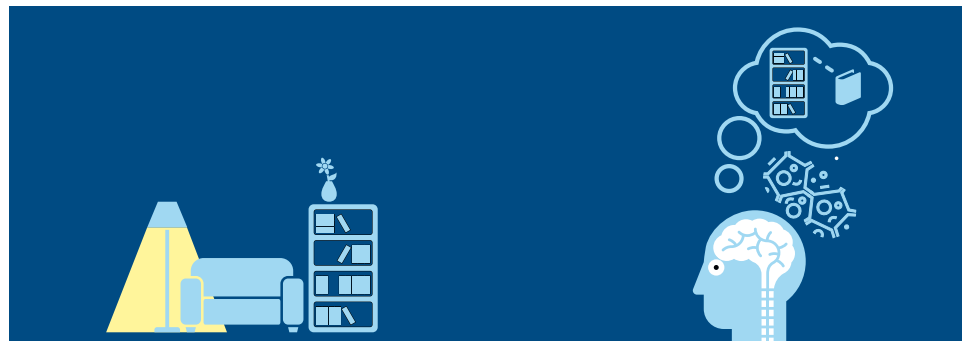
Not all of the visual points are authentic and intelligible. A cognitive map of older persons often includes memories of places or events that have disappeared over time, have changed, or nomenclatures that are no longer in use. Noteworthy here is, however, that a sudden confrontation with visual impressions from earlier times can influence the memory effect of a personal mental map and the already accumulated route will be recapitulated and remembered again.

*fig. 77 top down process
in the working memory
remebering the environment
at home*



The same phenomenon can be observed in enclosed rooms. People are able to memorise, within a short period of time, the size and position of objects in a room and can find their way in the room within a very short time frame. This ability also functions in complete darkness.

*fig. 78 top down process
in the working memory
remebering the environment
even at night.*



This goes so far that objects can even be retrieved from this room. Their location is remembered.



One of our targets was to promote the development of a mental map of the doctor's office for visitors and patients. Various elements were positioned to allow forming mental maps and to enable the memorisation of the pathways and processes in practice. The logo of the practice is such an element, accompanying visitors from the car park to the entrance, to the practice itself and will remain enlarged in the background of the reception counter as a reminder.

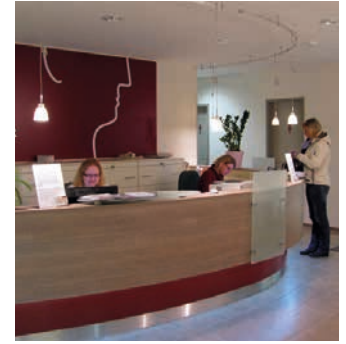


fig. 79 Entrance at the Otorhinolaryngology practice partnership.
left: rendering by Natascha Kelka, 2010
fig. 80 top: photo taken shortly after the completion, 2011



The different doctors with their various departments are distinguished by different colours. This was also important keeping in mind that many children are treated as patients. Children are sometimes overwhelmed by the medical terms.

In our example, we want to call the two doctors, for the sake of simplicity, Dr. Green and Dr. Red.

A patient has a referral to Dr. Red in the specialist practice. S/he has found the practice and has checked in with the receptionists at the information desk. Now s/he is to wait in the waiting area for his consultation with Dr. Red. Here, common practice is to call the patient, who is seated in the waiting area and explain to them which door leads to the office/examination room of Dr. Red.

After an initial visit, the patient has usually memorized the face of the attending physician, but rarely the way out of the treatment room. To emphasize the distinction between the various doctors, Dr. Red gets a red waiting area and Dr. Green, in a similar fashion, a green area.

fig. 81 Who is Dr. Red

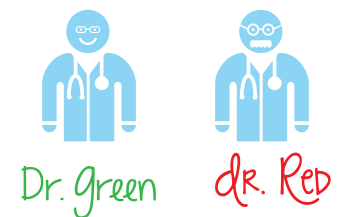
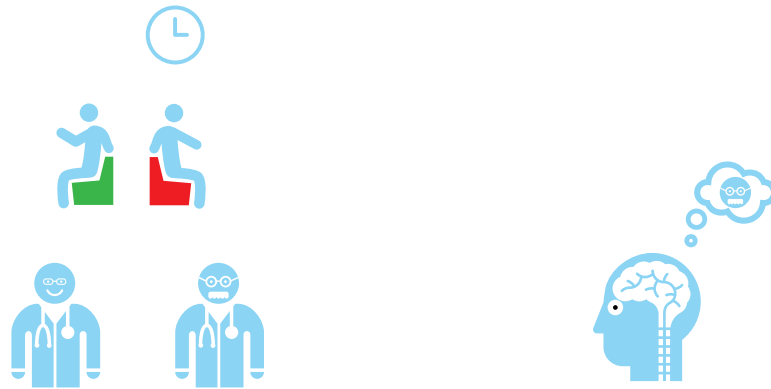


fig. 82 Which one is the attending physician?

fig. 83 and 84: waiting area
in different colours



As a result of various visits with the consultant Dr. Red, the patient will soon find the way to the waiting area independently. This type of guidance without signposting is not only suitable for children and the elderly, but also for people with language difficulties or a lack of language skills.

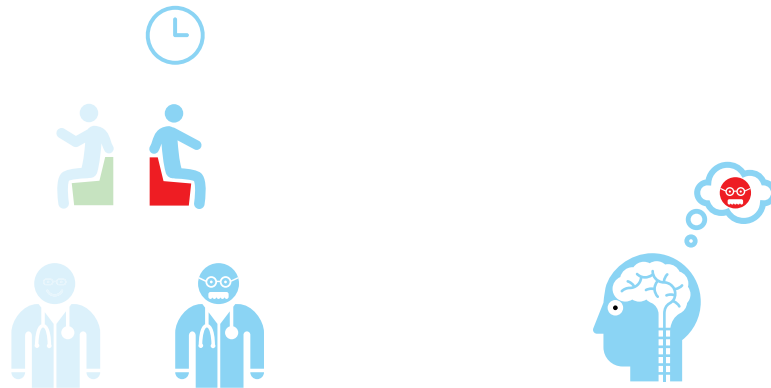


fig. 85
Draft of the waiting area

The additional waiting area, clearly marked as such, is particularly characterized. The choice of different coloured seating will serve to strengthen the guidance.

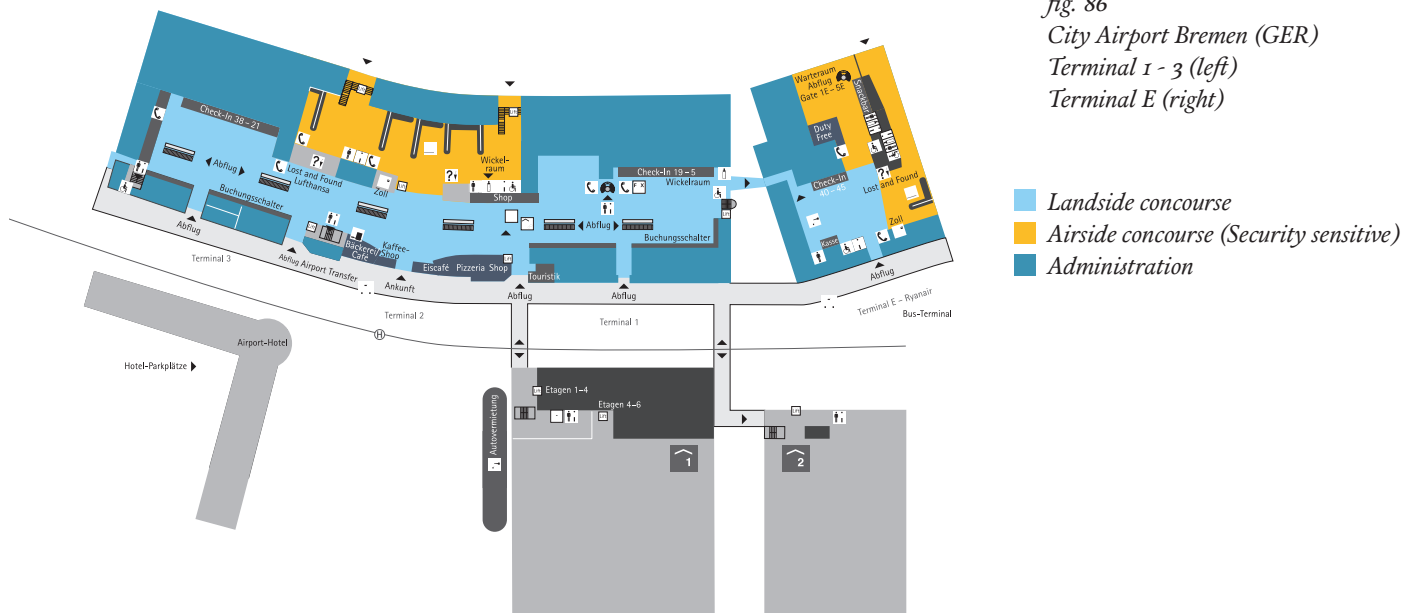
This example shows that it is possible to develop intelligent guidance system solutions for public areas, with the assistance of cognition psychology, especially if one leaves the trodden paths and ignores the conventional perspectives.

3.3 Testing and Optimizing the Visual Saliency of Signs

Available possibilities to test and improve an existing signage system, as presented by the example of the City Airport Bremen (IATA: BRE).

Bremen airport is an international airport, located 3,5 km to the south of the city centre of Bremen, the third most populous city in northern Germany. You can get from Bremen's main station to the airport within a mere 11 minutes, to fly directly to more than 40 different destinations worldwide. The City Airport Bremen acts as a full-service airport to 2.56 million business and holiday travellers a year (in 2011, Berster, 2012). The German aviation history and the Bremen airport are closely connected. The airport was founded in 1920, shortly before the airline manufacturer Focke-Wulf was founded in Bremen and Aero-Lloyd and Junkers-Luftverkehr AG joined together to form Deutsche Luft Hansa. Today, Bremen is still important from an aviation standpoint, because DASA is still located here, merged with Aerospatiale-Matra and CASA to form EADS (European Aeronautic Defence and Space Company).

fig. 86
City Airport Bremen (GER)
Terminal 1 - 3 (left)
Terminal E (right)



The city of Bremen began to develop a concept called Airport 2000 in 1985. From an industrial area near the airfield emerged what quickly became known as Airport City, in which the Airbus (airplane) factories are located. As part of this large-scale renovation work, the new terminal building arose, integrating parts of the historical structure of Hermann Brede (1968) into the

base of the new building. The architecture firm Schulze & Partner with H. & E. Campe Kijewski designed and built the passenger terminal building for the Bremen airport between 1989 and 2001. As was mentioned in the supra-regional press: “Spatial highlight is undoubtedly the central, light-filled hall that accurately traces the curved shape of the building. The lane like a layout with galleries and bridges gives this transitory place an almost urban atmosphere. City side, dominated by small shops, bars and offices, while connected to the opposite side of the spaces of passenger handling.” (Nils Aschenbeck in FAZ, 19.10.1998, Frankfurter Allgemeine Zeitung GmbH). The architecture is praised in Bremen as an example of regional modernism, as the building itself is unobtrusive in a calm rationality.

More than five airlines operate flights to the European business centres. Two hundred flights are completed weekly to hubs like Munich, Frankfurt / Main, Zurich, Amsterdam, Istanbul, Paris and Copenhagen. Many of these routes are served by the Bremen regional airline OLT. There are also seasonal flights from Bremen to holiday destinations like Izmir by the Turkish airline SunExpress, while destinations like Arrecife, Funchal and Hurgghada are serviced by the German airline Germania. Almost every holiday destination on earth can be reached with only one connecting flight. In the low-fare sector, Ryanair flies to 22 European destinations. In addition to this, there is taxi or company transportation traffic, for example to off-shore oil platforms or wind turbines, as well as ad-hoc charter flights or demand responsive transport. The City Airport Bremen is the twelfth (from 22) German commercial airport with an annual average of about 2.5 million passengers. Bremen Airport is classified as an international airport and seeks to serve the key European hubs on the short haul.

Twelve years after the three new Bremen terminals were dedicated, space at the airport was at a premium. To accommodate the growing needs, the construction of the Ryanair terminal was decided upon. An old, repeatedly extended, hangar dating from the 1930s was converted. With a glass façade it is opened to the apron. Only the required components, with the most favourable prices, were used for the technology needs and sprinkled as colourful cubes throughout the old hangar. With new design ideas and vivid, bright colours, the architects Bruns & Hayungs, Bremen, in 2007 composed a Ryanair world in this hangar that completely sets itself apart from the elder terminal buildings. This failed to take the wayfinding system into account. The increase in passenger numbers, as forecast by a DFS study, poses technical challenges for millions till 2020.



fig. 87
Bremen Airport, Terminal E

This was one reason to take a closer look at the wayfinding system in Bremen. In March 2011, I had the chance to visit City Airport Bremen. Together with the students of the Environmental Graphics course at the University of Lapland, I discovered that the airport is almost invisible in the city centre. It is unnoticed that aviation could be an attractive tourist magnet for Bremen. We launched a course topic to develop a creative architectural and environmental design concept. Based on the focused task of emphasising the City Airport Bremen as the ‘mobility gate of the north-west’ and Bremen itself as the most important aerospace centre in northern Germany, the task was to develop an exhibition including a main information pavilion. The design was to reflect the cultural heritage of Bremen as an aviation city and represent the progressive urbanness. The exhibition could use temporary constructions located in an esplanade (square) in the major cities of the region (for example, Bremen, Oldenburg, and so on).

The first insight of this study was handed over to the Bremen airport authority in June 2011. In August 2011, I was invited to Bremen. During a conversation with Luise Grafen, Fachbereichsleiterin (Head of Section) Terminal Service Airport Bremen GmbH, it became clear that the City Airport Bremen would in any case like to change the existing signage for passengers and visitors in its Terminals 1 to 3, the land-based outdoor areas and the car parks to a more future-based and clearer signage system. Existing weaknesses in the current guidance system should be analysed and, in a second step, eliminated. As part of a design reorganisation of the whole airport, a new and sustainable signage concept was to be developed. The integrated, uniform designation system with a renumbering of the gates and terminals should take place in view of a future redesign of the departure areas. The redesign of the appearance also included a new, attractive design for the inner and outer presentation of the airport. Based on this catalogue designation, a first design concept was to be created as a basic manual and, resulting from this, the re-labelling of the airport was planned. The graphic design agency of my colleague Kathy Wigge (www.wisuell.de) took over part of the redesign and communication with the Bremen airport. We were given the opportunity to visit the airport, both landside and airside, which gave us a picture of the current situation of the necessity of re-designing the guidance and airport signage.

An interesting aspect is already evident when first approaching the airport, that is, the rapid growth of Airport City into a major centre of innovation in Bremen, with a university, a ‘high-tech’ research centre and the

second largest Airbus plant in Germany – about 16,500 employees work in the area daily in over 500 companies. What was initiated at the beginning of the 1990s, under the heading “Airport 2000”, namely an “Airport Business Centre” with good transport links to the airport, has now surpassed expectations as a high-technology industrial park. The airport is indeed an undeniable historical starting point of the evolving Airport City, however, Airport City is more than just the airport, being primarily a workplace. Shopping and leisure activities are largely absent from urban life there. For first-time visitors to Bremen Airport, there is often the confusing question of which of the imposing glass complexes is the departure terminal. The main building of the airport is against all expectations an elongated and flat hall, which has nothing to do with the idea of a flight. The complex looks stocky, heavy and forms an association with a castle, with regular and uniform cuts making it look like a fortress. The use of the dark red brick, prevalent in the north on the external walls, reinforces the association and leaves the building with a hard-edged and repellent appearance (Manfred Ernst in Plagemann & Syring, 2005).

fig. 88
Bremen Airport City

- Bremen Airport City
- Bremen Airport



A first interesting impression resulting from our visit was how obvious it is that the City Airport Bremen is, together with Airport City, on a great leap forward, becoming an aviopolis. The airport is the archetypal ‘space of flows’ in an emerging network-based global economy that values process, speed, improvisation, and organisational flexibility and whose citizens experience

the sense of both travel and stasis, of getting somewhere and getting nowhere at the same time (Knox, 2007). For the airport authority, this means they have to work as an element in the chain of the endless rounds of global transportation. For the airport employees and airline passengers, the airport is like a living organism with its own rules, fashion, lifestyle, security needs and communication with signs, that is, icons.

On their way from landside to airside, passengers must once again show their passport, tickets, and boarding pass at the security and passport control. (Knox, 2007, p. 270). Airport employees and flight staff also have to identify themselves at the security control, where identity is constantly being questioned and re-affirmed. The main passenger concourse is structured very similarly to almost every airport worldwide. In Bremen airport this overall structure is disturbed because of the temporary corridors and labyrinthine passageways that were designed afterwards to cater for growing needs and architectural development. Reserved zones and exclusive corridors for transit and passage remain hidden to some passengers. In our guided tour we were led through a number of discrete and security-controlled entrances that gave access to corridors and passageways that articulate alternative airport geographies for airport employees but are invisible to anyone else. This is due to the growth of the various sections, contributing to a confusing overall complex. Even in the tripartite passenger terminals (Terminal 1-3, or check-in 5-38), built from 1989 to 2001, attempts were made to integrate some old elements of the previous building of Hermann Brede (1968). The old and extended hangar from the 1930s was converted with fancy design into a colourful Ryanair Terminal (Terminal E, or check-in 40-45), but this does not fit harmoniously into the overall picture of the City Airport Bremen. Even in the entry terminal, there is no stringent signage to this repurposed terminal hangar hall. The connecting corridor is more often perceived as a maintenance corridor.

The original guidance system, as used in Terminals 1-3, in the parking garages and outdoors, dates back to the planning and completion work from 1993 to 1998. The architect Gert Schulze, as a representative of functional architecture in Germany, was more about regard for the financial viability interests as opposed to the requirements of the operating company (Bremen Airport GmbH). The metropolitan traffic structure should be designed as cost-effectively as possible. Many of the paths should be almost self-explanatory for the passenger.

The necessary signage uses standardised characters in mint green on a discreet grey background. The visibility is increased by means of fluorescent



fig. 89
Bremen Airport Main Entrance



fig. 90
Inside Bremen Airport Signage to Terminal E



fig. 91
Bremen Airport Main Hall,



fig. 92
Corridor to Terminal E

backlight. An unwanted side-effect of the placement of the fluorescent tubes in the flat panel signage is a debt illumination gradient between the light facing and facing away from the lit part of the sign, which deteriorates the readability over long distances. The follow-up cost variant for the care and maintenance of these signs could not be taken into account during the planning phase. This resulted in the added expense of hiring two people to replace and maintain the signage panels, i.e. to replace the defective neon tubes to ensure visibility.

fig. 93
Left: Lighting changes in cold cathode fluorescent lamp, CCFL illumination



fig. 94
Right: Illumination not working

In exploring the signage concept of the City Airport Bremen quickly, the designer might play the role of the user and walk through the interface with a formulated task representative of the intended end user or customer. Recording such sessions on video is useful to capture the user's comments and reactions. Such recorded walk-throughs, captured on digital video, are a useful reference for future discussions in order to communicate the ideas to those not physically present. A first consideration to address the problem of an objective measurement of the signs, while using different user-case staged walk-throughs, was the idea of using a mobile eye tracking system to collect the data of test subjects on their typical path from the airport entrance to the gate and finally to the aircraft. A perfect tool seemed the Tobii Glasses Eye Tracker. The camera is able to capture what the subject sees, the eye-tracking sensor registers the reflection of the subject's eye and the microphone picks up the subject's comments. Initial contact with Dr. Peter R. Reuter (Area Manager Scientific Research DACH) from Tobii Technology GmbH, Frankfurt am Main (GER) was promising. A meeting was held in Frankfurt, which included an introduction to the handling of the Eye Tracker by Nicolas Pezarossa (Tobii Technology Managing Director). Unfortunately, it turned out that the handling of the Tobii Glasses needed so-called IR markers to specify the measurement frame for the communication with the glasses. This limitation could affect the results of the analytical framework quite seriously and



fig. 95
Expected heat map results from the Eye Tracker recordings

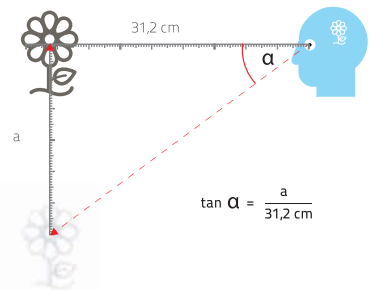
precluded the use of the Tobii Glasses for the eye tracking purpose intended. Another factor against the use of these glasses was the final price. Contrary to our initial discussions in which it was suggested that the glasses were to be made available at no added cost to the user, by the end of the negotiations a budget of around €4,000 per single observation was estimated.

In 2010, Alexander Wertheim introduced a method for measuring the visibility of signs. It is a simple and easy method to quantitatively measure the visual conspicuity of an object and could be used as a standard for quantifying



fig. 96 and fig. 97
 “Aja hitaasti” ‘Drive slowly’;
 influenced by visual noise.
 Finnish road sign, from the
 Finnish Transport Agency

conspicuity. The empirical evidence for the reliability and the validity of this method was presented, and the method allows us to answer the question of how conspicuous is this or that object. “The programme was originally initiated at the TNO-Human Factors Institute in Soesterberg at the request of the Dutch Traffic Department, who needed a simple formal rule to evaluate and formalise the conspicuity of road signs. It was later continued at the Psychonomics Department of Utrecht University in the Netherlands.” (Wertheim, 2010, p. 421). The aim is to measure the conspicuity of an object in its location against various backgrounds, at several viewing distances and in different ambient light or illumination conditions. The measuring process uses the phenomenon of lateral masking and the maximum gaze deviation in the visual periphery until the recognition of a target is lost. The result is a measured visual angle (α) which quantifies the strength of the visibility of a target object in its visual environment (Wertheim, 2010). It is possible to ascertain the extent to which the object is visually masked by its embedding surroundings, or how much it is influenced by visual noise when viewed peripherally. These results are perfectly scalable, because the measurement specifies the angle (in degrees) from the eyes of the viewer and is not related to the distance of the viewpoint. Correct measurement can be based on films, photos and computer-simulations, as long as the distance between viewpoint and object is taken into consideration. In our series of measures we used



$$\tan \alpha = \frac{a}{31,2 \text{ cm}}$$

fig. 98
 Conspicuity method
 explained.

standard rulers with a measurement scale running up to 30 cm and a cumulative length of 31.2 cm.

The visibility of an object is defined by the properties of the object itself (i.e. size, contrast, colours, brightness etc.). Each spectacular irregularity in visibility increases the value of the conspicuity of the object. The object with conspicuity markings or luminescent paint is more clearly visible, easy to see, obvious and striking to the viewer's eye. These are all qualities that attract our interest and contribute to the environment we want to have at the airport. Various specifications of the airport signage are already pre-defined, such as the size, but we started to deal with colour combinations in order to increase the conspicuity of the signs.

*fig. 99 and fig. 100
Different colored departure
signs in typical interior of
public buildings.*



In a clearly arranged environment, the different colours do not diverge too dramatically, for a passenger this is hardly noticeable. However, in a provocation of disorder in the environment, created, for instance, by the presence of poster advertising and sales promotion, our sign will become invisible by blending in with the background.

*fig. 101 and fig. 102
Different colored departure
signs in waiting area.*



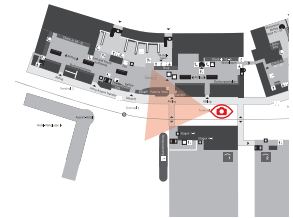
It is quite remarkable to see the difference in the two scenarios. The clear background intensifies the conspicuity effect manifold. The next question was how the change of colour could increase the conspicuity of the signs at Bremen Airport. For this experiment I have used previously existing motifs taken during my first visit at the City Airport Bremen (March, 2011). The

icons in the pictures have been only subtly changed in colour. The visibility of the signs was measured in two different study groups: one in Germany and one in Finland. The results in both trials confirmed the test series and demonstrated importantly, that the change of colour results in a huge step forward in respect to a better conspicuity of the signs. The measurement values were almost doubled, at very low costs for adjusting and maintenance. This highlights the issue that it is particularly complicated for architects to create elements of architecture that serve as guidance systems, even without destroying the alleged overall architectural impression of the building. But that exactly this is possible is shown in the subsequent examples of sign-posting elements, implemented in a modified form in striking ways in the test series:



fig. 103 Conspicuity Test at the University of Lapland, March 2011

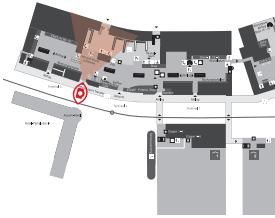
• Main Entrance Terminal 1 - 3



*figs. 104, 105
Entrance at Terminal 1-3,
Bremen Airport (position A)
Above: current situation
Below: modified version*



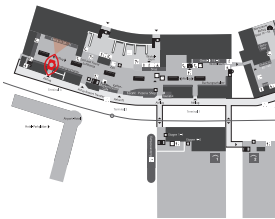
Terminal 1



figs. 106, 107
 Entrance at Terminal 1,
 Bremen Airport (position B)
 Above: current situation
 Below: modified version



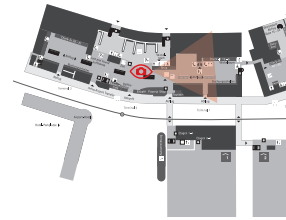
Check-in Counters 21 - 38



figs. 108, 109
 Check-in at Terminal 1,
 Bremen Airport (position C)
 Above: current situation
 Below: modified version



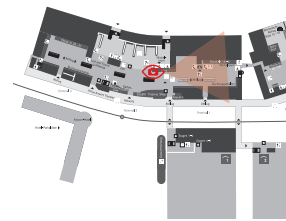
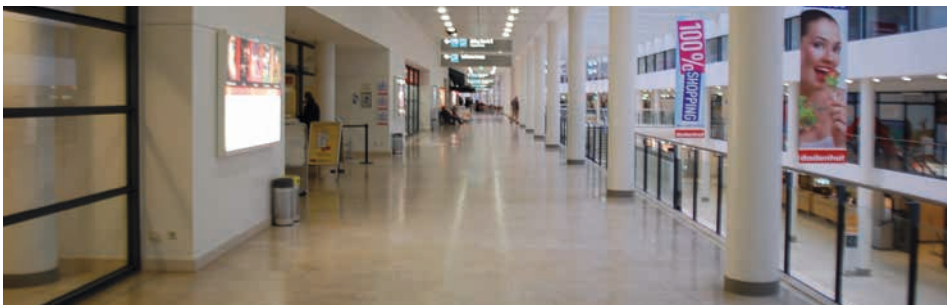
Long airport corridor between Terminals 1 – 3



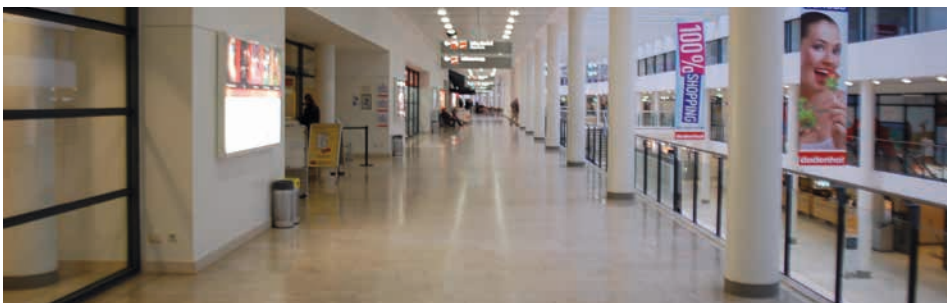
figs. II0, III
Terminal 1-3, Hallway
Bremen Airport (position D)
Above: current situation
Below: modified version



Internal balustrade between Terminals 1 – 3

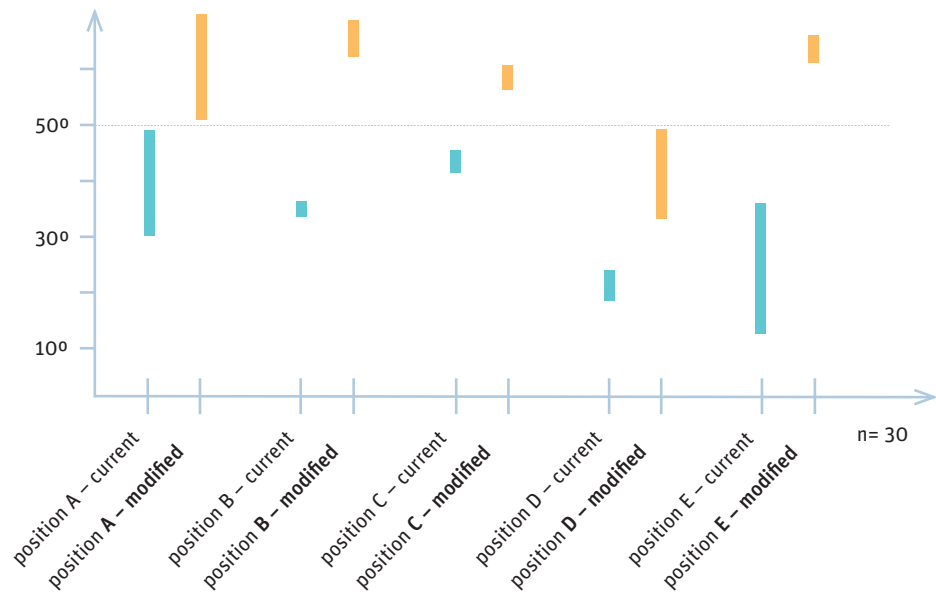


figs. II2, III3
Internal balustrade at
Terminal 1 - 3, (position E)
Above: current situation
Below: modified version



The preliminary results of the survey show the significant difference between the current situation in green and the modified version in orange.

*fig. 114
Preliminary results of the
conspicuity survey:
significant difference
between the current green
signage situation and the
modified orange signage
version*



The convincing results of our City Airport Bremen investigation have revealed that the test procedure for the determination of the conspicuity index is a practicable procedure to test current signposting systems. This method can become an interesting option as a standard for the rigorous testing of guidance systems. That, in turn, enables us to provide solutions to a whole set of interrelated issues, independently of an expensive eye tracking study. This simple realization is the result of conducting different experiments that provide reliable and valid results. The results of this City Airport Bremen investigation have been established and presented to the Flughafen Bremen GmbH and are still under discussion (at the time of writing). Together with other proposals, for example LED lighting solutions for the signage, these results may help to handle the growing volume of passenger traffic in the future.

The experiment carried out at the University of Lapland, Rovaniemi, Finland, showed that situational awareness can contribute to taking into consideration the different perspectives of ‘individual factors’, ‘task factors’ and ‘system factors’. This makes it possible to review the effectiveness and efficiency of the already established guidance system of the City Airport Bremen, help to uncover potential problems in the final application, and to outline tried and tested solutions.

3.4 Raising Public Awareness for the Design of Public Spaces and Signage

How to involve the population in the development process for a guidance and routing system at an early stage, in order to eliminate possible uncertainties in advance. This was demonstrated by the example of the Humboldt-hain public park in Berlin, located in the district Gesundbrunnen south of the inner city S-Bahn ring between Brunnen- and Hussitenstraße. Construction of the park was completed in 1876, which coincided with the 100th birthday of Alexander von Humboldt. The park should offer the predominantly less socio-economically advantaged people of the densely populated Wedding area a possibility for natural recovery. The idea was to encourage public accessibility and, with the combination of parking areas for quiet recreation, play, physical education and - with respect to Alexander von Humboldt - even to allow for an element of natural history education. The design concept was characterized by spacious playgrounds and sports fields and the harmonious creation of landscapes including numerous foreign trees and plants. Those were planted for reasons of biodiversity and according to the geographic

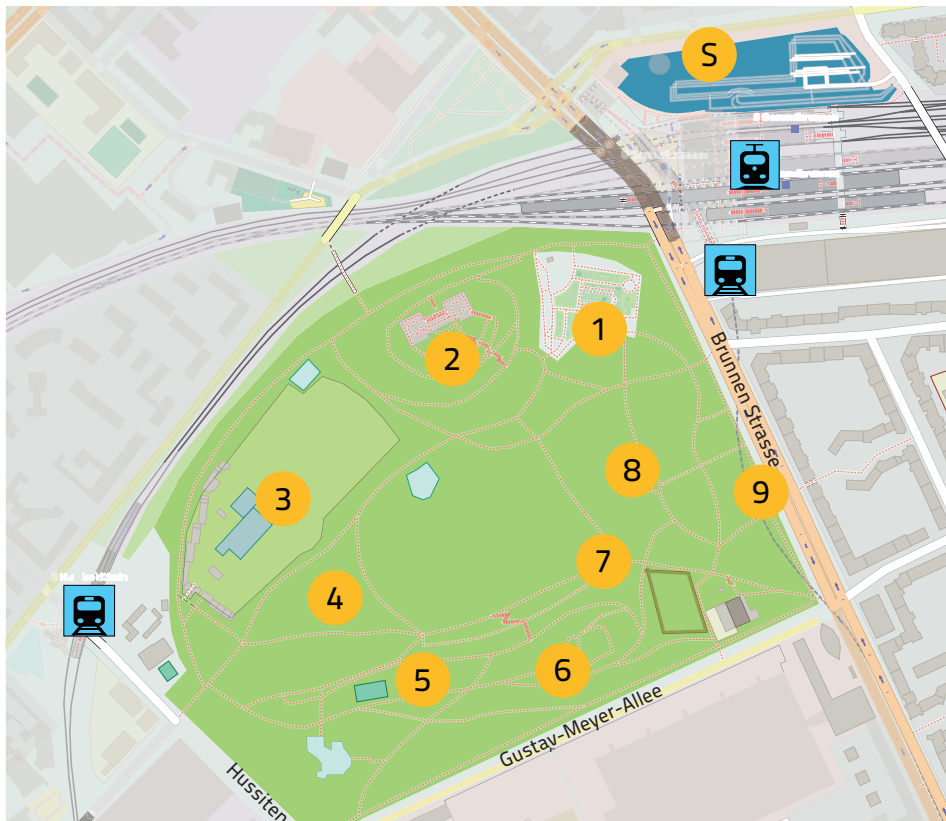


fig. 115
The map section shows the public park Humboldt Hain in Berlin Mitte reworked from © OpenStreetMap, data, courtesy of Humanitarian OpenStreetMap Team

- 1 rose garden
- 2 view of the Humboldt height
- 3 outdoor swimming pool
- 4 lawn
- 5 sledding hill
- 6 south Bunker hill
- 7 von Humboldt memorial
- 8 water garden
- 9 eastern way

S Shopping Mall
Gesundbrunnen Center

origin of the exotic trees. Furthermore, a geological wall was built and beds for botanical studies were created.

During and after World War II, the park was unfortunately almost completely devastated. Between 1941 and 1942 two flaktowers, designed as anti-aircraft batteries, were built with a sheltered command post. Control of these fortifications was heavily disputed through fierce fighting before Germany's eventual surrender. After the war, the remaining trees in the park were cut down for firewood. Following drafts of the Wedding Gartendirektor Günther Rieck, Humboldthain Park was restored with the support of Weddinger emergency workers between 1948 and 1951.

The remaining war era bunkers were levelled and transformed into small hills. The smaller of these 'mountains' is now used in winter as a toboggan run and the other, the 85m high point, now called the Humboldt Height, offers a magnificent panoramic view of the north inner city. In addition to the coverage of the park with many trees and shrubs, the Humboldthain Park of today is also characterised by an extensive recreation and sunbathing area, including an adventure playground, and an outdoor swimming pool with a large water slide and a diving facility with springboards. In the south-eastern part of the park on a natural hill there is a Japanese rock and water garden with a pavilion nearby a beautiful, geometrically landscaped rose garden and a pedagogically supervised botanical nature trail.

In the spring of 2012 I had launched an unsolicited practical examination about the behaviour and the characteristics of people walking in the park. The task in the M4 Environmental Graphics course at HMKW, Berlin, was to outline the ideas and strategies for a complete orientation and signage system for the park including pre-visit requirements. On the basis of these we developed five different and individual concepts with the aim of presenting the results in a public exhibition.

The idea was to develop a comprehensive, socially responsible, orientational design, based on a good insight into the leisure-time behaviour and mobility needs of all target groups and of Berlin's citizens in general. The design had also to be resistant against possible damage due to weather conditions and vandalism.

The students gained, on the base of qualitative data out of the district region profile (Bezirksregionenprofil Brunnenstraße Nord) a number of personas. It was interesting to see that the age range spans from a relatively small proportion of older people (13.6%) to the highest proportion of young people living in Berlin. This means that an above-average percentage of young

people live in this neighbourhood when compared to the rest of Berlin. The average age in this part of the city is 37.4 years. Many of the under-18s have a migration background (85.5%), this is the highest value in Berlin Mitte. Using this information it was possible to create personas and enrich them with detailed descriptions. On the basis of the developed personas, we undertook a monitoring exercise with different student groups. The monitoring helped the students to be aware of the present state of the signage system in the Humboldthain People's Park. The collected information subsequently helped to answer the questions that arose in developing the different design strategies. It was important to collect the information in a planned, organised and routine way. In our case, we tried a few case scenarios with a final group presentation. The students were urged to try to immerse themselves in the respective personas in order to act out the behaviours of the character type as closely and correctly as possible. The accuracy of the role-play and the exact report of the scenario and the monitoring from the partner have provided a wealth of data.

Team 1

You are disabled and unable to walk. You want to visit the observation deck Humboldthöhe/Humboldt Height
You start at the Brunnenstrasse entrance.



Team 2

You want to visit the children's playground (Kinderspielplatz).
You start at the Hussitenstrasse entrance.



Team 3

You are a group of young historians in search of artefacts from the Second World War. Where can you find information on both the two flak (air defence gun) turrets in Humboldthain and associated bunkers?
You start at the Hussitenstrasse entrance.



Team 4

You are a foreign student and want to study / learn in quietness at Humboldthain.
You start at the Brunnenstrasse entrance.



fig. 116 - fig. 122
Defined personas for the monitoring phase during the project.



Team 5

You are a passionate swimmer and want to swim in the outdoor swimming pool called the Sommerbad.

You start at the Brunnenstrasse entrance.



Team 6

You are a young mother and want to visit the water garden with your baby in a pram.

You start at the Hussitenstrasse entrance.



Team 7

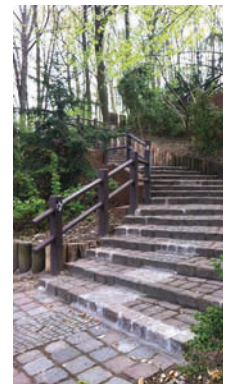
You are in Berlin for the first time and have an appointment at the statue in the Rose Garden.

You start at the Hussitenstrasse entrance.

*fig. 123 on the left:
lawn, © Lena Stadler, 2012*

*fig. 124 mid:
rose garden,
© Anna Wendorff, 2012*

*fig. 125 on the right:
south Bunker hill,
© Lena Stadler, 2012*



For a more realistic scenario we used a real wheelchair and a real baby pram as props. Each team included a role player, who had the task of solving the problem, and an observer who documented the role-play. In the final presentation it was important to show a fully documented journey.

The students had to answer the following questions: (Mollerup, 2005)

- Are places and functions named coherently?
- Are the names for places and functions good / consistent / deceptive / understandable?
- Do different users read the environment differently?
- Can we locate wayfinding problems by special audiences?
- Can we locate problematic times or places?
- Are there critical situations?
- Is one language enough?
- What are success criteria?
- Do we have/need pre-visit information?
- What might be a better solution: marking signs or directional signs?
- How might a y-a-h map look like?
- Do we need directories at the entrances?
- Shall we embed corporate branding?
- Are there other commercial considerations?
- Are there special requirements by the tenants?
- What important security requirements do we have to follow?
- Do we need special permission from the public authorities?
- Can we enable theme-related placements in dynamic signs for special events?
- Does our planning cover all groups?
- What kind of messages do we need?
- Where are the messages needed?
- What type of sign shall we establish (weather and vandalism resistant)?
- How can the signs be mounted, dimensioned, positioned, lit?
- Do we need ad-hoc (short-term) signage?

After an intensive and engaged working phase by the teams, the results were presented by a representative of each group and were discussed collectively. Special attention was paid to complaints of dysfunctional wayshowing in the Humboldthain park. In the next step the teams were formed into working groups and started drafting information concepts and planning the realisation of exemplary prototypes.

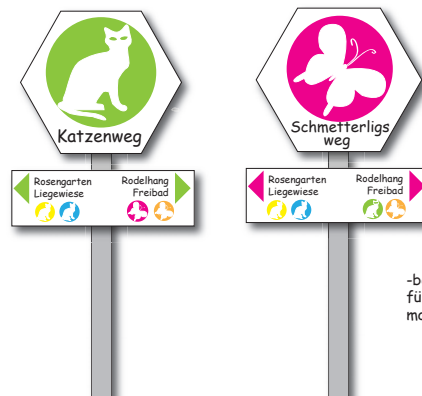
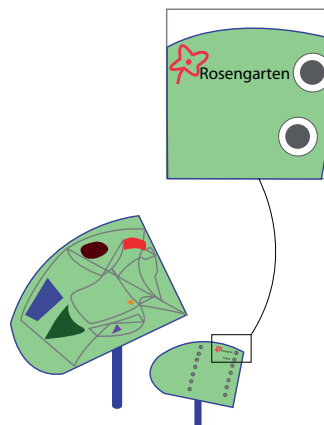
fig. 126 - fig. 128
 example for direction signs
 made of stainless steel - draft
 and testing mock-up (original
 size model made from card-
 board)



This intermediate presentation threw up many questions that had to be addressed before we could continue the further design process. Each group of students had to find answers to key issues, for example: What are the basic design elements? What is the basic typeface? Do we need arrows? Pictograms/colour codes? What are basic formats/grids? Do we use pre-manufactured signware (and where to buy it)? What kind of material (Silkscreening/Vinyl/...) shall we use? Do we need dynamic signs?

fig. 129 - fig. 130
 example for direction signs
 made of enamel - draft

Volkspark Humbolthain
 Beispiel für ein Orientierungsschild



-bessere Orientierung
 für Kinder durch Tier-
 motive und Farbe

In cooperation with my co-lecturer Petra Müller (Dipl. Designerin; exhibition designer), the idea was matured to develop a public exhibition to display the students' work in a public showroom. After a number of requests to responsible official bodies, with mostly negative answers, it was a surprise that Ulrike Fiedler from the ECE Center Management was convinced of the usefulness of our ideas. We were given the possibility of presenting our way-showing ideas to a broad general audience in a big Berlin shopping mall near Humboldthain People's Park.

The next step was to prepare the design proposals so as to make them fit for a public presentation in the exhibition system of the shopping centre. The measurements of the final posters were dependent on the collapsible filigree lattice-truss display system. The district councillor of Berlin, Department of Urban Development, Building, Economic and Public Policy and the Press Officer of the Senate Building Director were informed about, and agreed to visit, the exhibition.

The exhibition was placed in a W shaped structure in the basement of the shopping mall.



fig. 131
Gesundbrunnen-Center
Badstraße 4, 13357 Berlin

see map p. 125



fig. 132
outdoor advertising,
posters, for the public
exhibition of the students
results

The printing out of the posters was done at the university (HMKW) on a large-format printer (Epson Stylus Pro 9700 hat 44" / 111.76 cm).

The student group did the rigging and mounting of the displays in the early morning before the shops had opened. The exhibition was announced via a press release in the newspapers: "Walking is boring? No way!"

Anything but boring! This is how one of the most beautiful public parks in Berlin – the Humboldthain Park in Wedding is presented. A toboggan run, play areas and lawns, a rose garden, multiple playgrounds, including a pedagogically supervised adventure playground, outdoor swimming pool and, last but not least, the vantage point at 85 meters above sea level with sweeping views over the city, makes the park a special place in the heart of Berlin. The 29 hectares are ideal for those who want to get away from the city temporarily.

One will be presented with so many suggestions one can easily lose one's way. In addition, individual points of interest in Humboldthain Park are difficult to find because good signs are missing.

This was the starting point of students of the course, 'BA graphic design and visual communication' at the HMKW. As a semester project in the course 'Environmental design', they have developed different variants of a helpful guidance system. It is aimed at helping joyful visitors to explore the park and find the best it has to offer quickly and easily. This applies, of course, especially in the case of children, the elderly, and people with disabilities.

The concepts of the Design students were presented on 25.6.2012 in Gesundbrunnen-Center.

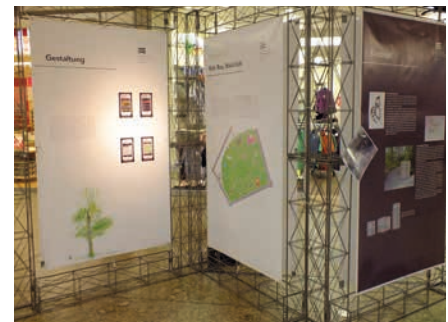
*fig. 133 left:
Exhibition at Gesundbrunnen-
Center, Berlin 25.06.2012*

*fig. 134 right:
Visitors discussing
the student's work*



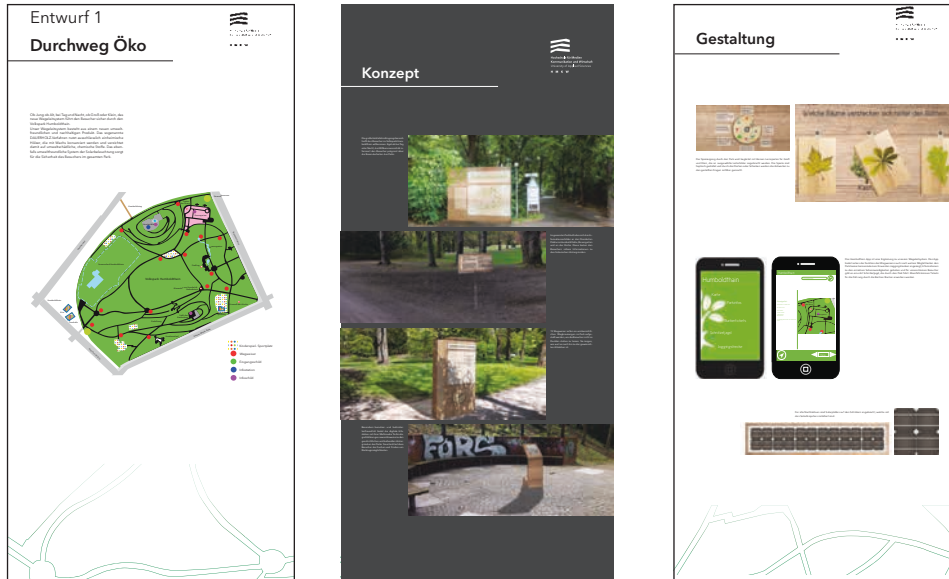
*fig. 135 left:
The idea of a Y-A-H-map*

*fig. 136 right (p. 133):
Each group displayed 3 posters
explaining their concept.*



The citizens of Wedding could voice their opinions via both a ballot paper survey and an online poll. The outstanding favourite was the idea from Group 1, comprised of students Susann Albrecht, Alina Jenke, Kerstin Lange, Oliver Rádai and Lena Stadler.

(fig. 136)



*Kick off: 26.1.2012
Students involved:
from the course
M4 Environmental Design
summer term 2012*

*HMKW Hochschule für
Medien, Kommunikation
und Wirtschaft
University of Applied
Sciences
Berlin, Germany*

*Group 1
Susann Albrecht
Alina Jenke
Kerstin Lange
Oliver Rádai
Lena Stadler*

*Group 2
Shunjit D'Costa
Samuel Gehmann
Marc Kesel
Farid Ribouni
Tobias Stempel*

*Group 3
Talip Hemde
Ramona Hufler
Giulia Schädel
Isla Smith*

*Group 4
Nina König
Gioia-Kitty Mansard*

*Group 5
Katharina Hentschel
Viktoria Stoiser
Laura-Hanan Tödt
Pia Weissenfeld
Anna Wendorff*

The draft convinced everybody with its well thought-out plan and stood out in terms of its ecological considerations. The next steps to be taken along the journey towards the development of a guidance and routing system for Humboldthain People's Park, Berlin, and indeed the future role to be played by the students, will be primarily concluded by the office of the District Councillor of Berlin, Department of Urban Development, Building, Economic and Public Policy. Discussions on this issue will be continued in existing committees at the commission level in Berlin.

What was first intended as a didactic lesson with the goal to create an open atmosphere in which the students can enter into an active exploration of a guidance system in the neighbourhood, triggered a process that occupied the municipal government of Berlin as well as various district offices and representatives of diverse interest groups. Based on conceptual considerations and empirical studies, and in line with the different perspectives of 'situational awareness' the students were able to develop exceptional signage systems with extraordinary service quality. It was important to take the different perspectives in order to examine the 'individual factors', 'task factors', and 'system factors' more accurately. (See model p. 96) Only from



fig. 137

With great pleasure and pride the students presented their work to the head of division 'Planning and public green' Beate Profě (second from right) from the Berlin Senat. She said, she "had not expected this variety of possibilities in public guidance and routing systems."

Persons from left: Lena Stadler (student), Ramona Hufler (student), Oliver Rádai (student), Giulia Schädel (student), Markus Schröppel, Beate Profě, Isla Smith (student)

this knowledge could the final convincing solutions arise which precisely met the spirit of the park's human visitors. In this example, only some of the methodologies of 'situational awareness' have been applied, but this made working solutions and demonstrated the predictive validity on the basis of the findings.

3.5 Cognitive Test of Airportsignage: Berlin Airport BER

How to evaluate a guidance system to eliminate uncertainties in retrospect. In June of 2011, the corporate design of the newly built Berlin Brandenburg Airport (BER) was presented at a large press conference. Once operational, it is estimated that 30 million passengers will be guided smoothly through the airport each year. Attempts have been made to do so by the corporate design agency Schindler, Parent & Cie Identity GmbH, Berlin (now Realgestalt GmbH, Berlin). The design of the new international airport, after a working process lasting two years, was unveiled with an unusual appearance involving a colour combination of purple and orange-red. This colour code will reflect the colours of both Berlin and Brandenburg and also engages with the early-stage design of red areas for the control system by the architects von Gerkan, Marg and Partners. A customised pictogram family with more than 100 developed characters was designed to facilitate orientation by Sibylle Schlaich and Heike Nehl (Moniteurs, Berlin).

Finally, the airport received a unique typeface, which should ensure an optimum of legibility. The comprehensive typeface family called BER was exclusively developed by Alexander Branczyk, (x)PLICIT and Georg Seifert for the corporate identity and the signage of the new BER Berlin Brandenburg Airport. The font allows the international application into a variety of language systems, such as Hebrew, Cyrillic and Greek, and includes Sans-serif and Roman variants, display, office and web fonts. The font has been described as “clear and classic, but still full of surprising lightness” among other things, in the verdicts of the juries which awarded the typeface multiple awards.

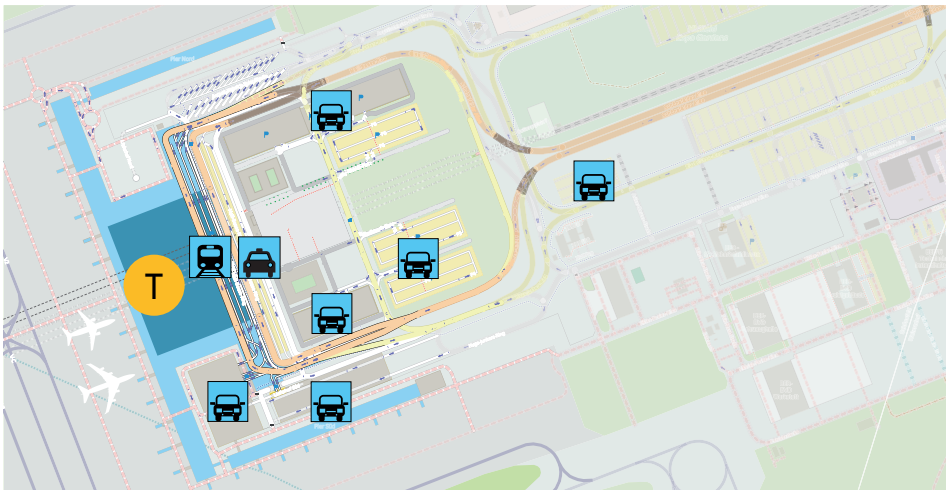


fig. 138
Overview plan
of the new Berlin Brandenburg
International Airport (Germany)
T = Terminal building

**Berlin Brandenburg Airport
Willy Brandt**

139



141



140



142



143



144



145



147



146

Abflug Departure

Moniteurs GmbH, Berlin



148



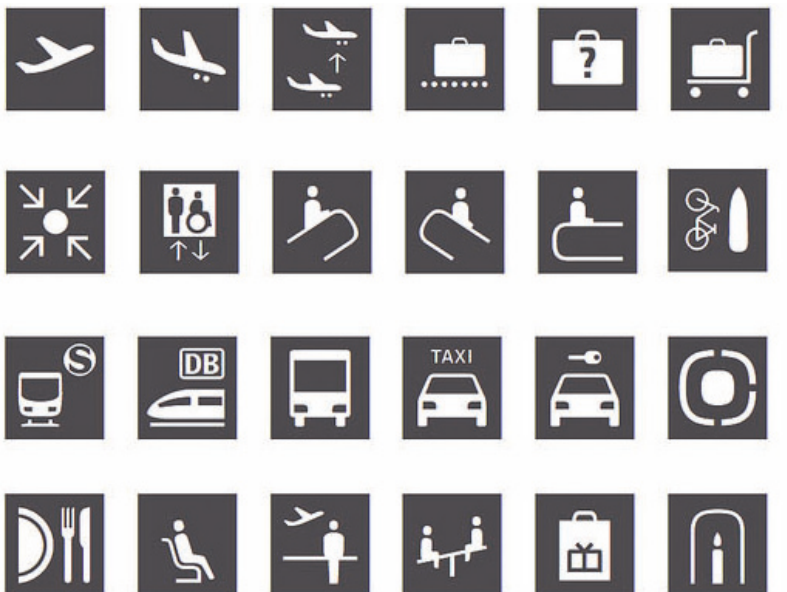
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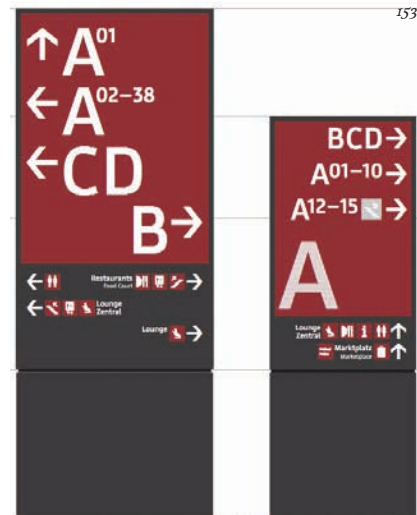
152



149



151



153

previous page:
fig.139: brochure 2011;
Berliner Flughäfen;
Press Office
figs.140 - 144 and 147:
gmp-booklet
Gmp Architects: Gerkan,
Marg und Partner, 2011
figs. 145 - 146 and
figs. 148 - 153
captured from the
moniteurs video
"Creative Mornings", 2012

* more at:
[http://typotalks.com/
berlin/de/blog/2011/05/
page/7/#sthash.IWINlxLI.
dpuf](http://typotalks.com/berlin/de/blog/2011/05/page/7/#sthash.IWINlxLI.dpuf)

The approach, developed by Schlaich and Nehl, to create a new, conceptualized Berlin Brandenburg Airport (BER) guidance system to provide a smooth transfer from one part of the airport functional areas to another, piqued my interest. It was intended not only to be a conventional sequence of signs but rather as an architectural implant from which people of all nationalities would be able to intuitively grasp the needed information from signposts and letterings. The different levels of development and the key features had already been introduced to an exclusive audience at the typo Berlin 2011 (May, 6th, 2011) [TYPOhall: ›Global Shift und wegweisende Identitäten‹]*

On January 27th, 2012, Heike Nehl and Sibylle Schlaich were invited to an extraordinary guided tour of the construction site (6th Creative Morning Berlin) supported by BER Airport Berlin Brandenburg and FontShop AG. At the event, held under the motto Identity and Function, they presented the BER Airport Berlin Brandenburg signage system on the spot. In the run-up to the considered official operation on June 3rd, 2012, the airport signage system was already being highly praised as the world's first signage, developed from the start in close collaboration between communication designers and architects.

The small attendance list made participation difficult. The guided tour had been booked out immediately after the announcement, so my information about this morning is only what others have told me with the video filmed onsite as a reference (<http://vimeo.com/36175730>). The concept of the signage is, according to Sibylle Schlaich, a combination of function and identity. There is a close reference to the architectural history of Berlin, invoking Schinkel or Mies van der Rohe, and the landscape of Brandenburg.

The colour code is a combination of red, white, and a dark grey. Grey is for flight information, while red is for service information. The Moniteurs also took part in developing the typeface. The typeface in the signage uses double differentiation with different font weights for each language. The pictogram family was developed out of the curves of the minuscule letters. The angles in the letters reflect the departure and arrival approach angle of aeroplanes. The signage in the Berlin airport should be different from the yellowish airport signs of the 1970s and the blueish-white signs of the 1990s, explains Heike Nehl about the BER Airport Berlin Brandenburg signage system on the Creative Morning "Identity and Function" Berlin #6.

In all other airports, colour and typeface are not used to build an identity. Berlin will thus add something new to the range of international airport

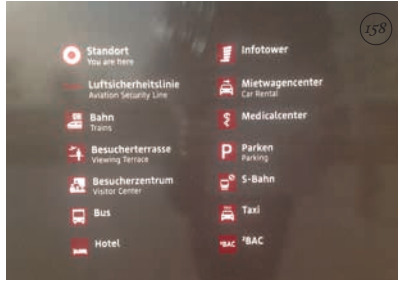
Dear Mr. Markus Schröppel,
You are successfully on board. On 28.02. (Tuesday)
From 08:30 until 15:00, you can test the new
Berlin Brandenburg Airport.
Your subscriber number is: m26160o.26160
Summary of your data:
Markus Schröppel
Date of Birth: xx/xx/19xx
Joachim Strasse xx, 10119 Berlin
E-mail: markus@xxxx.de
Your date: 28.02. (Tuesday).
From 08:30 until 15:00.
Arrival on trial day: VBB Transport Association Berlin
Brandenburg

identities. Berlin should also have a more consistent look in the signage. In other airports the guidance is comprised of a mash-up of different icon families from different decades. Berlin, in contrast, got a completely new, specially developed icon family with consideration for the requirements of a changed airport policy.

The colour-code differs between the two main function-types of an airport: landside and airside. Designers argue that the guidance takes the typical passenger journey into account and so provides an effective contribution towards facilitating passenger movements. The differentiation is not between colours, but with sign sizes and distances. The sequences, type-sizes, tonal values and decision points of passengers had been tested and reshaped with the aid of real size mock-ups.

To put it in numbers: about 2,500 signs were developed in this way. Tracing paper helped to integrate the signs in architectural elements. Additional graphics on concrete walls and glass elements will spice the building with landmark features and will prevent passengers from getting lost. The aim was to develop an identity combined with high functionality in order to attract passengers in the same way as airplane carriers to establish Berlin as a major hub in German air traffic and to put it in the same league as the top international airports.

With this in mind, I looked forward with great expectation to getting a personal viewing of the Berlin Brandenburg Airport (BER) guidance system. Luckily, from the end of November 2011, the airport authority started a six-





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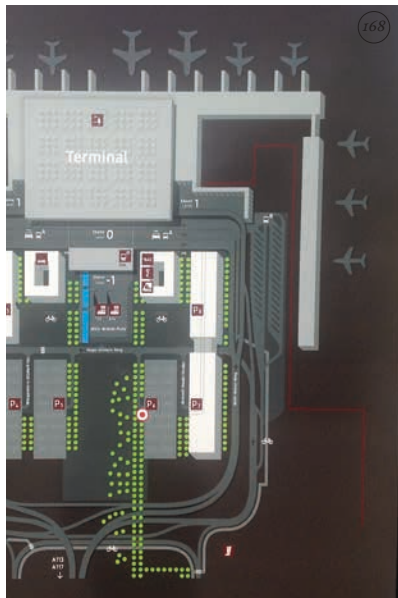
164



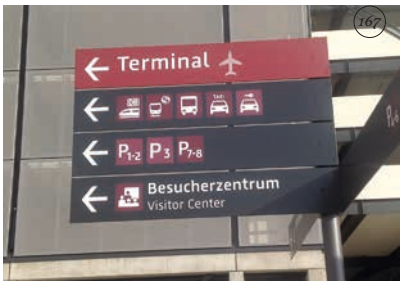
165



166



168



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figs.154 - 157: Berlin Brandenburg Airport testing phase. pictures by Oliver Pritzkow, 2014

figs.158, 163 - 165 airport test 28. Feb. 2012,

by Markus Schröppel

figs.159 and 160 - airport test 28. Feb. 2012,

by "Der Tagespiegel" issue 29. Feb. 2012,

figs.161 - 162: Airport testing pictures by Oliver Hein, 2014

fig. 166: airport test 2012, by Pressoffice Flughafen Berlin Brandenburg GmbH

figs. 167 - 168 - airport Berlin Brandenburg Airport 2012, by Markus Schröppel

month monitoring test phase. The ORAT (Operational Readiness and Airport Transfer) team was looking for volunteers for airport testing. I applied immediately and got the chance to test the trial operation at the new airport on February 28th, 2012, from 08:30 until 15:00.

I was, however, very upset when I read the full details of the reply which said that I am one of the first civilians ever given the opportunity to visit the airport since the construction process. Two weeks before that date, I had been planning to perform a comparison test with the aid of eye-tracking software. During the first talks it seemed that the measurement capabilities are a practically applicable method that fits under the umbrella of methodologies of 'situational awareness'. Dr. Peter R. Reuter from Tobii Technology GmbH, Frankfurt/Main, had committed to support my research with the brand new Tobii Glasses Eye Tracker. I thought with those discreet, ultra-lightweight mobile eye-tracking glasses it should be possible to analyse the environment of the airport, in real time, while moving freely. Unfortunately, it was forbidden to take photos, neither was I allowed to film at all. With such borrowed, eye-tracking espionage equipment I would represent a serious safety risk at the airport. The original plan was discarded, so I started out to reach the new airport by train on a cold February morning with only a tiny digital camera.

To map the processes as realistically as possible at the airport, all possible sequences are played by the testers before the opening - from check-in, through security control to baggage claim. Under the supervision of the ORAT teams the outsiders shall identify problems or weaknesses starting from the signposting to the toilets, hidden gates, to the direction signs to the restaurants in the huge maze of the new airport terminals. Along with all the others, about 200 different test subjects, I was equipped for security reasons with a green helmet and safety vest and instructed about construction site safety. The introduction was completed with a special briefing about the role to be played as passenger. Then, equipped with special task cards and test bags, we had to find our way through the terminal.

Everybody behaved calmly, although almost nothing in the whole system was working. In the various possible sequences we played (i.e. check-in, going through security control, baggage claim and so on) some doors were too tightly closed for us, while others opened timidly, civil servants were not in the correct spots and the building system went wrong. None of the flights were reached on time. However, it was a big pleasure to go through the brand new airport helping to find hidden issues.

The signage system was particularly striking. The colour combination was extraordinary, but the dark red mahogany of the check-in counters ‘swallowed’ the red colour of the numbers and letters. The apparently incomprehensible and ambiguous icons in their very low position created difficulties in perception and recognition. This was one of the key triggers for getting lost. This gave me the idea to work on an experimental setup focusing on the easy comprehension of signs, high colour contrasts and also on time. In a comparatively sufficient period of time it is possible to trawl through the immense amount of information posted on the plates. However, if a traveller feels totally harried, totally under time pressure and is threatening to lose track, how will s/he react? I have to say, I miss the underlying reason considering the applied capabilities of the passenger and the enhancement of the ‘situational awareness’ of the travellers.

In an experiment where the needed information is only revealed for a certain time interval (3 sec.), it is necessary that the message is clearly understandable. Architectural renderings from Berlin are combined with real existing airports and completely fake signs. The frightening thing is, the better drawn and clearer the sign, the easier and more effective is the orientation. The test deprives in a very genuine way the full view of airport environments.

The evaluation of airport guidance, here the example of Berlin, targets all major points along the ‘situational awareness’ chain in dynamic decision making. It was unfortunate that the use of portable eye-tracking equipment was not possible for cost and safety reasons. To still involve individual elements in the investigation, such as stress and different levels of knowledge in unknown environments, I have developed an experimental design with a computer-aided online survey. The specific task queries specific guidance-relevant visual stimuli. These visible signs are obscured by persons (as silhouettes) and only visible for three seconds. The stress can be increased even further by loud music or other audio stimuli in the test situation. All 68 participants in the study already had flying experience, but did not know the partially existing airport examples. The results were at least very meaningful to prove that some of the signage signs shown in the test have major shortcomings. Unfortunately, the guidance system of the Berlin airport (BER) presented in this chapter also has great deficiencies. One way to examine any possible deficits more precisely would certainly be the method of ‘conspicuity index’, as described in the previous chapter. The method presented here is intended to serve as igniting spark and inspiration for future guidance planning.

fig. 169
Image of the testing situation



Cognitive test of airport signage

This online test was developed to simulate the difficult situation to orientate and act in large buildings under time pressure. The time required to detect the partly less well readable signs is limited because moving people hide the view to the signage. This additional stress factor is taken into consideration assessing the legibility of the displayed guidance and routing systems. The participants chose the answer they think the display had shown. Some irritating signs can sow additional confusion.

fig. 170



N: 68 (number of participants/sample size)
Average Completion Time: 15 min. 2 sec.
Drop-Out Rate: 82.11%
2012.09.24 - key date: 2014.08.29

Age



- younger than 20 (4 = 6%)
- 21-30 (47 = 69%)
- 31-50 (12 = 18%)
- older than 50 (5 = 7%)
- No answer 0 = 0%

Gender



- female (40 = 59%)
- male (28 = 41%)
- No answer (0 = 0%)

Country

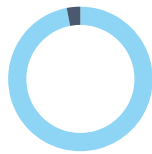
Australia (1) Ghana (1) Russia (1) Austria (1) India (1)
Rwanda (2) Brazil (2) Iran (1) South Africa (1)
China (1) Italy (3) Uganda (1) Colombia (1) Kenya (2) United
Kingdom (1) Ethiopia (2) Luxembourg (1) Zambia (2)
Finland (26) Malawi (1) Zimbabwe (2) Germany (11)
Netherlands (2) No answer (1)

What have you perceived?

1.) Barcelona Departure



fig. 171

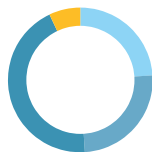


- Departure (66 = 97%)
- Arrival 0 = 0%
- Toilets 0 = 0%
- Exit (2 = 3%)
- don' know (0 = 0%)

2.) Paris Charles De Gaulle Gate E



fig. 172



- Gate E (16 = 24%)
- Gate E 4 (17 = 25%)
- Gate E 41 (30 = 44%)
- Gate E 51 (0 = 0%)
- don't know (5 = 7%)

3.) Austin Texas Gate 21



fig. 173



- Gate (0 = 0%)
- Gate 2 (8 = 12%)
- Gate 20 (4 = 6%)
- Gate 21 (53 = 78%)
- don't know (3 = 4%)

4.) Incheon Airport using Berlin signs



fig. 174



- to the right (9 = 13%)
- Gate A (33 = 49%)
- Gate BCD (17 = 25%)
- Exit (1 = 1%)
- don't know (8 = 12%)

5.) Berlin (architectural rendering) Gate A 05



fig. 175



- Gate 5 (20 = 29%)
- Gate A (1 = 1%)
- Gate A to the right (1 = 1%)
- Gate A 5 to the right (39 = 57%)
- don't know (7 = 10%)

6.) Icon 'Meeting Point' (FF Netto, Daniel Utz)



fig. 176

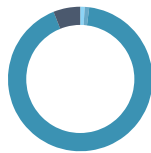


- Terminal 0 (5 = 7%)
- Exit (5 = 7%)
- Transfer (2 = 3%)
- Meeting point (40 = 59%)
- don't know (16 = 24%)

7.) Detroit Gate A49



fig. 177



- Gate (1 = 1%)
- Gate A (1 = 1%)
- Gate A 49 (62 = 92%)
- Gate A 59 (4 = 6%)
- don't know (0 = 0%)

8.) Zaventem (Brussels) airport terminal: Esca



fig. 178



- Exit (4 = 6%)
- Stairs (8 = 12%)
- Escalator (22 = 32%)
- Gate (7 = 10%)
- don't know (27 = 40%)

9.) Nautic Sign* (rendering by Kai Kasugai)



fig. 179



- Gate O (1 = 1%)
- Transfer (29 = 43%)
- Information 4 = 6%
- Restaurant (1 = 1%)
- don't know (33 = 49%)

* the original sign allows turning of ships

10.) Singapore Changi Airport



fig. 180



- to the right (8 = 12%)
- Exit to the right (4 = 5%)
- Transport to the right (12 = 18%)
- Terminal to the right (10 = 15%)
- don't know (34 = 50%)

11.) Image from 'Future of the Airport', Katrin Hanses



fig. 181

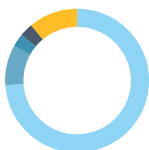


- Gate (1 = 1%)
- Gate G (0 = 0%)
- Gate G 06 (1 = 1%)
- Gate G 08 (63 = 93%)
- don't know (3 = 4%)

12.) San Francisco International Airport's Terminal 2



fig. 182



- Baggage Claim (50 = 74%)
- Ground Services (6 = 9%)
- Other Gates (2 = 3%)
- Exit (3 = 3%)
- don't know (7 = 10%)

13.) Waiting Area, sign by AIGA



fig. 183



- Restaurant (3 = 4%)
- Exit (1 = 1%)
- Arrival (6 = 9%)
- Departure (27 = 40%)
- don't know (31 = 46%)

"Cognitive test of airports signage."

is using pictures, maps and renderings from:

- 1.) Aeropuerto de Barcelona; 'El Prat' (IATA: BCN) (ES) (picture from sxc.hu)
- 2.) Paris 'Charles De Gaulle' Airport Terminal E, (IATA: CDG) (FR) (picture from sxc.hu)
- 3.) Austin-Bergstrom International Airport (IATA: AUS), Austin, Texas (USA) (picture from sxc.hu)
- 4.) Incheon, Incheon International Airport, South Korea, (IATA: ICN) (picture from sxc.hu) using icons from Berlin airport (moniteurs)
- 5.) Berlin 'Willy Brand' Airport Terminal rendering, (IATA: BER), (GER) (picture from von Gerkan, Marg und Partner, architects)
- 6.) 'people waiting in airport' (picture from Tania Idesti, sxc.hu), photocomposing by Markus Schröppel using an icon from FF Netto
- 7.) Detroit Metropolitan Wayne County Airport, (IATA: DTW), Detroit (USA)
- 8.) Brussels Airport, Aéroport Bruxelles-National (IATA-Code: BRU), (BE) Waitingroom, Brussels photo by Ulrik De Wachter: 'Snapshot of the new Zaventem (Brussels) airport terminal' on a Monday morning. Jan 27, 2005
- 9.) Rendering by Kai Kasugai; gallery space - interior perspective Edinburgh College of Art, photocomposing by Markus Schröppel, using a nautical sign (Binnenschiffahrtsstraßen-Ordnung (BinSchStrO))
- 10.) Singapore Changi Airport (IATA: SIN) (picture from sxc.hu)
- 11.) Image from Katrin Hanses masterthesis 'Future of the Airport', CIAD, Cologne, 2012 (GER)
- 12.) Rendering by Gensler's Design for San Francisco International Airport's Terminal 2 (SFO T2), (USA)
- 13.) Rendering by Zsuzsanna Kilian, Budapest, Hungary <http://www.freeimages.com>, photocomposing by Markus Schröppel, posters (fake), public sign by AIGA

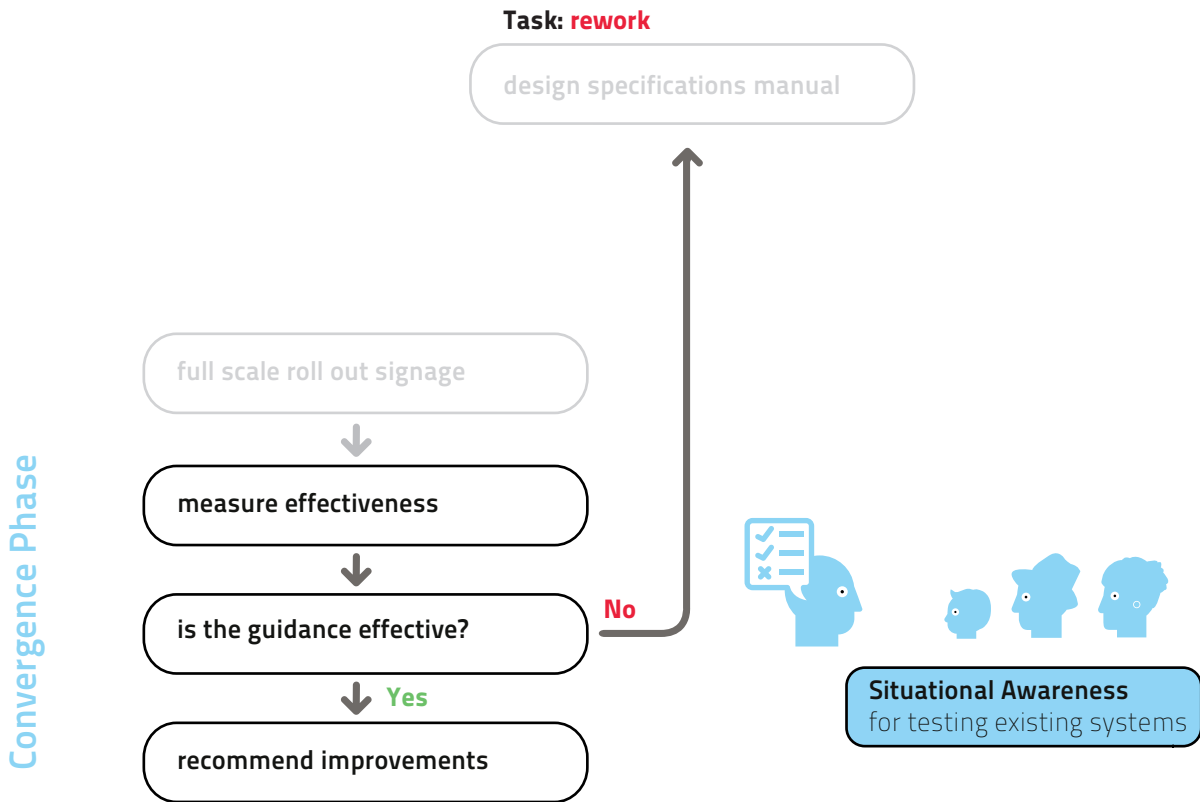
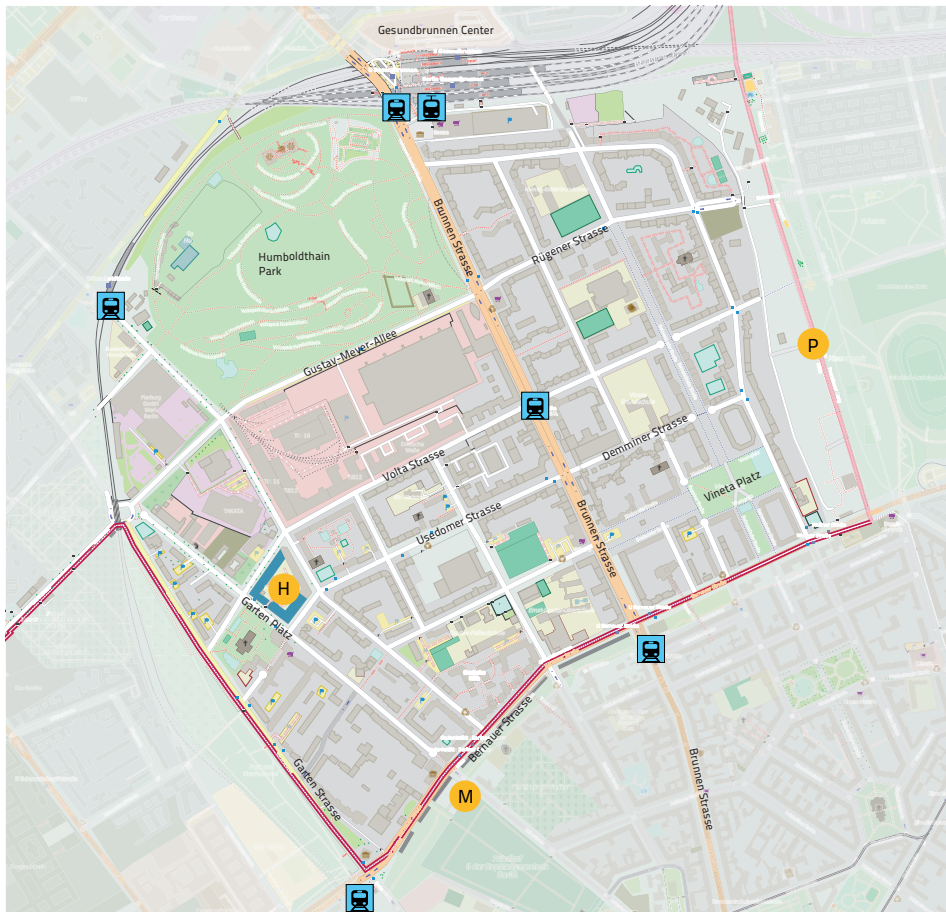


fig. 184 The possible use of the 'situational awareness' to evaluate existing guidance systems.

3.6 Guidance in Urban Quarters, Brunnenviertel Berlin

The question of how to overcome imaginary barriers in urban quarters. As a direct result of the Humboldthain Project exhibition in 2012, I received a request from Safak Yildiz, project leader of quarter management for the Brunnenviertel area, (Quartiersmanagement Brunnenviertel - Ackerstraße Stadtteilbüro, Jasmunder Straße 16, 13355 Berlin). The quarter management of the Brunnenviertel makes a substantial contribution to actively developing urban quarters. Together with S.T.E.R.N. Gesellschaft der behutsamen Stadterneuerung mbH (Society for cautious or, soft, urban renewal) they act on all topics that are considered important by the people in the urban district and take action to establish a holistic concept of fostering good neighbourhood, habitation for senior citizens, the integration of fellow citizens with migration backgrounds, and youth welfare. During the course of a first



*fig. 185 Brunnenviertel quarter,
in Berlin Mitte
reworked from
© OpenStreetMap contributors*

*M Berlin Wall Memorial
H HMKW · University of Applied
Sciences for Media, Communica-
tion and Management.
P Mauerpark,
Prenzlauer Berg-District
red line: former wall of Berlin*

introductory meeting I was asked which of the following projects would fit in with our academic environment and areas of research in the lectured module, 'Environmental design'.

1. Project Paths in the parks

Under conditions analogous to our research for the Humboldtthain Project, the S.T.E.R.N. Gesellschaft der behutsamen Stadterneuerung mbH is addressing a similar issue. They investigated the question of how the surrounding parks can be made more visible to local residents. In a preliminary investigation it was revealed that the surrounding parks remain closed to the residents, primarily because of psychological borders created in the minds of the people. There are a variety of reasons for this: for example, it could be caused by a fear of barriers and subjective spaces caused by the effects of the previous Berlin Wall. To incorporate the local residents in this subject, a public hearing with discussion was held in the cafeteria of the Ernst-Reuter High School (Secondary school) on September 14th and 15th, 2012.

2. Project Technology-Park Humboldtthain

The Berliner Innovations- und Gründerzentrum (BIG) [transl. Berlin Innovation Centre] in the Technologie- und Innovationspark Berlin (TIB) [technology and innovation park Berlin] was the first German start-up incubator which opened on the initiative of the Technical University (TU) of Berlin in the 1980s and was supported by the Berlin Senate. The close proximity of the scientific-technical departments of the TU and other institutes such as the Fraunhofer Society soon established a true innovation catalyst for young companies with a technology-driven approach in the Gesundbrunnen area, Berlin.

The site of the former AEG building will now be marketed in an enhanced dimension under the name "Technology Park Humboldtthain". All enterprises and institutions between Acker Straße and Brunnen Straße shall have the possibility to identify themselves with this potential economic area. The visual identity of the Technology Park Humboldtthain shall be at the same time clear and strong, unique and durable and should reflect a precise image of the companies or institutions in order to fit into an international and coherent communications strategy. The aim was also to create a versatile guidance system that would cater for the permanent and temporary events at Technology Park Humboldtthain and guide all visitors.

3. Project Historical Path

Dr. Rüdiger Dammann played an instrumental role in this context and liked to call attention to the extraordinary history of the Brunnenviertel neighbourhood. The infrastructure of the Brunnenviertel quarter was established and influenced by Peter Behrens between 1907 and 1914, who introduced the uniform enterprise appearance for the company AEG. Visible manifestations of the most prolific seasons in the history and development of this part of the city of Berlin is, for example, the programmatic AEG-turbine hall, one of first industrial buildings in the twenties of the last century, made from concrete, steel and glass. Amongst other plans, one major goal is to develop a historic trail guiding users around numerous buildings of historical interest leading to the official memorial in Bernauer Strasse to commemorate the victims of the Wall.

Participants of the meeting were representatives from the Berlin Senate Department for Urban Development and Environment (Mrs. Glücklich), the area coordinator Berlin Mitte (Mr. Schenk), the real estate association *degewo* (Mrs. Huwe), two spokesmen from both quarter management agencies, the road and parks commissioner, and representatives of the Brunnenviertel quarter itself. Mrs. Helm, a student in this project group, supported my presentation and kept the minutes.

In order to get an overview of the Brunnenviertel quarter, the whole group of students went for a stroll around the neighbourhood.

Shortly after starting we made observations and raised questions concerning the irregularities found in the guidance system. It is impossible to find one's own position on the map. The perspective being from a bird's eye view of the chart, a perspective-based distortion arises.

As a temporary solution, we decided to paste over the existing maps in Brunnenviertel with a new developed YAH-mark in a guerrilla action, to facilitate the orientation of foreigners.



fig 186
Map with Y-A-H marking
shows the current location.

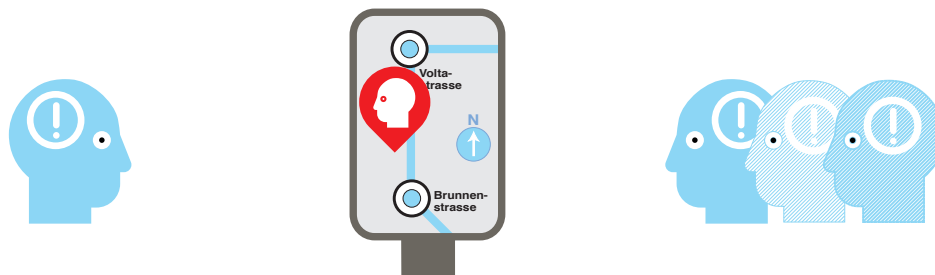


fig 187 *Map with sticker*

The surprised members of the quarter management governed our spontaneous reaction, but they were convinced of its effectiveness.

In 2011, the Quartiersmanagement (quarter management) Brunnenviertel-Ackerstraße presented an integrated concept of activity and development. This includes, inter alia, an updated description and analysis of the area, a description of the existing strengths and weaknesses and pointed out the potential of possible developments. The central location of the neighbourhood in the middle of Berlin was positively highlighted. Located in the Brunnenviertel district, within walking distance to the eastern city centre and Prenzlauer Berg, it also has good connections to the public transportation network. In terms of the mid-term planning, this situation can prove to be of a significant advantage for a positive development. This also includes the proximity of the urban recreation and leisure areas such as Humboldthain-, Mauerpark and the Park at the S-Bahn station Nordbahnhof (Winter, 2010).

The area has the potential to be an attractive residential area for families and seniors. The expansion of the remembrance landscape of state terror at the former Berlin Wall with expected visitor numbers of over a million annually, might lead to a revitalisation of the hospitality business in the quarter. The area Brunnenviertel-Ackerstraße is centrally located in the city centre of Berlin. It is apparent that the urban space is, however, relatively isolated. Especially in the northern and western parts, there are only few connections to the adjoining booming urban areas. To the north, the area is essentially defined by Humboldt Park as well as the Gustav-Meyer-Allee, while in the western part the Nordbahnhof area, the former Wall forms a natural border between Berlin-Mitte and Wedding.

The park and adjoining districts were accessible directly from the Brunnenviertel district. This opening allows new paths through or in the district. The permeability is greater in the southern and eastern parts. However, Bernauer Strasse with the tram and the remembrance landscape of the Berlin Wall also forms a natural border. This is reinforced by the current deadlock between the two parts of Ackerstraße, which prevents the connection to the southern part. Within these boundaries, the area is divided into two parts: The majority of this space is dominated by residential housing, only the northeast is used as a commercial area.

In the residential area, where the most people live, there are breaks in the rows of houses by buildings and open spaces of social infrastructure (e.g. schools, day-care centres, churches) and by a large bus depot (BVG). The only recognisable central spot is the St. Sebastian Church along with a few retail

stores. As a result of the strategy of breaking down of whole urban quarters in the 1970s during the Berlin urban renewal program (March 18th, 1963, by Willy Brandt, then Mayor of West Berlin and later Chancellor of West Germany) only a small number of individual family homes and Wilhelminian style buildings are visible in the area. The area is dominated by social housing constructions in block buildings. Five- and six-storey residential units in largely good condition, often equipped with green courtyards and balconies, dominate the district. Architecture sociologist Harald Bodenschatz explains (citing Bodenschatz in Loy, 2013) that the result of losing 75 percent of the old buildings was an urban desolation, the elimination of urban structures and spaces as well as the loss of functional and social diversity. With the decline of the neighbourhood in the 1990s came increasing crime and neglect. The Brunnenviertel lost in competition to downtown neighbourhoods in terms of population and purchasing power. Bernauer Straße grew as a social wall between the renovated buildings in the Mitte and the uncoupled migrant district in Wedding. Vast wastelands in the immediate vicinity of the Berlin Wall memorial along Bernauer Strasse were transformed into the remembrance landscape by 2010 and this reinforces the imaginary wall. Concerning this problem, the quarter seems to wall themselves off from the rest of Berlin, in ways similar to the Cold War era.



*fig. 188 (left):
Lecturing in the Demminer Strasse,
Berlin*

*fig. 189 (right):
Quarter management information
board, Berlin*



190



191

fig. 190 Gesundbrunnen Center and railway

fig. 191 Vineta Platz

fig. 192 Vineta Platz with floodlight from Friedrich-Ludwig-Jahn-Sportpark; sports site in the Prenzlauer Berg district

fig. 193 Underground station Volta Strasse



192



193

Resident groups according to origin:

The statistical proportion of ethnic concentration has risen in the past few years and is 27.9%, far above the Berlin average (13.7%). People with Turkish origin are the most numerous population with 50.04%, followed by residents from the former Yugoslavia with 9.08%, from the Asian region with 8.11%, from Poland at 7.02% and from Arab countries, 7.41%. Overall, the proportion of residents with a migration background in the Brunnenviertel-Ackerstraße area is about 54.5%; in the under-18-year-old cohort, the proportion is 80.6% (Häußermann, 2010).

Resident groups by age:

Both the proportion of over-65s, with 16.3%, and the proportion of under-18s, with 18.7%, in the Brunnenviertel area are significantly above the Berlin average. The largest group is the 25 to 45 year olds with 30.8%, followed by the group of under-25s with 29.07%. (Source: Monitoring Soziale Stadtentwicklung Berlin 2009). Among foreign residents, the group of 25 to 45 year olds is, with 46.75%, by far the largest, followed by the under 25 year olds (23.3%). Among the tenants who have lived for a long time period in this area, the group of pensioners is represented very strongly. The number of obese children is alarmingly high in Brunnenviertel. According to the statistics of the district, in Gesundbrunnen and especially Ackerstrasse, about 20% of first-year pupils are diagnosed as overweight. (Häußermann, 2010).

The central problem in the Brunnenviertel area is the effect of social, economic, infrastructural and urban planning deficits. Poverty, unemployment, a lack of language skills, family violence, unsatisfactory conditions in kindergartens and schools as well as difficult neighbourhoods characterise the district.

The predominant housing scheme of social housing makes the area, despite its favourable location, largely uninteresting for the apartment-seeking middle class. The flair of Wilhelminian-style residential areas with a variety of shops on the ground floors and attractive apartments is completely absent. To avoid conflicts, individual playgrounds in the residential complex block's interior areas were built on and ball courts have been locked. The supply of playgrounds is both qualitatively and quantitatively insufficient. The few facilities especially for very small children are unattractive and therefore rarely used. At the "central spot" of the area, at the St. Sebastian Church with a few retail stores (Edeka supermarket, pharmacy, beverage market, etc.) there are often complaints and incidents involving groups drinking alcohol. In

addition, vandalism and break-ins are regular complaints of institutions and businesses - but are rarely reported and/or solved. Perceived and actual security gaps, in particular in the evenings and during night hours, are complained of, especially by older residents and foreign workers. Drug trafficking and consumption in the area of the metro (line 8 extends partly into the area) combine to strengthen the fear and number of threatening situations in the locality.

The northern Brunnenstrasse in Wedding is not a shopping street or habitual residence at all. In particular, the narrow, crowded walkways are in sharp contrast to the stylish residential area of the southern Brunnenstrasse in the former Mitte. This all adds up to one of the reasons why the northern Brunnenstrasse does not invite people to linger and stroll around the area. Many residents are missing shopping opportunities of higher quality (like a good butcher). The absence of elements of infrastructure such as bicycle paths also leads to the fact that the northern Brunnenstrasse will be avoided in the collective perception of public space.

The aim was to develop Brunnenviertel into a liveable neighbourhood for families with children, seniors, young couples and single households of different ethnic and social backgrounds. The Brunnenviertel area is integrated with Berlin's inner city neighbourhoods, whose special quality lies in the juxtaposition of tranquillity and centrality, green qualities and shops, close to transport, leisure and recreational opportunities. The prevailing openness to new ideas paved the ground for creative experimentation and the assumption of responsibility by our students.

Very quickly it became clear at our first inspection that the basic orientation elements were disregarded: paths, edges, districts, nodes and landmarks are difficult to identify here. The essential features for orientation are missing or invisible. According to Lynch (see Chapter 4) paths as channels of movement, like the Brunnenstrasse, will be ignored in the collective perception. Edges or boundaries that break the natural flow of traffic still exist in the borders of the former East-West divide. This will result in the confirmation of the district as an area of recognizable identity of the underdog, in other words, the poor Brunnenviertel area is opposite to the rich (creative hipster, middle-class Bohemian) inner-city Berlin (gentrified) neighbourhoods. The only node or place of intense activity is the Gesundbrunnencenter (shopping mall) with the nearby subway and railway station. Landmarks or visually distinguishable points of reference are difficult to identify. Large buildings have replaced the lower-rise individual buildings, for example at Vineta Platz, the

former borderland. The quarter still looks like a frontier territory: unadorned and functional.

Besides the design of surfaces and objects, the inclusion of signage in private or public space is an increasingly important and challenging responsibility of the designer. In particular, the urban environment is more dense, complex and non-transparent. It requires visual – and often beyond the visual – aids and continuous signals for navigation and orientation in places and ‘Non-Places’ (Augé, 1995) – in transit and pedestrian streets, squares and parks, malls and fairs as well as train stations, airports or residential complexes. The placement of messages in the space necessarily leads to two kinds of reception: a visual, cognitive kind and a physical, active kind – in the successful sense that viewers interact with their physical environment when the signs and objects are carefully analysed and designed according to their intended interaction with the physical environment. That was our difficult task and will continue to be our responsibility in the future.

The networking between several disciplines requires an interdisciplinary work ethic and vision in order to open up the scope necessary between two- and three-dimensional considerations. These include considerations in the context of, for example: the public space of city maps and routes structures, transitions and interfaces, road networks, traffic types, propellant forces of urban structure and the development of exterior lighting (daylight and artificial light). In understanding cognitive functions on the basis of encoding and decoding as the fundamental basis of pictorial thinking and for the development and perception of signs in public space, the designer needs to understand the function and mechanism of signing the public space – the perception and psychology of information. Information in public space needs a clear analysis of their perception (we used our specially designed Persona concept). In specifying a structured proceeding for our systematics and interfaces, we succeeded in developing a stringent organisation and pragmatic formulation of an information chain for signage in public space. By including the use of modern cartography guidance and online information systems, we expanded the technical and technological possibilities of the project and helped to overcome language barriers.

Within the scope of user-centred design, the students focused intensively on various aspects. A traveller experience is a subjective feeling, that may not be explicitly designed. Rather, it is trying to enable a particular experience, by allowing the visitor of a certain area to make conscious positive experiences. User-centred design covers all aspects of interaction with an environ-

ment: As it is perceived, learned and used (Norman, 1988). It is also about avoiding potential negative emotions. A single negative experience - for example, becoming lost or frustrated about a complicated system - can make every attempt to evoke positive feelings among users count for nothing. It is the responsibility of the designer to take into consideration specific tasks to find the proper balance between emotional and rational design. Users have emotion-related motivations for their decisions and behaviours which often control rational decision-making. Consequently, design must take into account emotional aspects. "Design is not just what it looks like and feels like. Design is how it works." (Steve Jobs quoted by Walker, 2003) It is commonly known that we understand by design the creation of two- and three-dimensional products with special emphasis on user-oriented ergonomic, communicative and aesthetic needs on the one hand, and the technical design, production-related and commercial interests, on the other. It is also known that design concerns not only the formal shapes of the visible appearance but also the discussion of the related targeted structural organisation of the relevant functions. Design is thus always a synthesis of form and function. Under the umbrella of 'interaction design,' we can find tools for our creative work to help in developing and defining the way a user interacts with a design solution and the way this design interacts with its surroundings, for example in the way a driver interacts with a vehicle and the vehicle with the environment. This helps us to detect errors in the interaction design of signage interfaces and gives indications about the cognitive demands of future visitors.

Interaction design seeks to integrate different ways of looking at the current situation in three different perspectives (Preece et al., 2002).

- The technology-unfocused gaze.
- The approach of behavioural scientists.
- The point of view of social interaction (Preece, 2002).

By using fictitious person descriptions, so-called Personas, the students made sure that the identified requirements are considered during all development phases and that the focus remains on the attitudes and behaviours of the inhabitants of, and the visitors to, the Brunnenviertel.

The students developed Personas like:

Maria D., a 45-year-old female. She has lived in the Brunnen-neighbourhood in Berlin for 20 years. At the age of 30, she lost part of her visual ability. She is now colour-blind and handicapped by that. For this reason, she had to learn the neighbourhood by heart with the aid of her dog. She travels mostly by foot. Her usual walking distance to her place of work is about 15 minutes. She now feels very insecure and moves very carefully due to the lack of signage.



fig. 194 Maria

Gülcan, 25 years of age, has lived in Berlin for eight years. The young mother was forced into a contract marriage and brought to Germany for the purpose of family reunification. She is the mother of two children. A boy aged seven and a four-month-old girl. The education that she carried with her from Turkey is only on an elementary school level without language skills. The young family receives governmental Hartz IV benefits for living and family allowances to support the household. Gülcan is helping in the household of a friend of her mother to earn some extra money. Gülcan rarely speaks German, which constitutes an obstacle to integration. She lives in a closed community of Turkish people in the Brunnen area.



fig. 195 Gülcan

Seo Eun Gi, 22 years of age, from Korea. The self-employed photographer has been living in Berlin for two years. She is very interested in her environment. She barely speaks any German, but can speak perfect English. She is a creative and communicative person and likes the positive influence of her neighbourhood.



fig. 196 Seo Eun Gi

Achmed, 20 years old, trained as a mechanic, is the son of Abdul and Ada, who left their country of origin Algeria ten years ago moving through Morocco and Spain and finally to Germany. The sudden cultural changes, as well as the unknown language were difficult to accept for him. He had to cope with a lack of social contacts, not making friends among peers, a lack of proper conditions for social development, rejection, low self-esteem, no self-confidence, etc. School indicates there are concrete social problems occurring in the family. For time and cost reasons he travels on foot or by bike.

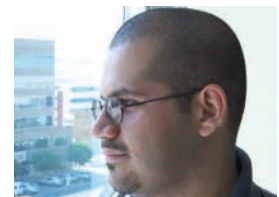


fig. 197 Ahmed



fig. 198 Kristján



fig. 199 Eva

Kristján Guðjónsson, 31, is a tourist in Berlin, visiting Berlin with his band for some gigs and does not have much time for sightseeing. During the little spare time he has left, he wants to explore the vicinity around his hotel closer. He comes from Scandinavia and feels extremely connected to nature.

The pensioner Eva, 75, is a Polish immigrant, typical characteristics: weak, slow, slow uptake, poor eyesight, impaired sense of direction, not related to modern technology, limited knowledge of the German language. Everyday Activities: light meal preparation, keeping rooms tidy, short walks, shopping around the corner, meeting like-minded people, and watching Polish home channels on the TV. In general, her life takes place without any major influence from outside.

Designers usually aim for beauty, not utility. However, following the principles of design was helpful in the development phase to make things understandable and usable. For the design student, this means that he/she has to give hints to the operations expected: this implied visibility – the more visible functions are, the more likely users will be able to know what to do next. In contrast, when functions are “out of sight”, it makes them more difficult to find and to know how to use. Using technology to make visible what would otherwise be invisible implies also giving feedback. For the visitor, this means the signposting is sending back information about what action has been done and what has been accomplished, allowing the person to continue with the journey. Various kinds of feedback are available for interaction design – audio, tactile, visual, and combinations of these. The design solution should be designed so as to ensure that it is clearly legible and that there is only one possible thing to do – the right thing. This, in turn, means restricting the kind of user interaction that can take place at a given moment. There are different ways the design concept of constraining can be achieved. As we have already discovered in the previous chapters, it is a need of human orientation to be able to map the present environment and to accommodate this information to personal needs. The comparison between personal movement and the effect in the surrounding world helps to adjust personal action. All artefacts serving for orientation need some kind of mapping between controls and effects, whether it is a flashlight, car, power plant or cockpit. This also refers to the design of signage. This design must use similar elements for similar information to continue giving clear and consistent instructions. Inconsistent signage allows exceptions to the rule and will cause confusion.

Finally, it is important that the affordances of the physical objects are perceptually obvious and that it is easy to understand how to interact with them and the environment (Norman, 1988).

We worked in various small groups that were responsible for the following content:

Plan, detailed plan: Natascha Klingbeil, Lara Daskalou

Signs, arrows: Tanita Helm, Dominic Sanny

Codes and markings: Claudia Henkel, Robert Vesper, Robert Wagner

Web links: Dieu Huyen Tran, Katharina Fleischer



fig. 200
The publication as a presentation platform of the achievements, presented to the Quartiersmanagement Brunnenviertel board on 04.06.2013 to members of the Senatsverwaltung für Stadtentwicklung und Umwelt, Bezirksamt Mitte Gebietskoordinator, and to the Straßen- und Grünflächenamt.

Plan, detailed plan: This group's task was to create a map showing the Gesundbrunnen district. They tried to simplify the present map as much as possible in order to clearly represent the focused elements. The group has worked mainly with coloured areas and reduced icons. In the design of the map they made sure that the plan has a uniform colour scheme. Important places are numbered. The map should be used through different media such as poles, banners or flags, signage plates, foldable maps and in mobile online items.



fig. 201
reworked map as replacement
of the silkscreen printed out-
door map.
Natascha Klingbeil,
Lara Daskalou, 2012



Signs, arrows: For the signage and arrows concept the students have considered working with colour gradations. The idea behind this is easy to understand: the closer you get to the target – the stronger the colour will be. In addition, it should vary depending on the target category as identified by different colours (e.g. green for parks; yellow for sightseeing and so on). The students expressed the conviction that it is easy to get to your destination due to the colour schemes.

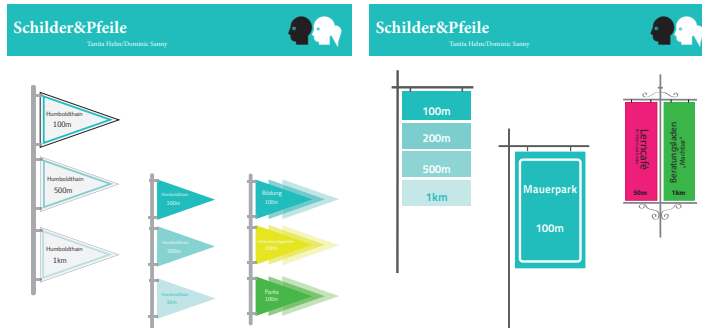
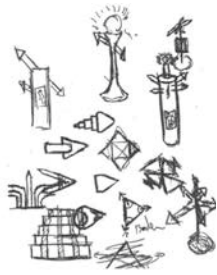


fig 202
developed signs and arrows
Tanita Helm, Dominic Sanny,
2012

Codes and markings: the basic idea of the students here is a network of signs using floor markings or signs. To implement this approach, they have determined to start with the most effective mounting points for the plates. The maps are all in easy to understand visual sightlines, so that with the technique of targeting the plates and signs it should be easy to find the next plate and sign. The marking signs work as an appropriate map – a gridded layer for the whole area pointing to certain goals and giving the exact position and also precise distances to landmarks or goals. The ground markers now provide a possible direct route from one plate-map to another. This creates close-knit and precise networking, in which the observer can orient quickly and easily from one sign to another. On each plate all the other signs are also listed. This plan appeared to allow a cost-effective, fast, feasible prospect for a signage system in the Brunnenviertel area.

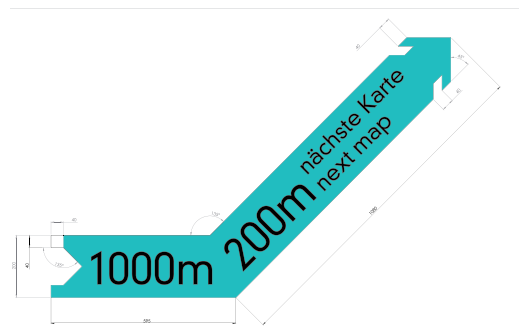


fig. 203
guidance system with a grid of
pointing arrows
Claudia Henkel,
Robert Vesper,
Robert Wagner, 2012

fig. 204
Guidance aid as well as a
smartphone/tablet application,
can be offered also online.
Dieu Huyen Tran,
Katharina Fleischer, 2012



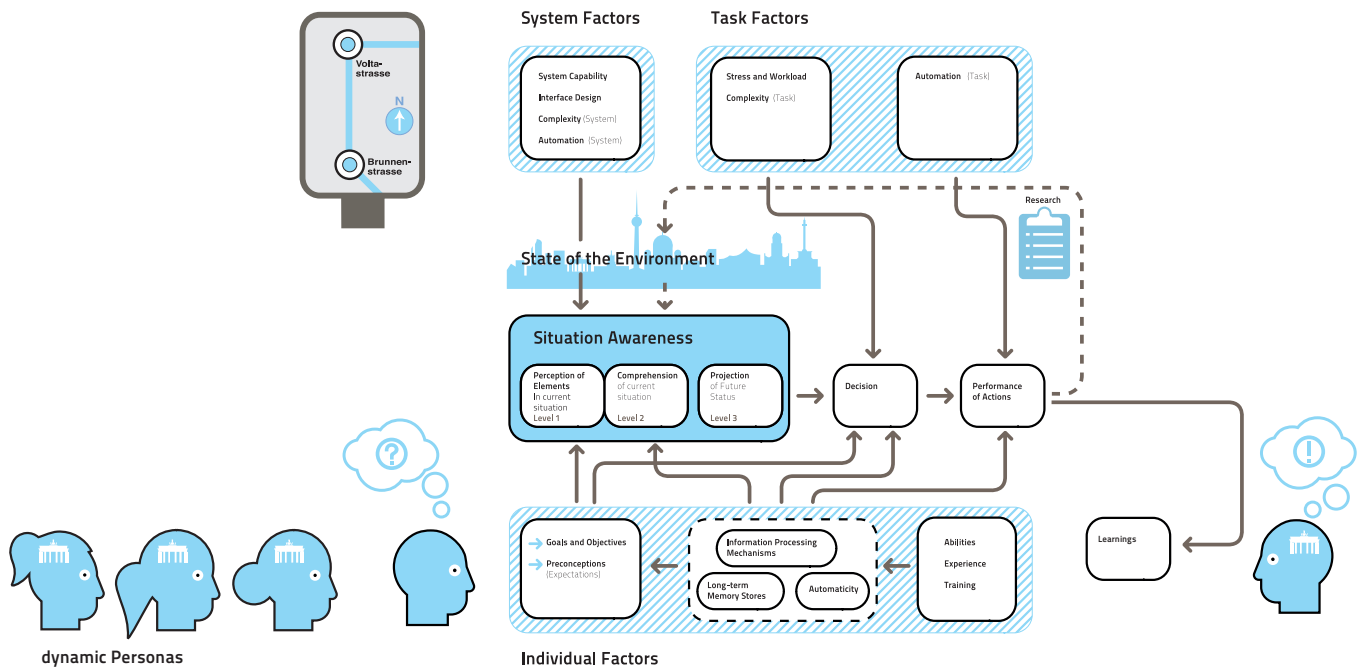
Web links: These students developed the idea of QR codes for guidance. Those QR codes refer the user to the website and partner sites. They are quick and easy to create and freely upgradable. They are also simple and can be used in many places. It is important for the codes to be placed in appropriate locations (i.e. on maps, signs, bus stops, etc.).

This case study is a good example to show that the different perspectives of situational awareness are at the heart of the graphical system design. Many of the emerging questions in the systemic approach could be clarified with the help of situational awareness. The questions that were addressed to the students correspond exactly to the cycle of the situational awareness model. Through these questions it became possible to move the perspective away from a very limited view on the guidance issue towards a more differentiated understanding of the situation. This approach helps to elaborate solutions in a wider context, also meeting environmental and urban planning objectives.

- What mechanisms are behind the situation?
- What are the factors / user / influences?
- What purpose does the system have in relation to the factors?
- What are the feedback loops to affect or correct the system?
- How can we determine whether the system achieves the goal?
- Who defines the system, environment, destination, etc., and monitors it?
- What are the options for the system to achieve the desired results?
- Are these possibilities sufficient to achieve the results?

With the answers to these questions exact predictions can be made about the future needs of guidance system in the public city area. With the aid of the different views of situational awareness it was possible to extract essential and required information that is highly valuable for the quality of life in urbanised areas. Using this information, it was possible to produce a detailed and accurate modelling of personas and scenarios with respect to different cultural backgrounds, different age groups, different tasks, and different stress levels. The developed proposals for solutions to direct visitors and residents of the Brunnenviertel quarter respond to the requirements of the individual needs, as well as the task demands and the system specifications. The proposed solutions even go so far that the psychological aspects like the bottom-up approach are involved as long as our visitor is piecing together information to provide a global overview and to make him- or herself familiar with the Brunnenviertel environment.

fig. 205
The model of 'situational awareness' helped to understand the guidance problems and was an important driver for developing and testing new ideas. For detail dimensions please refer to p. 213



The results of this research were reviewed and discussed by the responsible authorities. It was presented as a slide show (projector) presentation to the Quartiersmanagement Brunnenviertel board on June 4th, 2013, to members of the Berlin Senatsverwaltung für Stadtentwicklung und Umwelt (Senate Department for Urban Development and Environment), the Bezirksamt Mitte Gebietskoordinator (area coordinator), the real estate association degewo, two spokesmen from the quarter management, the road- and parks commissioner, and representatives of the Brunnenviertel quarter. As a second presentation platform of the achievements, we presented a printed version in book form. The final decision has not been made at spring 2013.

After my departure from Berlin in 2013, I passed the baton into the capable hands of my colleague Prof. Dr. Jan-Henning Raff. The following projects were realised in cooperation with the Brunnenviertel quarter:

Winterterm 2013/14 “Spielend das Brunnenviertel entdecken” [playfully exploring the Brunnenviertel environment]

Winterterm 2014/15 “Pop-Up Haltepunkte im öffentlichen Raum” [pop-up breakpoints in public space]

Summerterm 2015 “Brunnenviertel Barrieren begrenzen” [Brunnenviertel limit barriers]

3.7 Development of a User-Friendly Signage System for Different Age Groups

In this example an unusual development path could be realized, the development of a guidance system charged with connotative implications in a humanistic and generation spanning manner. In Wuppertal, Germany, children will be exposed to science, technology or the social sciences at the Junior Uni (Junior College) on a voluntary basis outside of the normal public school. The initiator of this project, source of ideas and acting as the motor behind the Wuppertal Junior University, is Prof. Ernst-Andreas Ziegler. He had raised the prospect of this educational project with numerous experts and consultants in 2008. Since then he studied students between the ages of four and eighteen years in over 22,000 courses. The lack of spatial resources quickly became evident in light of the strong demand. After five years of existence in temporary buildings, the junior college has found a new home in a beautiful and colourful building with extraordinary architecture. The new building was financed solely by foundations, corporations and individuals.

The educational concept implies an approach to teaching that goes beyond traditional subject boundaries, for example courses lasting up to eight events in various disciplines. The classes are conducted by outstanding pro-

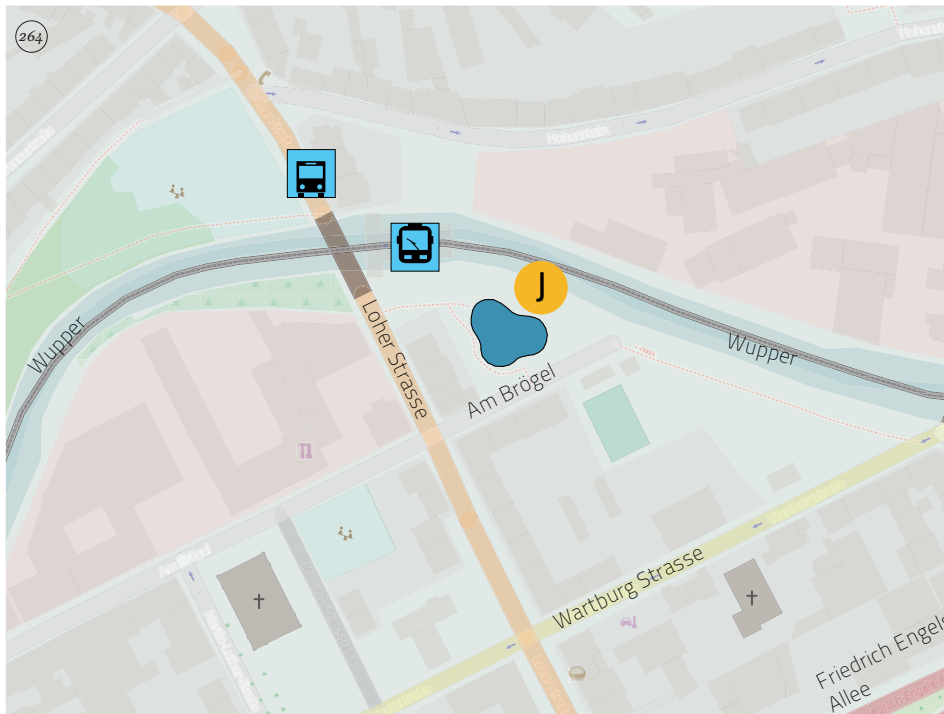


fig. 206
map of Wuppertal
Unterbarmen area

J · Junior Uni building

fig. 207
The suspension railway follows
the small river Wupper; station
›Loher Brücke / Junior Uni‹



fig. 208
*Josef Johannes Niedworok
 (architect) explains the
 concept to the future users
 at the topping out ceremony;
 May 2013.*



fig. 209
*Logo of the JuniorUni:
 The red logo is a modern,
 abstract representation of the
 Möbius strip.*



professionals in business, science and education. The success of this training concept is, among other things, the high calibre of the outstanding lecturers who are able to pass on experience and knowledge to the interested young people. All without the pressure of getting good grades and to meet on an equal footing.

On the 3rd May, 2013, I was very fortunate to meet Prof. Ziegler by chance. Shortly after that first meeting, I became a fixed element of the project planning. It was a stroke of luck to be involved in the early stages of the project planning, so we had the chance to work very closely with the customer (Junior Uni), the architects and the interior designer to develop an innovative visitor guidance system. On December 7th, 2013, after only ten months of construction, the impressive, cheerful-looking new building of the Junior Uni opened with an individual signposting solution developed and manufactured by the students in the different courses and by myself.

The course task for the HMKW students was formulated in terms of personas as the basis for the user structure analysis of the JuniorUni. The aim was to use the definitions of these user cases for the further development of a user-friendly design.

The students had to develop and sketch concepts for a signage system for the Junior Uni. The initial specification requirements, like different scenarios or different age groups, were discussed and set up.

For example

- Define a Persona (Specifications: Visitor, Male, 38 years)
- Define a Persona (Specifications: Visitor, Male, 38 years)
- Write a script model of your Persona
- Explain and exemplify on the basis of your script model your design of a signage system for the Junior College.

To explore more personas and visual styles we created a range of personas like: [The assigned task was: Define a Persona; Specifications:]

- | | |
|---------------------------------------|----------------------------------|
| • Visitor, Female (78 years) | • Child, Female (4-5 years) |
| • Visitor, Female (38 years) | • Teen, Male (14 - 15 years) |
| • Visitor, Male (28 years) | • Teen, Female (14 - 15 years) |
| • School-aged child, Male (7 years) | • Young adult (Male, 18 years) |
| • School-aged child, Female (7 years) | • Young adult (Female, 18 years) |
| • Child, Male (4-5 years) | |

Students had already developed initial ideas during the course M4 in Cologne.



fig. 210
sketches of possible signage

Daniela Imbusch, 2013

The students have attempted the represented personas as authentic as possible and linked with a realistic story based on real-life circumstances and truths. This requires the ability of competencies like curiosity, openness, empathy, and an open readiness to positively reassess one's own world vision. This ability to communicate in situations of intercultural contact needs the greatest possible sensitivity (empathy) in the problems and needs of the represented person. That is the only way to ensure to develop an optimum, intuitive guidance concept.

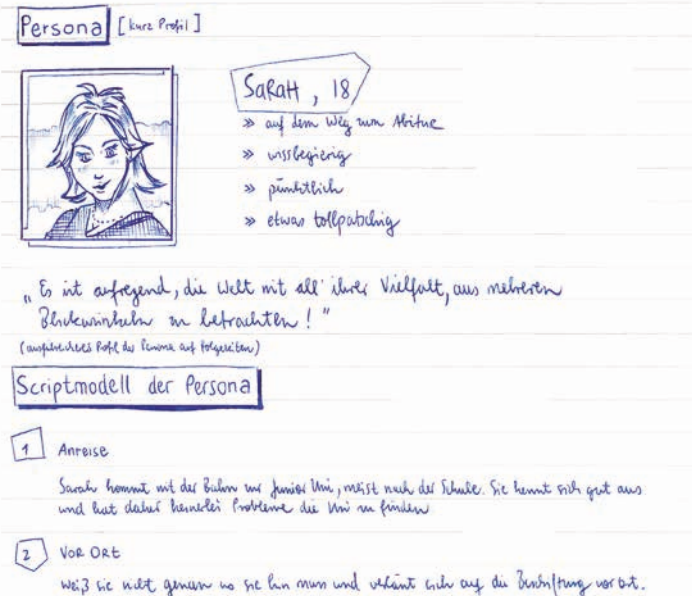


fig. 211
Developed persona with profile

Ercan Bektas, 2013

The new building JuniorUni in figures:

architects: Hans Christoph Goedecking and Josef Johannes Niedworok

Total cost: about 5 million euros

Land size: 1757m²

Net floor area: 1992m²

Spacious foyer of 165sqm, which also could be used as a venue for larger events. 18 conference rooms including a computerlaboratory, a working space and a water research laboratory and a laboratory for biology, physics and chemistry classes. In addition: two mini laboratories in which small groups of students can perform independent research, eg. for the german competition „Jugend forscht“ (Youth Researches) or European Junior-Research Programmes.

The Junior College is a non-profit GmbH (a non-profit private limited company). So it does exactly what politicians and scientists for decades demand: children should already be promoted very early on a non-school learning center, to have a place to meet their natural inquisitiveness.

Through the personas developed, the nodal points of visitors to the JuniorUni quickly became apparent. The different visitor-groups made it necessary to establish a system that will be understood by all age groups.

































fig. 212 visitor group

We had to recognise that the different visitor-groups need a system that will be understood by all age groups.

fig. 213
Matrix of communication abilities

Persona

	capable of reading	understands icons	used to mobile devices
  pre-school			
  first-formers			
  youths			
  young adults			
  adults/parents			
  grandparents			

The commonly used communication models at the JuniorUni are on the one hand, very personal, for example the staffed registration desk, while on the other hand, there is also communication with visitors via digital displays and posters.



fig. 214
New building for the Junior Uni is a landmark

The building itself is a landmark. The base surface has the shape of an amoeba and it is located predictively by the architects on the bank of, and at a bend in, the Wupper River, in sight of the suspension railway, the main public transport vehicle, which is still emblematic of the city of Wuppertal. With the help of a massive PR campaign, an “open day” featuring family-friendly highlights and a number of newspaper articles concerning the new building, the location has been made very well known.

The movement structures in the building are clearly predefined by intelligent architectural solutions. Visitors should enter the building through the funnel-shaped entrance (1) and are safely guided through the room by points of light until they reach the half-moon shaped reception counter (2). Parents can leave their minor children with the receptionist to be cared for during the courses. Older teenagers meet the other participants of the course at predetermined points. All students of the Junior Uni can only enter the rest of the building with their respective teacher - an electronic locking device prevents unauthorized opening of the entrance door to the upward staircase (4). Parents or friends can wait at the booths (3) until the classes are over to pick up the children and young people after class. The upper floors can only be left by way of the second staircase (5) whose door can be opened only in the direction of the foyer.

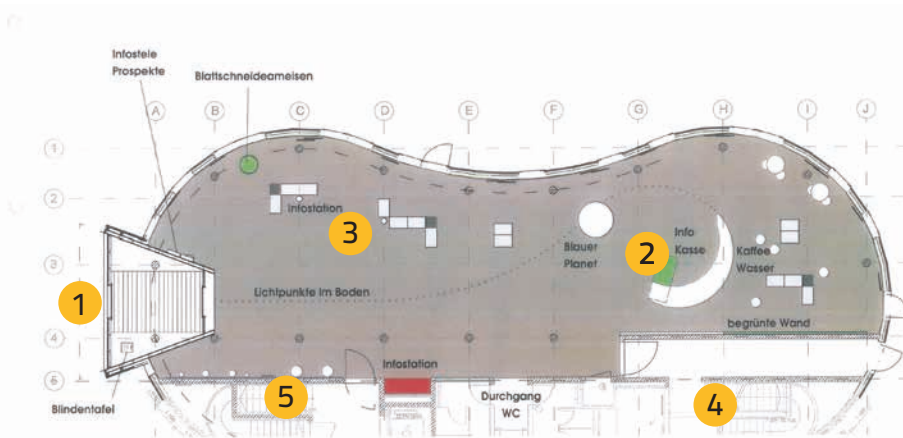


fig. 215
Floorplan Junior Uni,
groundfloor

Legend
groundfloor Junior Uni

- 1 main entrance*
- 2 desk*
- 3 waiting area*
- 4 stairs up*
- 5 stairs down*

To establish an intelligent signage system for the many visitors from different age groups between the various floors, a design theory of the Bauhaus movement was remembered. The rigorous use of different primary colours for the flooring is one of the results, among others. This is developed according to the colour theory of Paul Klee with its three basic formal levels:

- The level of the colour degree - the size of the colour space.
- The colour weight - tones from the brightness values or tonality of a colour.
- The quality of the colour - tones from the colour value of each colour.

Through the distribution and proportion of a space connected with corresponding colour tonalities and colour qualities, a colour dynamic will emerge that is able to fill the rooms of the Junior Uni in a dynamic way and is also able to structure the rooms according to their use in an understandable way. This kind of colour system was used in 1927 for the first time, by Max Burchartz and Anton Stankowski in the Hans-Sachs-Haus, a building in Gelsenkirchen, Germany - the world's first example of a 'signaletique' orientation system. This concept, to guide people to their destination using colours alone was revolutionary at that time. This method can be learned by any visitor without any pre-knowledge at all in order to orient themselves. This method is still working at the Junior Uni today. Any visitor who is able to perceive colours, is able to orient themselves in the building. Visitors regardless of age, education or cultural backgrounds can find their way. The colour-coding system was the long searched for brick in building the desired universal communication. Burchartz's system resulted in the colours red, green, yellow and blue being used in the Hans-Sachs-Haus, each colour standing for a different floor of the building. There were also white, black and grey as complementary colours. This system was adopted when planning the



fig. 216
Max Burchartz interior
of the Hans Sachs-Haus
Gelsenkirchen

Junior Uni. The only exception was in the use of yellow for the ground floor, this was changed to a bright wood tone, because the entrance area was built complete with parquet flooring as a donation.

The flooring on the upper floors is coloured linoleum. On the 1st floor blue linoleum was used, red for the second floor and green on the 3rd floor. The corresponding numbers in the stairwells show the corresponding colour in the direction of the floor. The grey tiled areas are used as equipment rooms and laboratories.

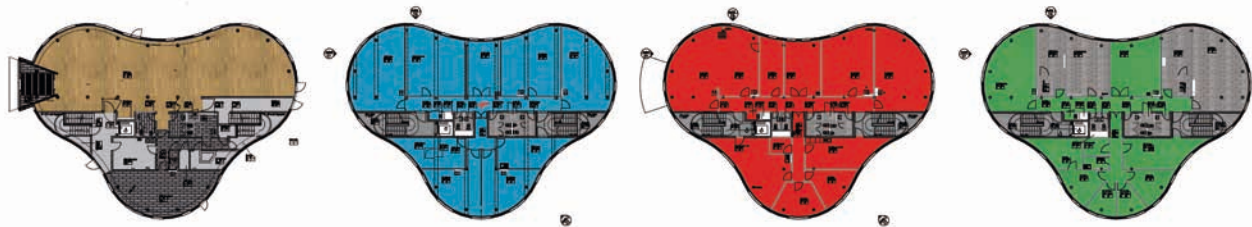


fig. 217
Floorplan Junior Uni

Beklebung Auf-/Abgänge und Aufzug

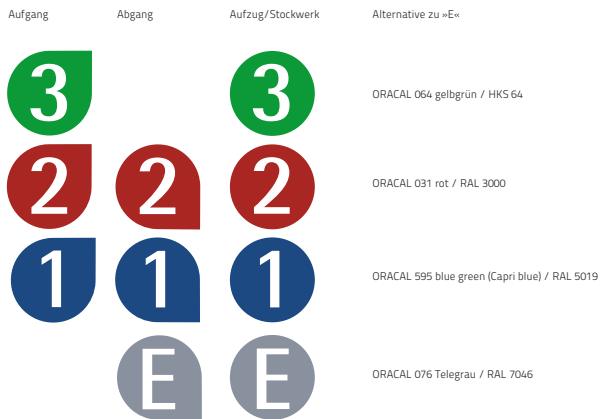


fig. 218
Direction indicator for a safe stairwell: from the entrance to the roof are designed as vinyl „stickers“.

A conventional pre-manufactured door signage system was categorically ruled out as an option in the planning phase. It is commonly knowledge that even experienced adults have problems in finding their way in a sequential signing system with room numbers, like in office buildings. Going back to our developed user matrix, it was logical to choose icons for the orientation system. To identify each door using an individual function to be carried out in the room was another smart option.

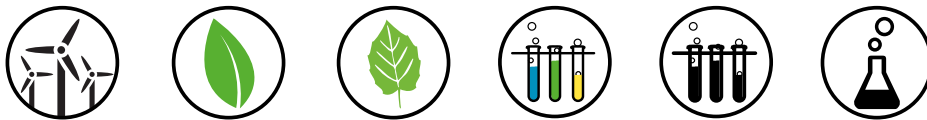
For cost reasons, the introduction of a signage system from external suppliers (for example Moedel) was rejected at an early stage of planning. Instead the opportunity was seized and the decision taken to use weather-proof plotter cast (ORACAL) in order to stick the label directly onto doors

and walls. The cast PVC film with a thickness of just 60 micron was processed on a digital cutting plotter for cutting the layouts on self-adhesive foil. We have chosen here an image from the early idea drafts by Daniela Imbusch to denote a fictitious chemistry lab. The design of the bubbling Erlenmeyer flask as a prototype icon failed. Not even all the adults and adolescents with experience in Chemistry had been familiar with this sign, but it was completely misinterpreted by the children. Our testing crew could be recruited from the future users, because all meetings were held in the old building of the Junior Uni. The most important design steps were printed as posters (in 70 x 100 cm) and could therefore be presented to a larger group of children, parents or lecturers. Their comments influenced the further developments.

With Daniela Imbusch's first sketches as a starting point, the other students from Cologne developed fifty different icons on the following topics in a similar line - with and shape:

fig. 220
ideas of guidance icons
to inform visitors of the
functions of each room.

Daniela Imbusch, 2013



- | | | | |
|-------------------------------|---------------------|----------------------------|-------------------------|
| 1 Technology | 14 History | 27 Meteorology | 40 Financials |
| 2 Electrical / Electronics | 15 Theater | 28 Medicine | 41 HR (human resources) |
| 3 Mechanics | 16 Regional Studies | 29 Media | 42 Marketing |
| 4 Applied Technology | 17 Communication | 30 Film | 43 Computer Science |
| 5 Energy Technology | 18 Design | 31 Photography | 44 General IT |
| 6 Tools / Measuring Equipment | 19 Science | 32 Communication | 45 Programming |
| 7 Materials | 20 Natural History | 33 Mathematics | 46 Web Design / Design |
| 8 Infrastructure | 21 Physics | 34 Math Brain Teasers | 47 Databases |
| 9 Traffic | 22 Chemistry | 35 Geometry | 48 Program Application |
| 10 Culture | 23 Biology | 36 Applied Mathematics | 49 Humanities |
| 11 Art | 24 Astronomy | 37 Statistics | 50 German Studies |
| 12 Architecture | 25 Environment | 38 Business Administration | |
| 13 Music | 26 Geology | 39 Accounting | |

fig. 219
door labels · Moedel, signage
systems

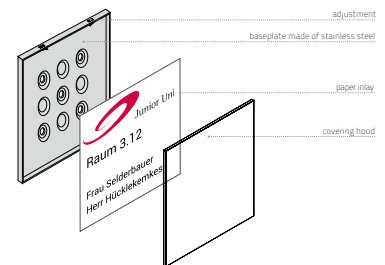
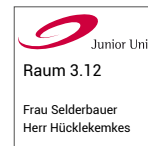




fig. 221
Final meeting about icons,
colors and floor signage

from Left: Dr. Ariane Staab,
Prof. Dr.h.c. Ernst-Andreas
Ziegler, Annerose Ziegler,
Dr. Amitabh Banerji

The poor results of the test surveys, however, have led to new ways of dealing with the problem of space signage. Examples produced during the development of images were not discarded, but got a special place in the entrance hall.

Between the founding of the Junior Uni and our planning meeting in May of 2013, around 20,000 children and young people had attended classes at the junior college. The Junior Uni was from its very beginning planned and created as a permanent, non-formal education centre for children and young people, in particular for families with disadvantaged backgrounds. Through the age-specific offers, the universal education programme attracts all age groups.

The aim of the Junior Uni is to teach learning with joy. It is not the pure transmission of knowledge, but it is the imparting of values and a reflection of the society's understanding. The question we asked ourselves was as follows: "How can we direct the attention of the students and visitors to the outstanding personalities and leading figures from the local, national and international community who stand for the imparting knowledge and represent the core values of the Junior Uni?"

Distribution of applications to the departments by age class
(in %)

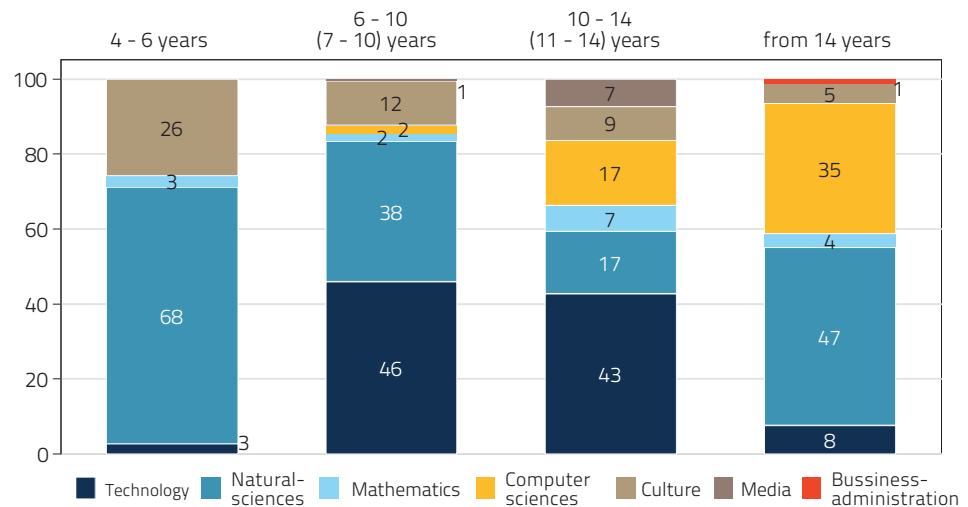


fig. 222
Applications in different
course offers by age.

fig. 223 (on the right side)
The developed portraits, by
Natascha Klingbeil, Claudia
Henkel, Tanita Helm,
supported by Markus Schröppel

Font development in Truetype/
Opentype Font Format, 2013

In an already conducted evaluation of the Junior College it became clear that the interests are pronounced very differently to the course offerings at different ages. Even in infancy a human develops the amazing ability to recognise faces. This ability has been used in order to distinguish between the

spaces. For the younger students, the symbol of an Erlenmeyer flask may not be known, but faces are more memorable/recognizable/easier to remember. Merely by seeing famous faces, people can recognise such outstanding personalities from the fields of science, politics and society. The combination of the powers of recognition and memory of the human brain enable such abilities. The research results in the area of face recognition have shown that people develop notional face recognition units, links with the names or attributes, so-called personal identity nodes, to identify a person uniquely. Children process faces in a similar way to adults (Bruce, 1992). The 18 seminar rooms, computer labs, tool room, chemistry, biology and physics laboratory and seminar room, meeting room, lounge, library or material bearings were labelled with portraits of famous people such as scientists, writers, inventors, artists and other role models, which give orientation and communicate a position. People are excellent at identifying faces, even from very low quality images. Recognition performance for moving and static learning conditions is a function of familiarity. According to the predominant colour in the floor, the portrait of the person has to have the same colour. The only difference is the function of the room. A coloured portrait indicates a public place while a grey portrait is used for administrative offices or storage. The displayed persons are also labelled with the respective name and lifetime, so the young researchers can match the faces together with the life stories for better recognition. The portraits can also be found in the programme leaflet and in the always-current information about daily events displayed on the monitor close to the entrance, in order to know in which room which course is taking place.

During the process the students in Berlin developed about 100 portraits of selected famous persons

Memorable Portraits

Keyboard Configuration

Archimedes 0	SalkJE 1	Benz, Carl 2	Alsberg, Paul 3	Lasker-Schüler: 4	Bayer, Friedrich 5	Humbolt: 6
Kopernikus: 7	Mandela 8	Bausch, Pina 9	Beauvoir, S .	Hillary, E ;	Rau, J :	Koch, R !
Platon ?	Schmidt, Loki .	Schöll, Hans ,	Bach, JS {	Beethoven, L }	Schöll, S @	Montessori, M *
Armstrong, N /	Frank, Anne &	Lindgren, A. #	Einstein A. %	Sartre, J.P. <	Bilharz, T =	
Schweizer, A. >	Alsberg, B. 	Sokrates \$	Fairbairn, W. §	Michelangelo + (Plus)		
Sabin, A. B	Adenauer A	Brandt: B	Curie, P C	Darwin: D	Erleben: E	
Fuhrrott: F	Gallie: G	Hahn, Otto: H	Semmelweis, I I	Jackstädt, W J	King, ML: K	Langen, E L
Mozart, WA M	Kant, I N	Preußler, O O	Pfeiffer, Ida P	Fossey, D Q	Rieppel, A.v R	Schuman, R S
Trautwein, F T	Newton, Sir I. U	Vinci, Leonardo V	Westkott, J.F. W	Stöcker, H X	Mendel, Gregor Y	Aristoteles Z
Arendt, Hannah a	Benz, Bertha b	Curie, M c	Domagk, G d	Engels, F e	Fleming, A f	Gasperi, A. g
Hessel, S h	Leibniz, G i	Juchacz, M j	Korczak, k	Lagerlöf l	Meitner, L. m	David-Néel, A. n
Gauss, o	Planck, Max p	Leipnitz, H q	Röntgen, r	Salomon, A s	Tenzing t	Frisch, Karl v. u
von le Fort, G v	Wegener, A w	Benzenberg, J.F. x	Schade, H y	Zatopek, E z		

as role models for the signage in the Junior Uni. The concept was restricted to deceased individuals only. The sudden death of Nelson Mandela changed the configuration of the list of great humanists from Immanuel Kant through Henry Dunant, Rosa Luxembourg and Hannah Arendt, Albert Schweitzer to Martin Luther King and Nelson Mandela. From the final list, 86 portraits were chosen and a font was developed for easier use and integration in online applications as well for usage in printed publications.

The first draft of the creative concept with the portraits could be copied to a clipboard that was to be mounted directly onto the wall, beside each door. In the test phase it was obvious that the portrait was too small and the text element too large. We decided that the facial portraits should instead be applied directly onto each respective door.

fig. 224
top: Presentation draft of wall mounting,
right: Presentation draft of door and wall sticker.



fig. 225
grid for the numbering



During the different artistic variations of the portraits it was quickly apparent that the results differed depending on the artist, resolution of the scanned original and the software used for digitization. The only requirement that had been made in advance was the so-called 1,000 points rule. In order to incorporate a portrait in the digitized font, the value of 1,000 Bezier points could not be exceeded. The level of detail, and the resulting visual evidence of the portrait, was restricted by this technical requirement. The skill here was to obtain the same form, detail and size of the portraits, so that they appear as if coming from the same family of portraits. It was also technically important that all shapes have so-called closed paths, since the cutting plotter would otherwise generate an error.

On October 8th, 2013, about 90 heads were therefore placed on a 10-m² piece of tracing paper at a scale of 1:1 printed in the respective floor colour.

With the help of all employees of the Junior Uni, the portraits were distributed in accordance with their colour to the respective doors.

This step served as a control of the quality of the drawn portraits, the direction of view of the faces - they should always look in the direction of the door handle; and the enforcement of the floor colour and colour of the person at the appropriate laboratory.

It quickly became obvious that not all portraits would work. Some elderly faces of portraits from the turn of the century looked too grim. The children, asked in interviews, were very good and objective critics. The corrections were forwarded to the students in Berlin so they could change the portraits, the font had to be modified soon after. Sixteen additional editing loops became necessary, until portraits, names, dates and quotes were developed correctly and of satisfactory quality.

The last logistical preparations were made. We used a Roland cutting plotter developed for the professional high-quality production of vinyl cast that was bought a long time ago at the HMKW. All students involved in this project had been trained on the cutter and the GX-software in the preliminary phase. A second similar plotter has been purchased as a donation for the Junior Uni, in order to speed up the process of cutting the loads of stickers and to be able to make alterations independently in the future.

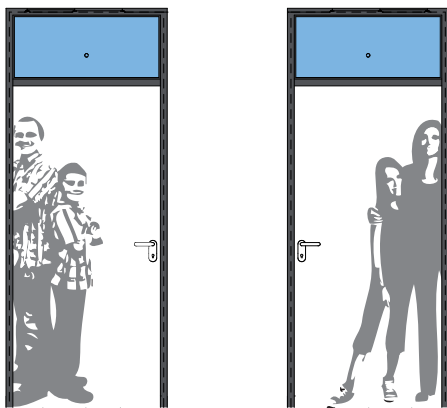
For the process to be successful, the surface of the doors must be completely clean. So teams were organised for the cutting, cleaning and the delicate and multilayered task of the dry application technique of the vinyl cast. After weeding the application of the tape, the team had to position the letters and portraits precisely on the door or wall using masking tape and finally

*Students involved from the course
M4 Environmental Design
summer and winter term 2013
HMKW Hochschule für Medien,
Kommunikation und Wirtschaft
University of Applied Sciences
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*Berlin team developing the faces
and manufacturing the vinyl-cut
signposting:
Natascha Klingbeil
Claudia Henkel
Tanita Helm*

*Cologne team developing the floor
numbers and manufacturing the
door and wall signposting:
Fatma Aydin
Ercan Bektas
Bianca Caster
Anabel Eskici,
Daniela Imbusch
Sabrina Mattle
Anja-Maria Strack
Caroline Tschiderer*

*Cologne team developing of the
course icons and manufacturing
the guidance:
Zuzanne Abts
Valentin Barghizadeh
Leena Brüne
Collin Carus-Ottlilge
Demet Cinar
Oliver Gaspers
Katharina Granzeier
Katharina Grumke
Marah Heinen
Denise Knips
Laura Kurpat
Melina Kürten
Amanda Lakop
Janine Richartz
Jenny Christina Thiele
Elisa Wolff
Marie-Krystin Wolter
Fil Zepp*



*fig. 226
Toilet signage, final version,
which was produced and
signposted but reworked.*



*fig. 227 Annika Schächt
controlling the door signage*



*figs. 228 - 230 Cologne team is manu-
facturing the door numbering*



*fig. 231 interested visitors got a picture
of the focal point of the new lette-
ring and marking of the building.*

*figs. 232 - 238 placing the graphic on
the surface and applying the film
by using a felt-tip squeegee*



fig. 234 After only a short working time the new cutting machine had a technical defect.
Once soldered the spare parts, the vinyl-cutter continued to operate for the next weeks

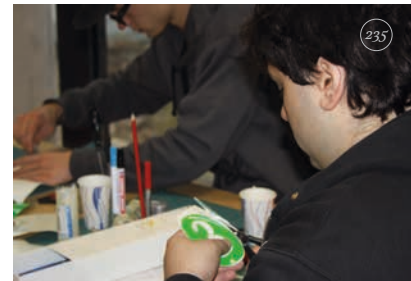




fig. 239 - 241 The scrutinizing view of the Berlin students detected mistakes, errors have been corrected and the process has been considerably revised, so that the quality increased.



vigorously wiped with a squeegee. We used a durable film, with permanent, not removable, bond. Every mistake was visible immediately. .

On the second day, the designers from Berlin arrived. The cutting operations with the changes of the revised portrait series could be performed. One element that had not been voted on in the committee was the signposting of the toilets. The icons on the toilets should be in keeping with the designer's visual concept of the portraits in colours, line width and visibility. The logical continuation of the fundamental design would be to stick life-sized silhouettes of users to the restroom doors. Analogous to the colour code: coloured silhouettes using the floor colour for visitors and grey for employees. A silhouette of children could indicate a toilet for children, as well as for adults and adolescents.

The small users of the Junior Uni voiced some concern about this restroom labelling shortly after the opening. The silhouettes frightened the children. 'The figures look like ghosts', was a sprawling opinion. For this reason the stickers were removed from the doors and replaced by stylized icons, representing a man, a woman, children or a wheelchair. Again, it required a number of different versions to develop icons that everyone accepted. The selected icon for children finally appeared with arms and was finished before New Year.



fig. 242 color-fan from the self-adhesive film Orafol ORACAL 751 High Performance Cast



fig. 243 sticker made from self-adhesive film

Beklebung Toiletten

ORACAL 054 gelbgrün / HKS 64
ORACAL 031 rot / RAL 3000
ORACAL 595 blue green (Capri blue) / RAL 5019
ORACAL 076 Telegrau / RAL 7046



fig. 244 Restroom signs reworked by Collin Carus-Ottlilge, 2013



*fig. 245
The new building on Dec. 7th*



*fig. 246
The Lord Mayor of the City of Wuppertal Peter Hermann Jung made an introductory speech.*



*fig. 247
Already in the first week the foyer was populated by children and their parents. Markus Schröppel 2013*

On December 7th, it had been accomplished. The new building of the Junior Uni was festively inaugurated and officially opened to launch operations. As the first courses took place, it was already clear to see that the long controversial new building of the Junior Uni was a complete success. The control system was adopted by children and adults, visitors and employees alike.

It proved to be a wise decision not to mark the rooms with functional icons; otherwise the different use of a room by different classes would imply additional confusion. The characters themselves were not always consistently thought out from a user perspective, which would lead to incorrect interpretations of the icons by different people; an additional nuisance which could be avoided.

A real advantage was the consistent involvement of future users in the development phase of the guidance system. With the aid of interviews with young and elderly visitors at the beginning of the planning and development stage, many issues that seemed to be functional from the designer's point of view, could be sorted out, as they turned out to be impractical for the end user.

*fig. 248
tactile map at the entrance*
*fig. 249
The wall at the entrance shows the various scientific disciplines with the developed icons.*



*fig. 250
Charlotte, my daughter was a great help in detecting possible faults.*

The foyer with the multivariable seating was very well received by the visitors. The reception area acts as a barrier and provides for good accessibility and a welcoming atmosphere. The safety-oriented and efficient pathways, in a clockwise direction, together with the electronic key reserved for faculty

members, prevents unauthorized access to the laboratories. This has significantly relaxed the concept of rotational movement, as it became apparent that even in the case of a large volume of traffic of changing groups, the walking directions of visitors do not overlap.

During operation, more points are coming under focus about which fields are not covered by the guidance and routing system and building signage. It was found that due to the increase in the number of visitors, the number of dogs in the foyer is increasing significantly. The developed system of icons was reaching the limits of the known semiotic triangle. In the upper example of the 'No dogs allowed' icon, the 'red circle' and the 'oblique bar' reinforce the learned attributes of a serious prohibition sign. However, the representation of the dog as a puppy diminishes the severity of this statement. In the lower sign, 'Dogs on a leash', the effect is similar. The effect of the grey sign is more that of a note than of a piece of advice. The sign with the red circle as a clear warning sign speaks with a commanding tone. Once again, one can see that a neutral, reputable image element enhances the effect, while a puppy diminishes the effect of the icon (as already described on page 30, chapter 2.1.2).

The project of the guidance system for the Wuppertal Junior Uni was an exciting and outstanding challenge for all persons involved. It was a great honour and joy for the students of the HMKW to develop the signage system. The method of including the future users from the very first planning steps and taking their input into consideration has proved an invaluable resource for design solutions. Through the systematic investigation of the subjective perception of users in different situations and places, we could remove any niggling irritations early in the planning phase without disturbing the operating process or causing greater disruption later during the implementation. All participants clearly understand that the process of the signage system is not yet completed, new requirements will come, but the path taken by the whole team has demonstrated how these future challenges can be solved. "The important thing is not to stop questioning" (A. Einstein).

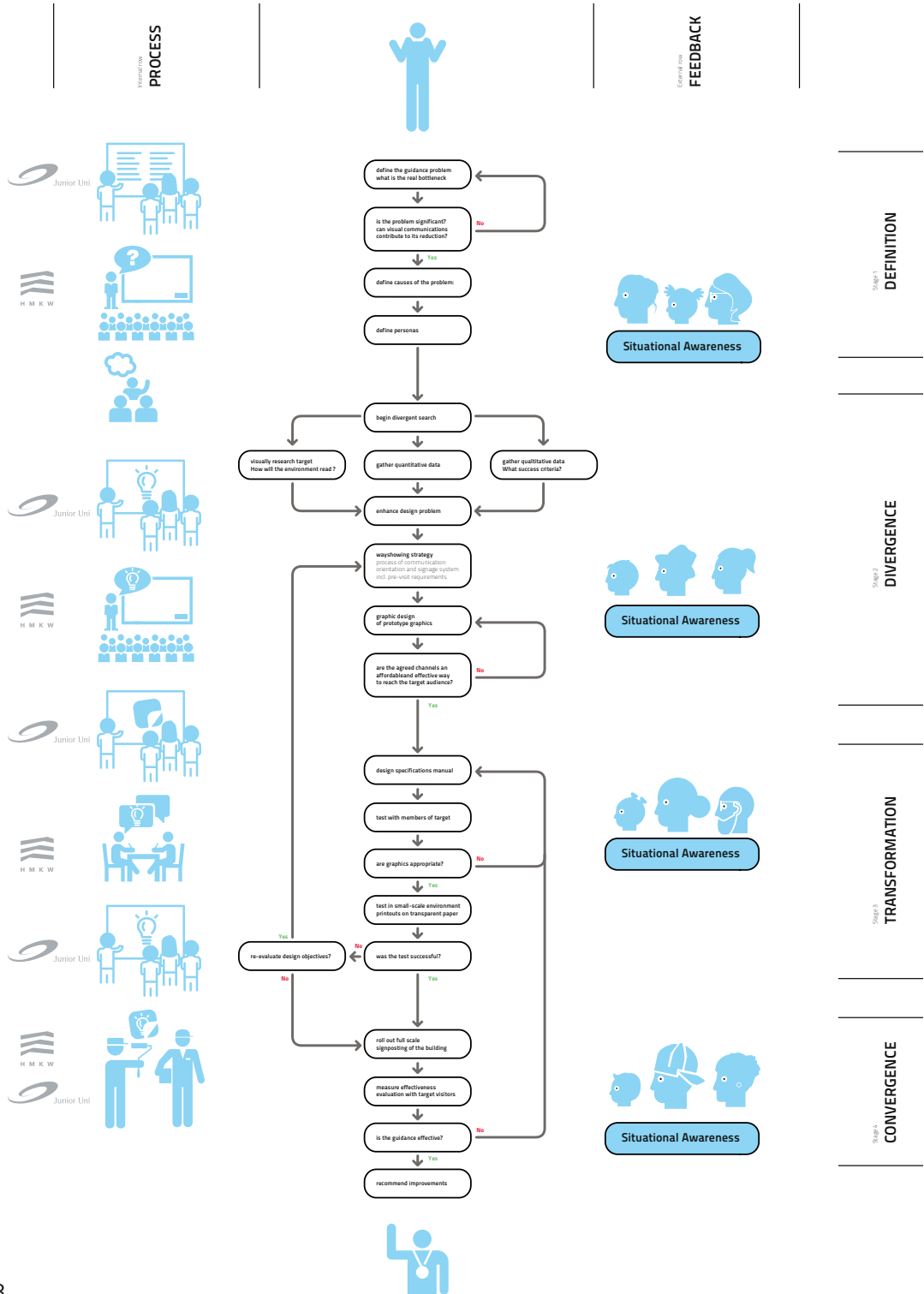


fig. 251
 left: "dogs not allowed"
 right: "dogs on a leash"

fig. 252
 Predictive process
 flow diagram of the
 development steps
 at the JuniorUni,
 during May 2013 –
 November 2013

For detail dimensi-
 ons please refer to
 p. 214/215

Details and further
 explanations:
 see p. 220/221



3.8 Pre-visit Guidance for the Lapland Central Hospital

To remove uncertainty and confusion of orientation in public buildings through specific prior information in advance illustrated at the example of the Lapland Central Hospital. The Lapland Central Hospital (Lapin sairaanhoitopiiri), Rovaniemi (Finland) has the opportunity to lead in the improvement of health-care delivery so that the right care is delivered in the right place at the right time for every patient. In an increasingly challenging environment, hospitals will have to meet the high expectations of the public. For patients, visitors, suppliers, and staff alike, navigation in hospitals is a frequent problem. These legitimate participants in the public health system often lose their way, take a longer time than necessary to find their destination, are late for appointments and have a bad experience overall. Some of them will eventually ask every health professional they meet for directions, thereby spreading the problem of disruption by delaying others, interrupting staff etc. Patients and/or staff being late for appointments means the inefficient use of scarce material resources and workforce. In the long term, wayfinding problems can probably add up to a number of years of lost staff productivity. “On top of this, inferior signage and other kinds of bad wayshowing give the hospital and the whole health system a bad reputation” (Mollerup, 2009; p. 112). System design may help the visitors to the Lapland Central Hospital to have a more stress-free stay.

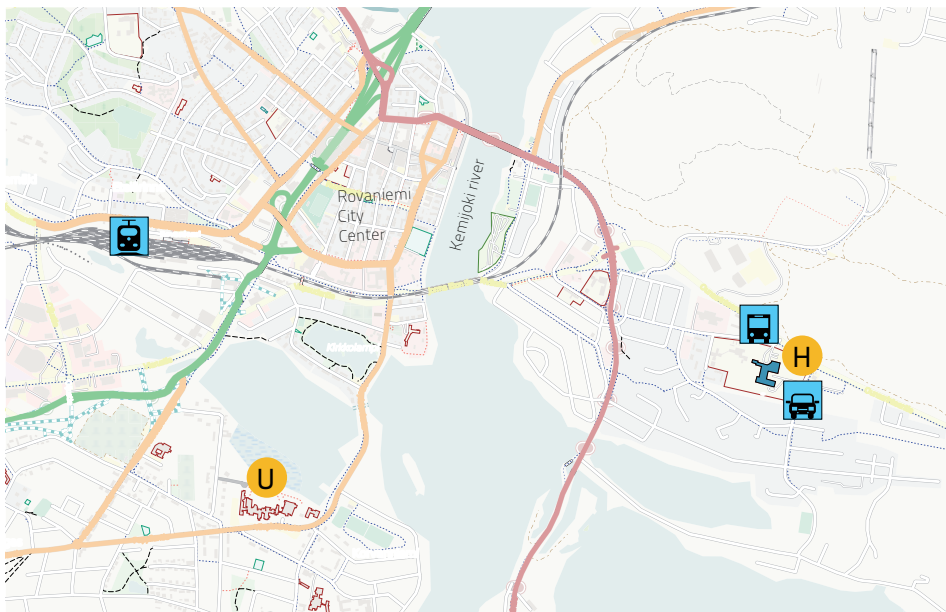


fig. 253
map of Rovaniemi (Finland)
H · Lapland Central Hospital
U · University of Lapland
(main campus)

fig. 254
Lapland Central Hospital
(Lapin sairaanhoitopiiri),



have difficulties in finding their way in hospitals due to varying problems. A hospital is often a complicated built environment. Many patients and visitors also have problems in finding their way around the hospital building, because they are first time visitors, or because the hospital has been rebuilt, or functions relocated, since their last visit. The confusion is often increased because of the number of long, difficult and yet often similar sounding names on the signposts. The designer should also be aware of the often reduced capacities of people in a hospital surrounding, caused among other things by visual impairment, reduced mobility, or reduced mental capacities caused by anxiety.

Our task description aims in particular at the problem of a lack of preliminary information in advance of the visit to a hospital. We wanted to develop concepts and draw up active measures for pre-visit information that should include wayshowing information to support patients, visitors or other external users before their arrival at the hospital. The information should also include information about accessibility, public transportation, or parking possibilities and should offer patients and visitors the opportunity to plan their visit to the hospital ahead of time. The goal is to reduce the number of visitors stumbling around, engaging in trial and error as they move around the hospital building having encountered trouble in finding their way.

Initially, it was important to understand the different scenarios that could possibly lead to a visit to a hospital. For that reason, we developed various personas and scenarios for possible hospital visitors from different age groups, as described in the previous chapters. In the second step, for each of these fictitious persons we designed a scenario that makes their stay in the hospital plausible, important and necessary. Similar to the analysis of the three New York airports with a video camera by Paul Mijksenaar (Eibl, 2002) we thought of monitoring orientative studies of persons acting in the hospital environment. This would help to find answers to questions involving crossings or intersections, where the visitors have to decide: In which direction should I go now? Is the architecture of the hospital supporting the orientation? Will I reach the treatment room in time? Where is my room? Which is the way to the medical department? Such a complex procedure was unfortunately not possible in the short time frame involved. Nevertheless, it was important for us to understand the psychological mechanisms of human orientation. Instead, the orientative studies took place in the memories and experience of the students. We developed, out of the specified scenarios, possible flow charts intended to replicate a visit that could actually take place in the hospital (from their memory, as if the visit to a hospital was voluntarily or involuntarily). It

was interesting to see that there were similar nodal points in the flow charts in almost all cases that required a similarly related input for decision making for each given person. These information clusters were exactly the points that we were looking at to improve the flow of information for visitors.

The demand for the respective groups of students was to find ways around these information gaps with prior information. There may even be remote solutions to accomplish this externally to, and independently from, the hospital. Possible options for the spread of such information are widely applied to the corresponding population groups. One appropriate action could be, among other things, a broad information ad campaign in the local newspapers (Lapin Kansa, Inarilainen) and in the free weekly newspaper Kaupunkilehti Uusi Rovaniemi to promote the hospital and additionally to illustrate the most important points on a map. This method could be extended by a broad-based poster campaign, distribution of information material to the households as direct mail brochures, impressions in the local phonebook (Rovaniemen kaupungin Puhelinluettelo), visits to schools from the hospital staff and information seminars in public schools, on the university campus and at other higher education institutions.

The task in the course was to develop a Pre-visit information including all the way-showing clues that can support the patient, visitor or other external users before the arrival at the hospital. The media may be letters with appointments, websites, or ads in the local phone directory or community handbook. The information is typically given as maps supplied with text. The maps can be survey maps presenting a general plan of the hospital and its surroundings or part of it, or route maps that show the route from the city to the entrance, or from the entrance to the meeting place. Pre-visit information can also include information on accessibility, public transportation, and private parking. Good pre-visit information helps the user to plan the visit to the hospital. This reduces anxiety, the time needed for transport, and the space that the visitor occupies at the hospital. (Extract from the task-description given to the students, March 2014)

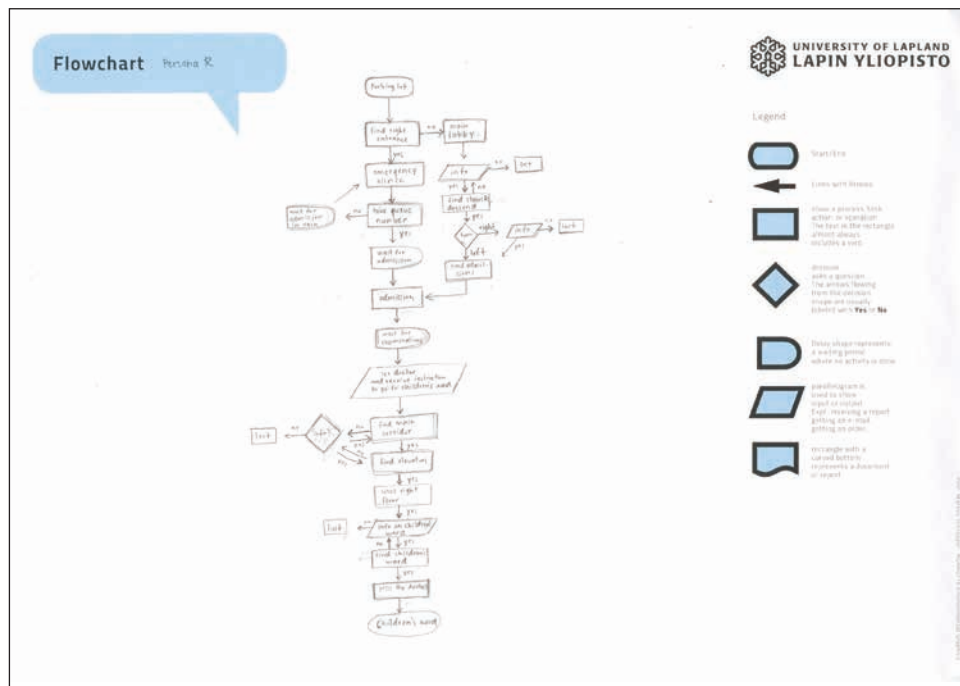
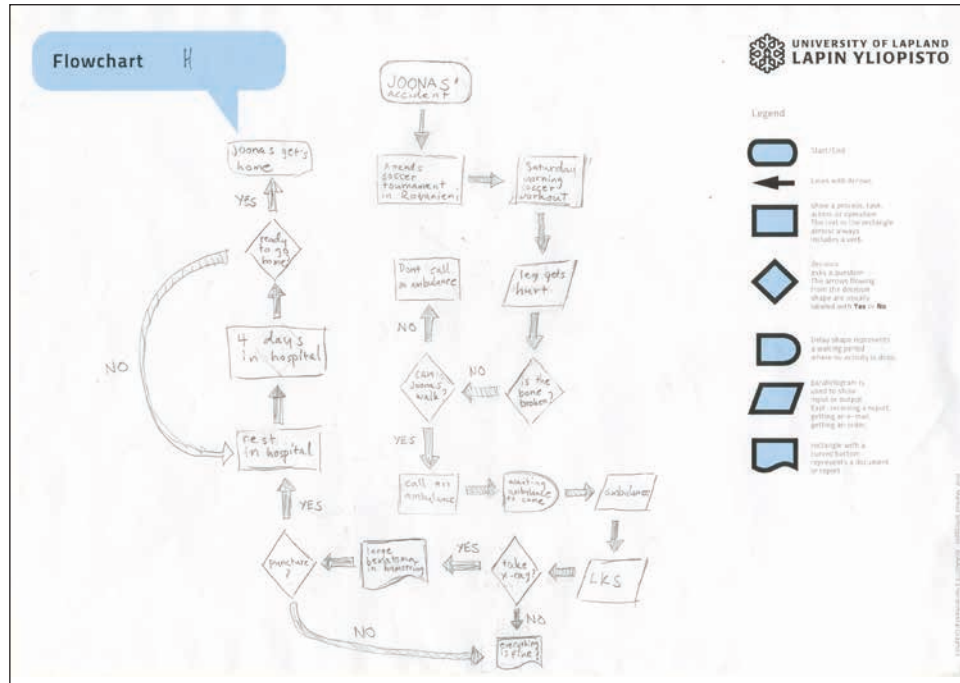
An early question that arose was answered by the students themselves: How do we perceive the hospital in the landscape of the city of Rovaniemi? By means of mental maps, we wanted to find out what the important landmarks in the city are and how are they related to the observer's view of the hospital.

An important insight of all mental maps was the location of the city centre itself in relation to the hospital. In all the mental maps it can easily be seen that the city centre of Rovaniemi is often clear and detailed with many landmarks, and is separated by the river in the west (right). The west bank of the

figs. 263 - 264
possible flowcharts of treat-
ments in the hospital:
top: Persona H: Joonas,
victim of a soccer game,

below: Persona R: Katari-
ina, mother with her two-
year-old child

course achievements 2014



typical, conditions, we developed flowcharts that illustrate for a subjective viewer a recognisable organisational process of the hospital visit. Beginning with the emergency call, for example relating to an accident, to transportation, receipt, detailed anamnesis and structured patient history in order to record information about the pain, through to the stations of the various treatment rooms or specialists.

One idea was to involve modern digital media in the information chain. Using a mobile phone or tablet application - all the processes of a hospital visit could be customized for each person. Such a communication chain could react correspondingly to a received emergency differently and more specifically. A patient due to undergo a routine examination or receive a vaccination could be addressed more personally using the same system. The obvious advantage of this system being partly automated and partly directed through a rescue coordination centre, is that it can be adapted to the continuously changing conditions in the hospital over years of use.

In a final presentation of ideas on April 4th, 2014, the students exhibited their design elements and digitally animated wireframes as a slide show. It was impressive to follow how this user-centred approach produced new ideas about ways to meet the needs of patients and visitors. Even the question of how to get the address of the application was brilliantly answered by the students:



fig. 265
Serviettes with information
about the navigation app.

Milla Sillanpää, 2014



fig. 266
 Navigation app including
 the possibility to arrange an
 appointment for a consulta-
 tion or for treatment

Chris Lam, 2014

figs. 267, 268
 Previsit Webpage and
 navigation app

Chiara Scalvi, 2014

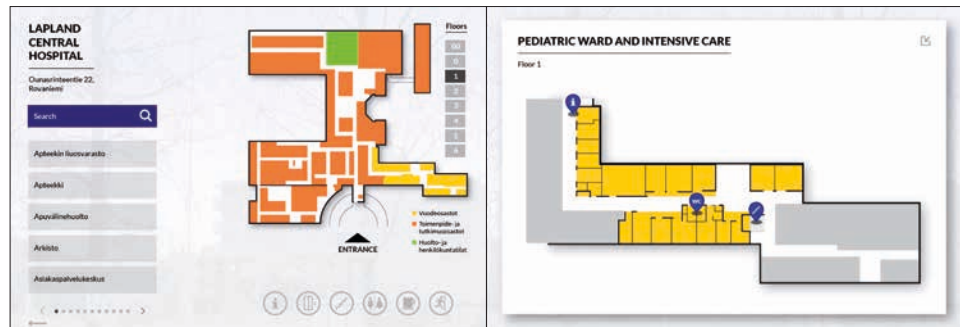


fig. 269
 Interactive app for arran-
 ging an appointment for a
 consultation or for treatment
 incl. map service

Noora Kallio, 2014



fig. 270
 Interactive patient administration system for consultation or for treatment incl. map service, public transportation and emergency.
 Henna Rintala, 2014



fig. 271
 Interactive app including an emergency button for handicapped and elderly people and map function with floor map.
 Lasse Paldanius, 2014

Due to the focus of this study just a few examples of the 17 impressive designs for a pre-visit system for the Lapland Central Hospital developed during the 2014 Summer Term in the Environmental Graphics course were presented here. The exciting thing about all of these examples is that solutions were now being found through our user-oriented view of the actual communication problems for the hospital, which were not considered in the classic design process. The 'situational awareness' of different user groups has demonstrated that in many different user cases, the actual 'spatial problem-solving problem' stems from a lack of pre-visit information. The umbrella of methodologies of 'situational awareness' has quite clearly enabled us to a modified and more objective perspective, which has clearly led to the convincing results. The changed perspective of situational awareness has provided a new conceptual approach and a predictive value for the process development for the visitor flow management in the hospital. The future comprehensible structure of the guidance system of the Lapland Central Hospital was developed by the two designers in 2014, but it requires more than icons, processes and pathways for visualisation. We were able to show a possible way forward in this course.

4.1 Results

The preceding chapters show that definite opportunities exist for the improvement of general guidance in the public sphere. It was noted at the outset that in the field of public guidance and routing systems there is a clear need for investigations to find workable solutions. The present work criticises the principle approach of architects and designers, who often do not worry about final user groups while designing guidance systems solutions.

The resulting concerns and issues led to the research question: Is there a possibility to evolve a predictive system to develop, implement and verify design solutions to direct and optimize the flow of visitors in large public spaces? (chapter 1.3.2)

To try and answer this question we have introduced the semiotic methodology for the interpretation of visual communication. (chapter 2.1.1) To select semiotics as a helpful tool for developing guidance solutions in the design practice, we had to manage to understand the inconsistencies in the different semiotic traditions with the attempt to reach a common vision. (chapter 2.1.2) The historic development of the development of iconographic characters as information providers in non-verbal communication was highlighted to understand common viewing habits and aesthetic ideas. The first attempts of Comenius, which had an influence on the later work of Neurath and Arntz, were discussed. These are recognized as the ancestors of all icons used today, due to the development of the International System ISOTYPE, and have decisively influenced the evolution of signage in public spaces and traffic signs. (chapter 2.2) A brief aside examined the rapid development of international transportation and underlined the need for a uniform, internationally comprehensible, information system in public spaces. (chapter 2.3) The steady figurative convergence of continents and literal convergence of different cultures makes this necessary. Employing the example of the Olympic Games, this was further consistently observed. Even at the earliest beginnings of the modern Olympic Games, images were used for the identification of individual disciplines. During the Olympics in Tokyo (1964), icons were consistently applied to allow non-verbal communication at matches and in venues. (chapter 2.4)

The success of these signs led to various considerations aimed at encouraging such communication internationally. The attempt by Icograda (International Council of Graphic Design Associations) to foster the creation of a universal set of icons by means of an international student competition

failed. The idea of the International Committee for Breaking the Language Barrier (ICBLB) to develop an internationally recognized visual language also failed. On the contrary, the idea of image communication along the lines of the Tokyo Olympics inspired many imitators, on the government side as well as in the field of industry, which led to a variety of coexisting signage systems. The emerging symbols possessed a partially normative status or have had their use deliberately deferred due to sometimes tense political and economic situations. This led to an inflationary use of partially poorly understood signs. With the development of the guidance system for the 1972 Munich Olympic Games (Aicher), for the first time a graphical grid was established. This set of rules for the systematic development of commonly understood icons is still valid. It is in use for signage in public buildings and for other purposes to this day. Nevertheless, the point had to be made that the developed and established rules for designing signs and symbols has not helped to keep the icons internationally understandable. Evidence for this can be found in the development of different icons for identical situations and/or amenities in different environments. The problem of confusion caused by different icons combining to a meta-icon contributes to the impairment of the quality of signs. Extensive research (see Dreyfuss et al.) has shown that a reference to allegedly trained image shapes or sign colours does not achieve the desired effect. The varying regulations of different standardization bodies have further complicated this issue. (chapter 2.5)

To put the original communication problem back at the heart of the debate, the models were extended and further enhanced. A cultural filter in perception (Cho) was examined, and the factor of subjective, situation-related perception (Barthes, McCauley) was considered. Furthermore, the process of perception itself was subjected to a more detailed consideration. In an excursion toward the area of cognitive psychology, the 'top-down' and 'bottom-up' processes in decision-making were closely examined. The effects of subjective perceptions and insights from cognitive psychology, identified in further examples and experiments, have informed a changed approach to the development and evaluation of icons for non-verbal communication in public spaces. Particular attention was paid to the nodal functions of international traffic junctions such as airports, sporting events or trade fairs. A first model which takes account of this fact, the "recognition-primed decision making model" (Klein), was presented. (chapter 2.6) This model allows the formulation of a based response which, at the same time, takes into account individual situations prevailing in guiding systems, as experienced by

different user groups. In a next step, the procedure has been more closely examined in order to predict the wishes and needs of a fictitious or real person (Osinga, 2005) and to connect with the model of situational awareness (Endsley, 2003). (chapter 2.7) Through the analysis of the issues arising from the situational awareness analysis model and the corresponding transfer of a design process to a conventional flowchart, a very accurate and 'different requirements' model was presented, taking advantage of both previous methods in order to answer the question of how personal choices can be inspired and influenced with the aid of guidance systems. (chapter 2.8)

In the following practical examples, the proposed model with its different ways of looking at 'individual factors', 'task factors' and 'system factors' using an umbrella of methodologies for the development and evaluation of different guidance- and signage systems was tested for its practicability. The introduced contribution to knowledge and gained practical experience can be reused for the planning and execution of any other information- and orientation systems and therefore also meets the requirements of a practical based PhD. (Winter, et al. 2000)

In the first example, we become more aware of the different perceptions of the different user groups at the Düsseldorf International Airport (Germany) while taking the needs of the communication problems into account. In this initial project, it became clear which complex requirements arise from the different perspectives of a guidance and signage system and that the communication between the involved groups, such as the building promoter, project developer, owner and tenants, also has a significant influence. The implementations presented are mainly due to specific agency requirements. However, it should be mentioned that an unconventional approach, using sound to provide guidance, was designed and implemented in Düsseldorf. (chapter 3.1)

The attempt to eliminate uncertainty when consulting a doctor through creating greater reliability of the guidance system was the goal in the second practical example at a medical centre. Here, an approach was presented based on research results for spatial orientation (Spitzer, 2006), that can be completed without signs. The method presented in this example would also meet the requirements of people coping with language or cognitive deficits, as it uses different colours to identify and represent different medical departments. (chapter 3.2)

The following case was to establish the possibilities to test and to improve an existing signage system. In the example of Bremen Airport (Germany)

the goal was to develop an experiment setup to evaluate the visual impact of elements in a public guidance system. The problems identified were caused by various signage systems that had been developed in parallel at Bremen Airport over the years and had led to irritation and confusion amongst passengers by the time of the investigation. The preferred method of investigation was to employ eye tracking – as discussed at the beginning of the chapter – but it unfortunately could not be implemented due to time and cost restraints. Instead, it has been shown by the method of Conspicuity Index (Wertheim) that the attempted modified signage elements had a much greater visibility than the original mounted versions at Bremen Airport. (chapter 3.3)

We have been able to show how to involve the local population in the development process for a guidance and routing system at an early stage by the example of the signage system for the public Humboldt Park (Berlin, Germany). It was possible to show the vital links between the fields of action and the different solution variables. With the different usage parameters for fictitious possible users in mind, the students developed different approaches for a visual and user-oriented, multi-lingual guidance system. To encourage population participation in the development process, the concept approaches were presented in a public exhibition. Suggestions as well as criticisms were collected and included in further considerations. The project was well received by those persons in charge of urban planning in Berlin, but unfortunately the plans were not pursued any further. (chapter 3.4)

This research project examined the topic of evaluation of a guidance system to eliminate uncertainties in retrospect. This field trial at the new Berlin airport made clear that the presented investigation method is also suitable for the evaluation of existing guidance and signage systems. In the context of the public testing held at the Berlin Brandenburg Airport, in a trial operation by ORAT-Consulting (Operational Readiness and Airport Transfer), the airport was closely examined. A cognitions-test method was developed and presented to retrospectively examine a pre-existing airport signage system. In this cognitions-test, the partly international test subjects detected significant errors in the signage systems of airport terminals. (chapter 3.5)

As a direct response to the previous, self-initiated project regarding fictitious end users of the Humboldthain Park signage, the research questions in this follow-up project pursued overcoming imaginary barriers in urban quarters. The request came directly from the district management of the Brunnenviertel (Berlin) to investigate the urban neighbourhood. The goal was to examine the prevailing conditions of the concrete and practi-

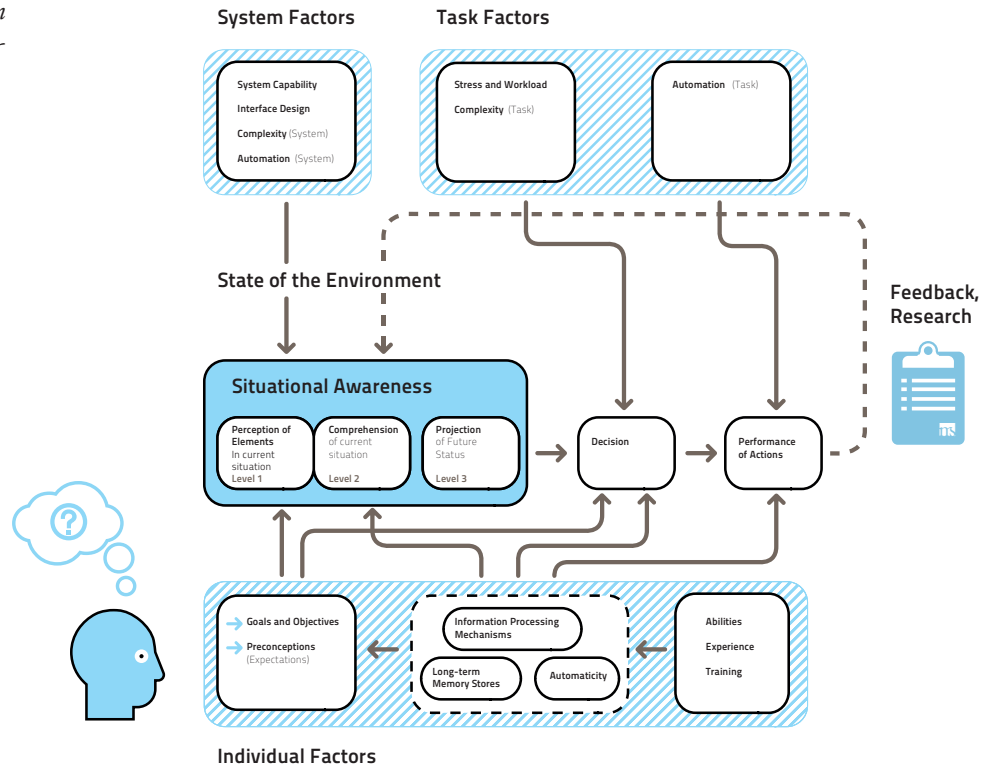
cal guidance system in the city district and to identify potential weaknesses and options for improvement. As a semester project with students, the area, settlement, and demographic structures were analysed. Problems were identified which resulted from the district's former situation as an 'island', a section of West Berlin partly surrounded by the former death strip of the Berlin Wall, and now located beside the up-and-coming district of Mitte. Fictitious characters with typical case studies were developed in the course. These fictional inhabitants helped the development of design elements to serve for better orientation in the district. By using the Situational Awareness method, scenarios corresponding to each of the personas were created. Improvements were found which could easily be realized and appropriate measures were defined. The final study was presented to the Berlin city administration and other public bodies. A final implementation is still under discussion. (chapter 3.6)

The concrete request or question of research was to develop a generation-spanning guidance system charged with connotative implications for the Junior Uni Wuppertal (Germany). The design students were involved very early in the process of designing a signage system. With the help of fictitious developed personas, the necessary steps were worked out. In collaboration with the client and architects a way-routing system has been developed that combines, on the one hand, the architectural possibilities of the building with design solutions, and, on the other hand, addresses the ability of perception of the visitors, especially of under-aged children. The example of the iconographically clear solution for the guidance system at the Junior Uni Wuppertal, developed and finally implemented by students, showed the complete interaction of 'situational awareness' processes. The complete process chain, from the planning stage through to implementation and the final user test, covered the predictive process model for the development of a guidance system in a public space. (chapter 3.7)

To remove uncertainty and confusion of orientation in public buildings through providing specific information in advance was the method of 'situational awareness' introduced to develop an interactive pre-visit information system for the Lapland Central Hospital (Finland). The different approaches addressed the well-known issue that long-established hospitals, often the subjects of extensions, renovations, redesigns and so on, are frequently confusing environments for visitors. With the support of mobile devices it should be possible for visitors to reach the hospital easily, to find their way around the building safely and to coordinate appointments with

the appropriate stations and departments by means of mobile applications. The needs of different visitor groups could thus be taken into account extensively. (chapter 3.8)

fig. 272 Model of “Situation awareness in dynamic decision making.”



One of the most important insights that developers, designers and decision-makers will gather from the study is the focus on user-experience or user-needs on which to base future design considerations in architecture or interior design, guidance and route layout. Through this acknowledgment we have not only the opportunity to evaluate already existing guidance and routing systems solutions, and consider ways to overcome barriers, we have found a process that is also a useful method for predictive solutions to conduct future visitors and/or users. The initial research question to find an option to evolve a predictive system to develop, implement and verify design solutions to direct and optimize the flow of visitors in large public spaces is thereby answered. The actual implementation of an appropriate solution strategy derived from the way being considered here, in terms of day-to-day practice at all levels, will throw up new issues that will first become known during operation and must be examined in each individual case.

4.2 The Findings in Brief

In my heart of hearts I am curious, I want to understand the problems of the world and to learn new things every day. Yet, the more I learn, the more I understand that it is difficult to get a full and/or satisfactory answer. Employing the methodology of science, I have tried to find clarity in my questions. As a result, I came to realise that, in doing so, I must argue against common sense, because although there are explanations that seem obvious to the natural sciences, the same rules are less useful when applied to social life. The observations made during various design applications for user-centred designs to guide in public spaces, clearly demonstrate that it is possible to generate valid data upon which to develop the design solutions required for, often very different, situations. The basic idea of developing a universal, and universally understandable, system of signs was discarded. With the benefit of hindsight, it is obvious that a project to create a general, and for all cultures, globally understandable universal character set, will be a great challenge for future generations. Our problem is that usually we tend to look at something retrospectively and believe it possible to find an answer from the past that is fit for the future. This is certainly misguided, as can be seen in the debate about how a nuclear waste warning symbol, which still needs to be understood in 10,000 years, might look. We know from experience, that symbols can vary across different cultures and times. We have to question the idea of the “landscape of thorns” from the landscape architect Mike Brill (1993), designed to warn people of the future away from our radioactive waste cemetery. When our modern communication methods and languages have changed in the far future, will it still be possible for beings to receive the information that is intended to be conveyed? Trying to find common-sense answers to simple questions is absolutely fine in our daily lives. In more complex scenarios, however, we have to first question our own beliefs before we begin to find an answer.

In the presented work, the endeavour was not to develop a universal sign language, which might be assumed at first. Rather it is a more complex answer to the issues raised by the dilemma of the mechanistic worldview and the inter-relationship between cause and effect. This ancient dispute between Plato (ideas are eternal, remembered and unlearned; caused by inductive reasoning) and Aristotle (ideas are produced and shaped by conventions, not by biology or heaven; caused by deductive reasoning; using i.a. syllogisms [if $A = B$, and $B = C$, then $A = C$]) (Everett, 2014) still affects the

fig. 273
The “landscape of thorns”
as visual sign for e.g. the
Onkalo nuclear waste repository
(Olkiluoto, FIN).
marking system for the WIPP
(Waste Isolation Pilot Plant).



concept by Michael Brill and
art by Safdar Abidi, 1993
Sandia Report SAND92
1382 · UC-721

quests of present-day humankind. Inspiration from Aristotelian logic can be found in the works of Gottfried Wilhelm Leibniz, John Locke, George Berkeley, David Hume and the logical clarification of thoughts up to Franz Boas who, with his works, documented that different races within the species showed equal ability to learn. Boas had, as is generally known, a great impact on the work of Margaret Mead who also influenced Rudolf Modley and others in the development of signs as a language (see Chapter 4.2). In this study, an attempt has been made to examine the processes of human cognition, emotion, perception and motivation in the context of guidance and routing systems. In several examples in the previous chapters, the limitations of transnational communication were discussed. The understanding of cognition, emotion, motivation, and other psychological processes, constrains our models of cultural and social perception and, as a consequence of that, the practical implementation. Basically, we took two steps: the first one to determine the main point of a communication problem, and the second one to understand and analyse the particular parts of the signposts, trusting that the majority of people surveyed said that the signs were intuitively correctly understood. This is a good starting point from which to determine the main point of a fundamental communication need, but we will miss the background necessary for us to be able to design programmes for vulnerable groups. We normally approach communication problems between signposts and users with the analytical and academic perspective of a scientist. However, as scientists, we are not part of the community that we are studying. As designers, we work towards a goal to be achieved with the help of representations of this goal (our final product). To design means to structure systems of signs in such a way as to make the achievement of human goals possible. To produce the several ways of construction and representation, the design needs intuition and requires methods, especially in precise areas such as typography, signage, and specialized communication. These design principles are semiotic by nature (Nadin, 1990).

Communication, as a form of social interaction, from the viewpoint of design, is dealing with the development of sign systems and their necessity of public acceptability and of function in our society. A certain type of sign – the symbol – had been considered to be timeless and universal for all human cultures. To say so, is, in fact, not entirely correct. We have made an assumption in line with the definition advanced by Ferdinand de Saussure (and followers) of a sign as the unity between a signifier (the actual sign embodied in some material form such as words, shapes) and the signified (what

the sign is supposed to mean). We have also adopted the logical structure, with the understanding that each type of sign and each sign operation can be described within a pan-logical system, so that an object can be represented:

- **Iconically:** representation based on likeness
- **Indexically:** representation causally influenced by the object, such as a mark of the object, and
- **Symbolically:** representation based on convention.

It was also established that before designers reach for the highest shelf in the library of semiotics as the measure of all things, they need to consider the limitations of these books. The semiotic perspective has become a tool for design practice, but the process of semiosis as a guideline value for design solutions is difficult to use. In light of the user position, the first stage of the process of reception, that is, the simple denotation, can already be vague and ambiguous according to the local common understanding and/or one's personal worldview. The following negative connotations will block any possibilities of proceeding to see the meaning of the intended guidance. To halt this process I have shown the characteristic features by which one can recognize the appearing problems, in order to resolve them. The most important point is to take a close look at the actual requirements of people in their respective situations to remove confusion, discouragement and intolerable delays.

The examples, drawn from practice in the previous chapters, vividly illustrated that knowing one design solution does not mean knowing every design solution. Unfortunately, in reality it will often be the case that one design (which works rather nicely for public signage, or for devices in the form of displays, instructions, buttons, etc.) is taken, and from this sign a new one with previous interpretation is inferred. The semiotic principles are usually not further explored during the training of designers, who apply the common semiotic knowledge we all acquire in the environment in which our social life takes place. Designers develop signs using a practically infinite repertoire of techniques, such as, omission, insertion or replacement. However, whatever shape a designer will choose, it will not suit everyone (Nadin, 1990). Design is applied semiotics in its appropriate framework, but the conditions are not likely to be repeated. There is no universal method in design that, once applied, will ensure good or effective design forever.

Semiotics as a rational system for the analysis of communication and design problems can provide a methodology for the evaluation of communication and design from the perspective of its function. The application of semiotics for analysis and evaluation during the design process allows under-

standing, and can effectively be employed for communication. It will generate and evaluate various answers with the objective of expressiveness, precision, and user-friendliness with regard to problems solved through design. It was important to me to develop a system to establish rules for evolving an orientation system - taking into account all possible user groups but also the different 'individual factors', 'task factors' and 'system factors'. The ability of semiotics to predict communication reaches its limits.

In order to clarify the appropriateness of signage, its integration capacity in the life and cultural tradition of the environment and the essential perception and interpretation of potential users, it is necessary to emphasize universal or core similarities for all human beings. At this point, we are at the limits of using signaletics in defining the various properties of a sign: its cognitive function, the heuristic function, the expressive function, its constitutive moment and the associated hermeneutic function and so on. The process of designing, from simple signs to more complex signage systems, requires, besides design intelligence, also an aspect of cultural sensitivity equipped with a capacity for empathy. In order to collate information about human behaviour, the designer often slips into the role of an observer. S/he will perceive an etic framework of a culture as a starting point from which s/he derives design solutions. The anticipated result is expected to be flat and empty, because group- or culture-relevant knowledge and interpretation of the sign system is missing. The observer rates their observations against their own personal scale and previous standards of quality and value.

fig.274

*The most poisonous frog:
Golden Poison Frog
Phylllobates terribilis*

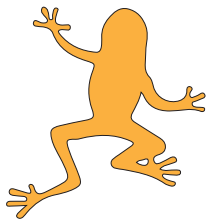


fig. 275

*remember: top-down process
in the working memory;
remebering the environment
in the Amazon rainforest
even at night.*



A more objective result can be obtained from the worldview of the participants, as reconstructed by the researcher, and which corresponds to

the meanings participants themselves attach to their experience. The terms etic and emic were both coined more than fifty years ago by the linguist Kenneth Pike. This altered perspective would mean that we have a tool for understanding other cultures. The etic concept is about finding the best and freshest ingredients for a menu, but the emic concept is how to cook it. They represent two ways which can be used to view the same thing, giving “a stereoscopic window on the world”, as Pike (1957, p. 142) said, in order to describe the sign from outside and inside, enabling one to understand its user-related local custom, meaning, and belief.

This would also take the effect of cultural constraints into account and the effects of human communication. For a long period it was unimaginable that there exists a contemporary language without colour terms. However, Pirahã, a language from Amazonia in Brazil, lacks any unique colour terminology (Everett, 2012). This does not mean that they would be unable to orient themselves. On the contrary, with all our signage systems and signs we would get lost in the jungle of the Amazon.



fig. 276
Redesigned pedestrian sign

Thomas Weigl, 2015

This means that fellow designers and planners should position themselves to adapt the changing paradigms of thoughts and set their perspectives on modified academic views. In the previous chapters I could prove a promising path for a holistic system for the user-oriented design of guidance systems in public areas.

As a designer, I am always on the look out for solutions to a problem and less concerned with the discussion of what label for the problem would be the most fitting. Therefore, it was more important for me to bring together the practical research and the search for techniques to solve current design problems of non-verbal communication than to enter yet again into scientific debates. I am convinced that these improvements are going to provide a basis for future design developments.

The results of the presented helicopter's perspective of 'situational awareness' and the corresponding solutions and recommendations can remedy the situations which the majority of users are faced with when confronted with icons and guidance systems. It is additionally beneficial that the presented method, with its umbrella of methodologies and the focus on the user, is also capable of checking and evaluating existing sign systems for functionality (see Berlin airport). In a recent research project, the application goes so far as to question the internationally defined warning and traffic signs at pedestrian walkways for their suitability and recognition. In a deliberately playful approach, the students developed new opportunities for safer crosswalks, and in the second step we have been developing a mobile application-based learning platform to promote traffic education in a playful way for children. With the described methods of situational awareness and the cornucopia of analytical methods like the conspicuity measurement, we had the possibility to scrutinize the results before verification.

In conclusion we can make out the following: The times of the mechanistic worldview, of 'reason' and 'consequence' in the design of guidance and orientation systems are now things of the past. There is no rational explanation to carry on creating doubt and confusion for users in signage systems. With the introduced methods in the concept and realisation of navigation systems, it is possible to develop user-friendly navigation systems in all areas of direction signs and this will consequentially eliminate doubt.

4.3 Contribution to Knowledge

While undergoing my training as artwork producer of the old school, I developed an emphatic and reliable approach to the forms and figures of visual communication. But the career qualifications to be a graphic designer have changed dramatically over the last 30 years. Design became a new industry at the dawn of the century, and has expanded from a specialized, largely invisible profession to an open-access enterprise. The general public has increased access to tools to design things by themselves. Designers, in response, are avowing themselves as authors, publishers, instigators, and entrepreneurs. As Kevin McCullagh explains: “The scope of design has expanded, and the old disciplinary boundaries have blurred”. (Kevin McCullagh in Core 77, Sep 24, 2010; <http://www.core77.com/posts/17426>)

With my first diploma's degree at the Fachhochschule Augsburg [University of Applied Sciences], I gained a specialty in key techniques, like finer points of typography and general design skills such as creativity, sketching and visual sophistication. This design expertise was acquired in the lectures and honed through years of professional practice. But I have to say I sensed a great deficit of theory and I missed the multidisciplinary perspective. Lateral competencies like a big-picture perspective tend to be developed 'on the job.'

In my second diploma's degree at Bergische Universität Wuppertal, I had the chance to deepen my specialty. As a scientific employee of Professor Tönis Käo, Professor of Product Design, I was confronted with his teaching concept 'Design in der Forschung' (Design in Research). In initiated applied scientific studies and public projects we worked as designers on organizational structures and social problems, on service, and experience design. Some of the problems involved complex social and political issues. As a result, we designers had to become applied behavioural scientists. In some concrete practical projects such as the exhibition of visionary scenarios 'Hospital of the Future' (red dot design museum, Zeche Zollverein, Essen) or 'electronic ticketing' for public transport on behalf of the Verkehrsverbund Rhein-Ruhr GmbH (VRR) [Prof. Gert Trauernicht, visionlabs.org] we were woefully undereducated for the task. Even in my later activities as an art director in international advertising agencies, I often came to frontiers where pure visual creativity had to be replaced by general creative problem solving. The former distinction between Formlehre and Werklehre according to the Bauhaus curriculum is no longer appropriate. Considering design as applied (human and social) science, the actual design process is the causal link bet-

ween an identified problem or need and an imagined and described final goal or solution. The prevailing opinion in design schools is if a problem is well established, the solution will follow almost automatically. This logical structure of the design process is also most widely accepted (and practiced) in agencies. A look at design literature often displays only the final results in beautiful images instead of clearly demonstrating the considerations and theory behind the development process. This problem became clear to me during my activities as a teacher in front of students. The situation prompted the question of which theoretical model of design could be used as a basis for education. The problem was even more tangible during my participation in the project Düsseldorf Airport. The assigned and highly decorated design team that handled the orientation system did not catch the whole complex problem about the interlocking complexities of human and social behaviour at the airport. Consulting airports from around the world that are working on similar projects pointed out that designers often do not understand the complexity of the issues and lack knowledge in this field.

Reading research papers took me to the edge of knowledge in this field. Dismaying for me was the realization that an often-quoted article of fundamental importance on the topic “Wayfinding and Airport Terminal Design” included only a few pages.

At the Dawn of the New Millennium other fields of design already discovered the necessary secrets to run projects with the focus on user experience. For me, that meant a critical investigation on the basis of a preliminary working hypotheses. Summarizing the research methodology and the main findings of the research influenced the formulation of the research question. The focus was primarily on design practice and the importance of design methodology to include different disciplines in the context. This includes at the same time a radical change of the systematic mechanistic understanding of the design process. The introduction of the ‘situational awareness’ concept was one first important step towards a systemic understanding of the design process. The scientific inquiry and attitude of future users are carried into the field of the design project and of practice. The evaluation of the approved topic was resulting in an independent and original contribution to knowledge. This is a key concept of practice and of the education program that prepares the student for the practice of similarly dynamic processes. The designer has to see everything in a relationship, to understand the dynamic of a system, and to act within a system. It must be internalized that designer and user are part of the design process, which is also part of the system. Signs

and Icons as objects in the guidance system can have a visible presence, but relationships are invisible. Visual-spatial intelligence tends to depart from the traditional connection with our material world sooner or later. That means designers themselves have to take into account the complex interplay and relationships that build up the world of the thinking, feeling, and willing human being. (Findeli, 2001) Design schools usually do not train students about these complex issues, about the interlocking complexities of human and social behaviour or behavioural sciences.

fig. 277 Model of "Situation awareness' in dynamic decision making." with intelligent learning people (dynamic personas).

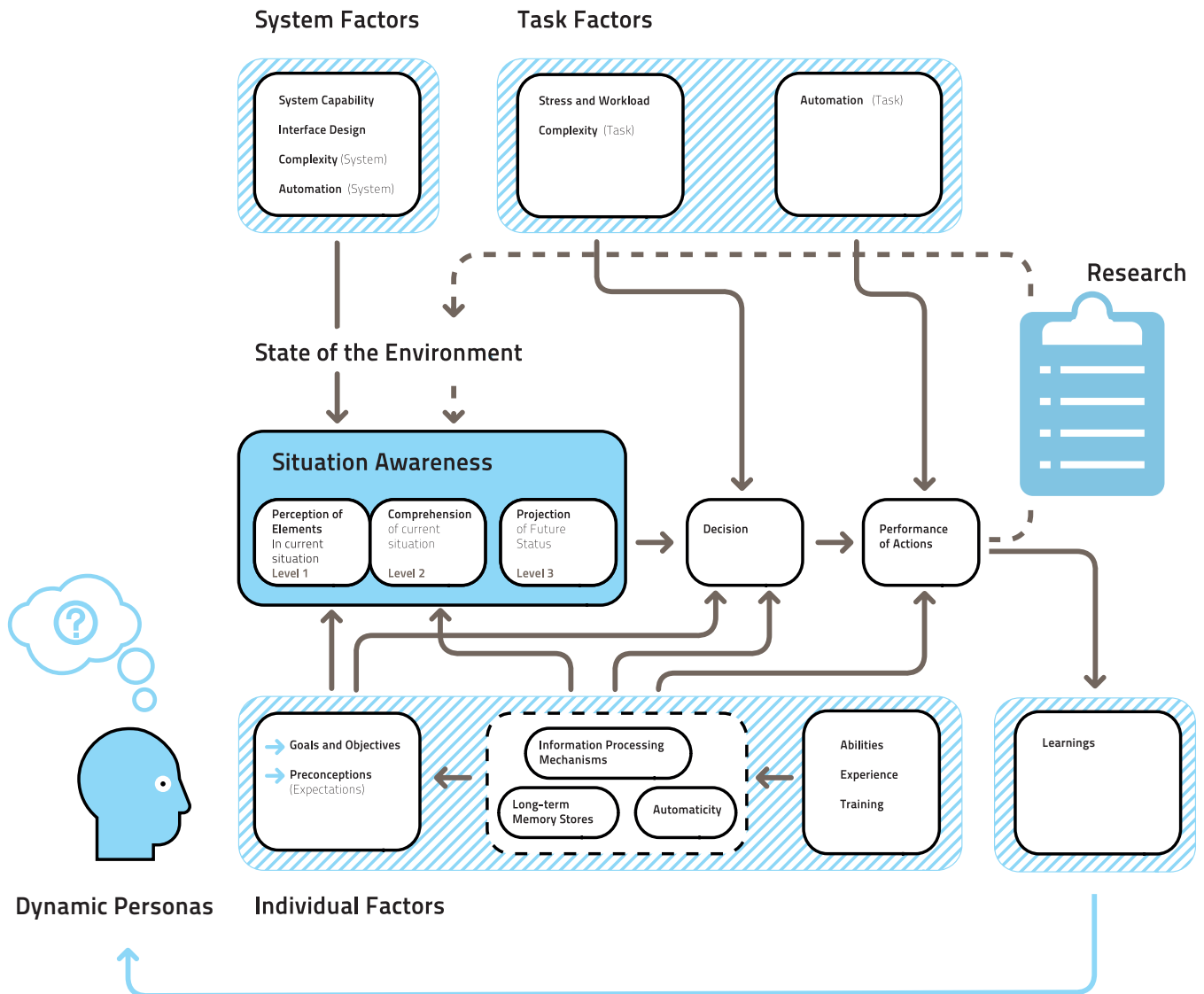
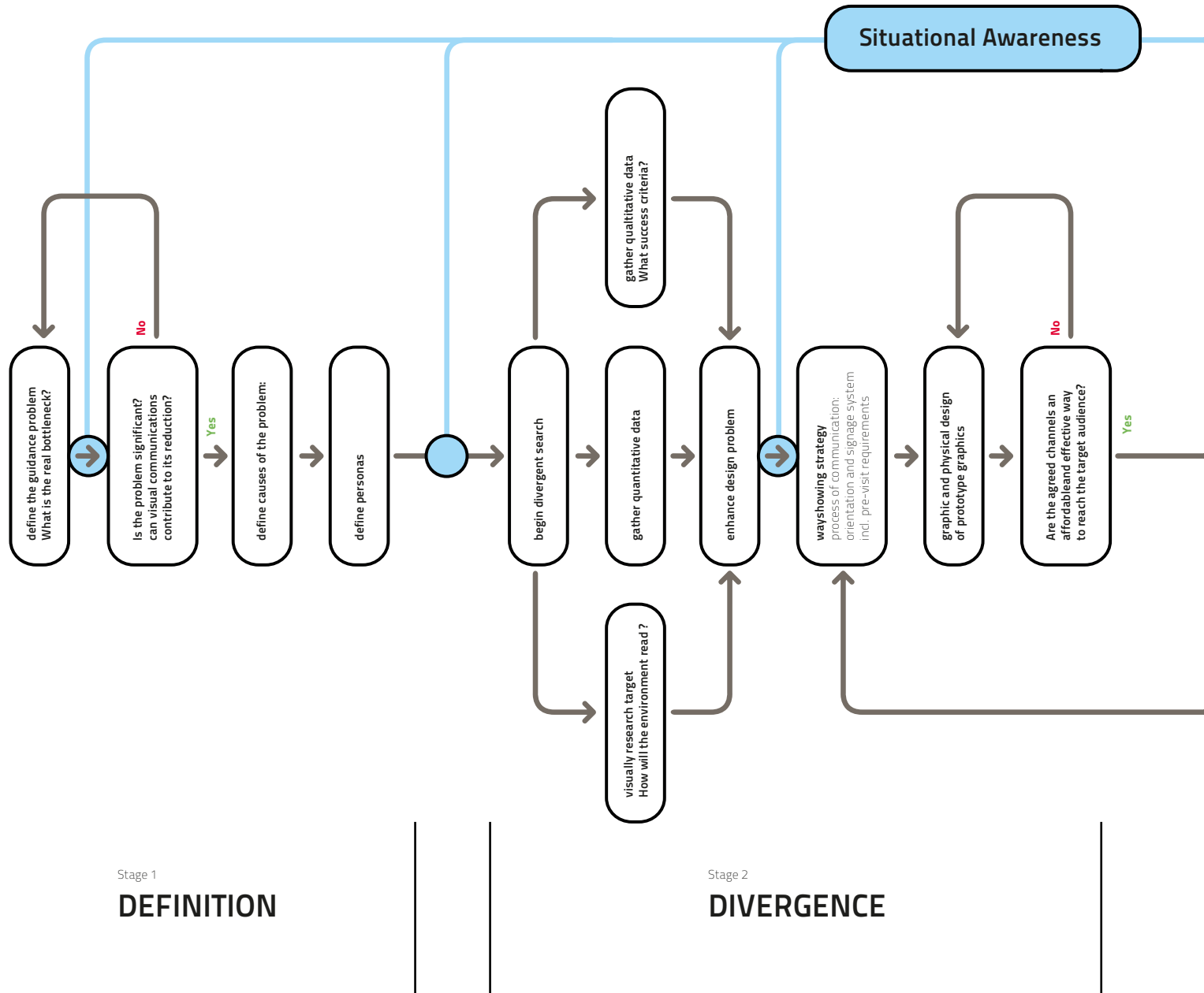
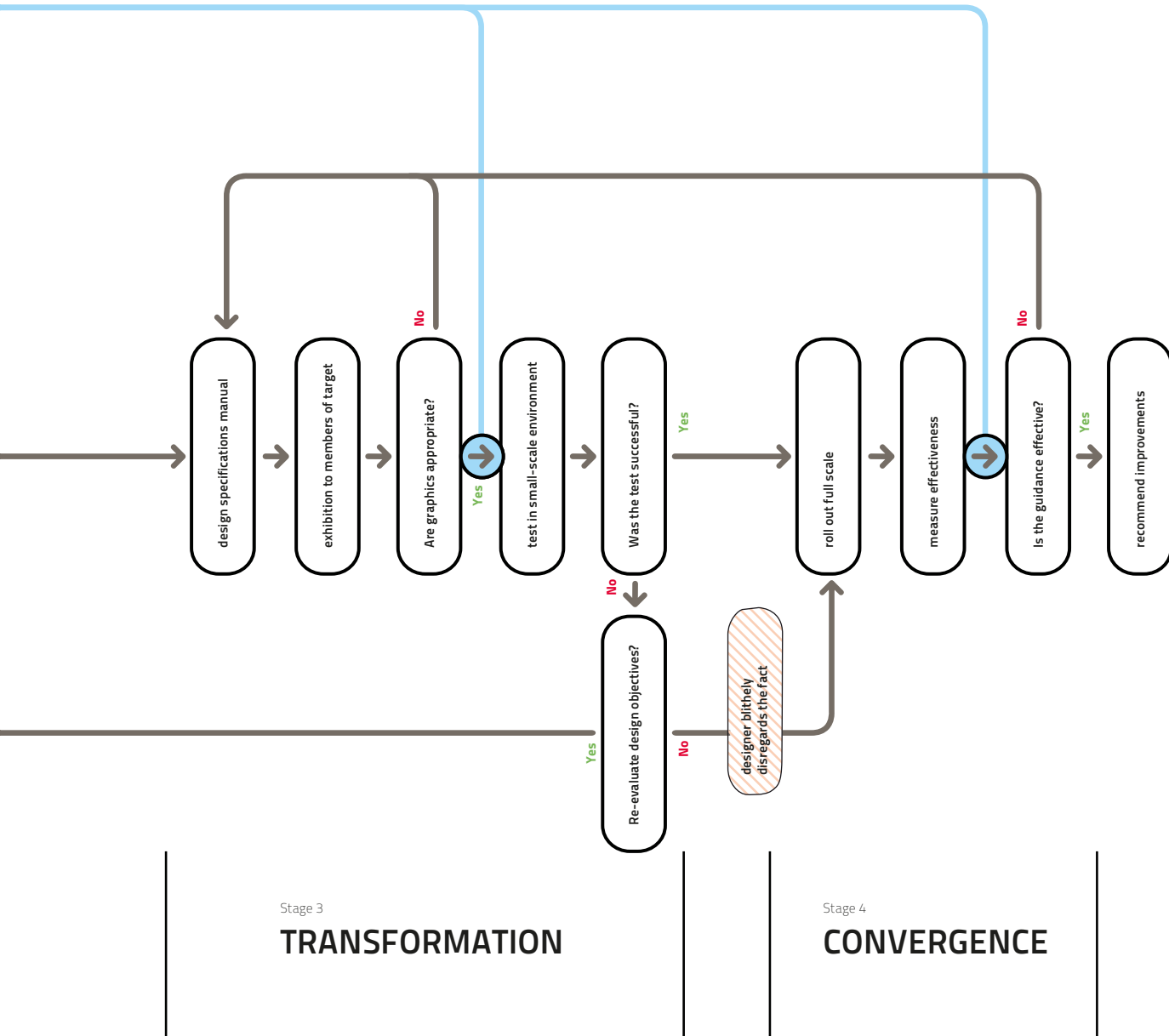


fig. 278
*design process and
 implementation possibilities
 for the 'situational awareness'
 tests.*

The desire to create a systemic model to understand the dynamic process of public guidance in large environments was the driving force behind my work. The 'situational awareness' model as the final result can be seen as a parameter-driven model that contains all the important aspects of human factors referring to the environment. This model also demonstrates an understanding of the research methods appropriate to the chosen field of guidance in public space.



The disadvantages of this model and a marginal level of esteem in the world of design are because designers show a marked ignorance to science. I hope my colleagues will bear with me – but, if I dare say it, designers are usually poorly trained to meet the demands of rigor, science, and social or human behaviour. The designer needs results immediately. The results of a usual design process can be far from optimal or less than perfect, but they are completely



satisfactory for everyday usage. Designers are also often ignorant of how people behave when confronted with their signposting for orientation. I have developed the flow model to try to meet these pragmatic, applied goals. Designers can develop and test their guidance without further development of statistical methods and procedures. The success of the results is strongly linked to the amount of the experimental studies. The flowchart helps to eliminate potential biases when the designer evaluates their experimental results. The model was critically investigated and evaluated in practice as well as in research and teaching. It was apparent that the method is an independent and original contribution to knowledge appropriate to the chosen field.

Uncertainties remain, however, in the field of design and the distinction between research and practice. I refer to the remarks made earlier regarding this by Kristina Niedderer and Seymour Roworth-Stokes at IASDR 07. [International Association of Societies of Design Research]. This enables a finer differentiation between technical/scientific research, methodological/process-oriented research, and conceptual research (including, conceptual, semiotic, aesthetic, etc.) (Niedderer, 2007). It is apparent in the design process model that the research process is based on practice. The outcomes of the research are of direct relevance for the final solution/s in the different steps. The “research methods for addressing and answering the research questions, issues or problems” (AHRC, 2015) are the result of this clearly specified investigation. The findings are taking into account the results of the ‘situational awareness’. The designer as a researcher can take different points of view into consideration (not only their own know-how) and include underlying assumptions and (personal) bias of the research to get objective results. Collecting objective ‘situational awareness’ data from early simulations can assist the transparency and consistency of the research process and design process respectively. This method improves the quality of the coherence of the research and the validity of the findings. In particular, this method is appropriate for designers. It is an opportunity to acquire more in-depth cognitive competence and experientially gained tacit knowledge.

The presented work thus contributes an advancement of knowledge, understanding and insight. This thesis proposes a way forward for the design sciences, from the unexplored middle of uncertainty between analysis and aesthetics, to a rigorous research capability to eliminate doubt.

4.4 Limitations of the Study

The study focuses on a significant gap in the big-picture perspective of graphic design work for guidance aid in shared common spaces. There are, of course, limitations to the applicability of this study. The practical examples given in evidence have been developed and tested with a few exceptions in the protected environment of the university. It would be reasonable to question whether a similar effort is justified or even possible in the project development of a guidance system for a real client. However, it can be considered as proved that the combination of qualitative and quantitative research strategies is increasing the generalizability of the findings and more workable solutions (Johnson & Onwuegbuzie 2004).

The principal results of research for a certain orientation and guidance system are presumably transferable. It cannot be assumed that the findings of one particular piece of research can be transferred to other similar studies. Any investigation arrangement has its peculiarities, and each user group has differences in behaviour, influenced by effects of culture, gender, time and age in their interpersonal orientation.

This thesis discusses a summary and findings according the topic of human orientation in large public spaces. Different perspectives have been shown across a spectrum in the phenomena of orientation, and various examples have been named. The nature and measurements of the examples, and the summaries and discussions of the findings, are influenced by the researcher's subjectivities on the outcomes in the special cases. The findings and the conclusions drawn from the different examples (chapter 3.1. – 3.8) come from the single perspective of the researcher. Other projects will show whether the proposed model needs to be modified.

Further significant restrictions of this study are time and monetary constraints. As mentioned in chapter 3.3 there was an accepted concern among the airport authority of Bremen for a more intensive examination of the visual saliency of the public signs at the terminal. The interest went so far that it was proposed to provide rooms in the airport building for the students to set up an on-site laboratory. Unfortunately, this was not compatible with the normal semester planning of the university. Furthermore, the cost of the originally announced free eye tracker was so high that an investigation was not financeable. Another system bought by the university later is only usable when stationary. I would like to carry out a further public project with the existing technical possibilities.

4.5 Ideas to Design

To help readers in forming their own opinion on the suitability of the thesis, I would like to use a simple example to introduce how to handle a project ideally. In giving a detailed description of the manner in which a project may be organised and carried out, I want to show the different steps with the aid of a specific example. Our example is a specific project enquiry that was never executed. The example comprises the guidance system of a hospital situated in Germany, in the north of Frankfurt/Main. The example concerns a specific project request dealing with a real communication problem:

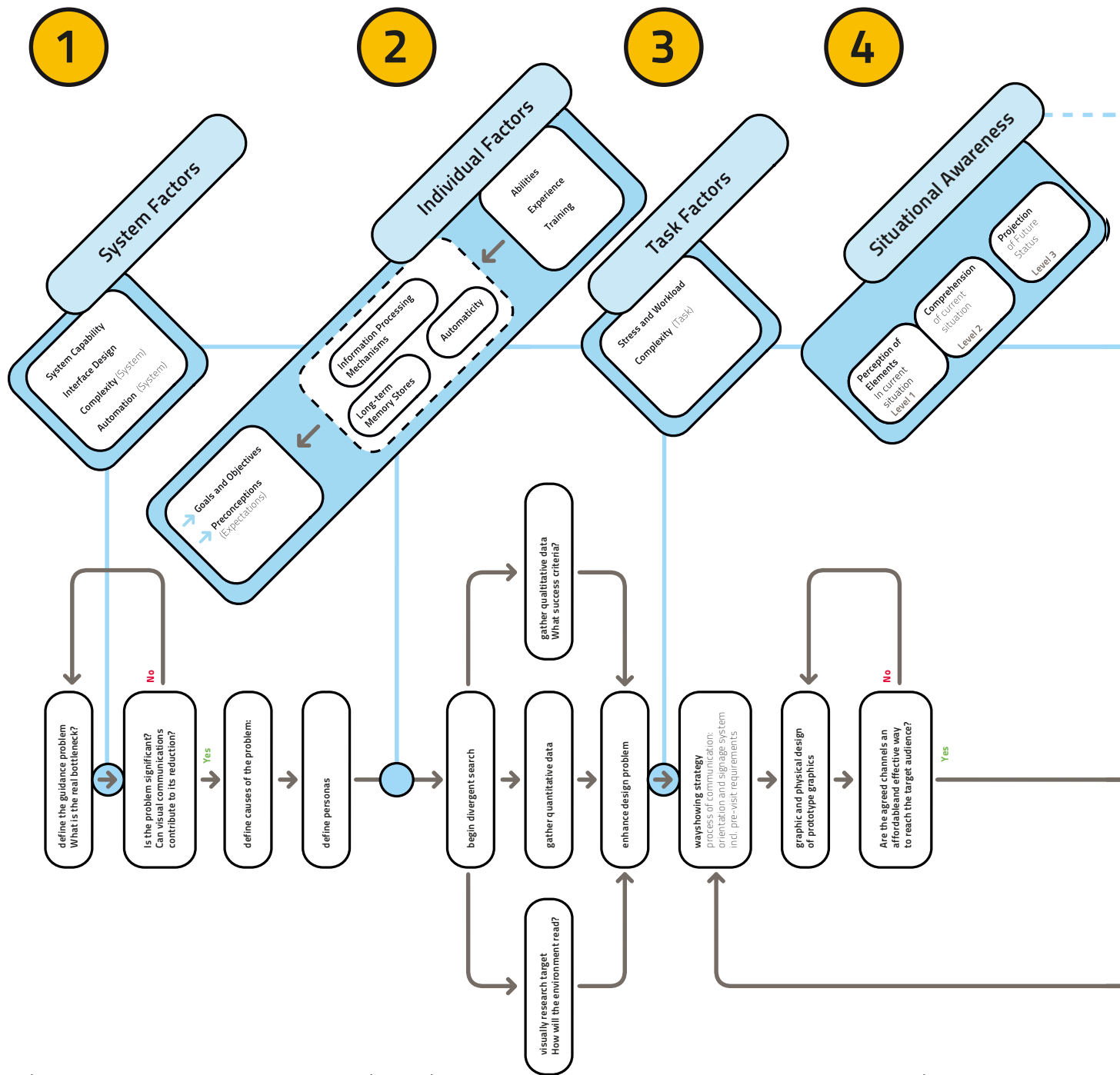
After the construction of a new parking garage, visitors and patients had trouble finding their way around the departments of the hospital. The task was to develop solutions for a visitor guidance system.

We have already heard about the mental spatial problem-solving process in the preceding chapters, which is individually different.

To begin with step (1) at the definition phase, we have to define the guidance problem and should review whether further developments would result in a more effective general creative problem-solving solution. The detailed view of the state of the environment is: How the elements are perceived by visitors in the current situation. Essentially, that will provide us information about the system capability, the current interface design and of the complexity of the actual system. For instance, monitoring the patients and visitors and/or drawing mental landscapes with a range of test persons will show the complexities of human and social behaviour in this unnatural environment.

Based on this we can derivate concrete measures supporting the causes of the problem. We begin in step (2) to develop a vast array of personas as a prerequisite for the creation of use cases. As a consequence, we create a holistic and fully operative concept for the systemic understanding of the design process. For the development of the personas, we use individual factors like individual goals and objectives, preconceptions and expectations, and, furthermore individual abilities and experience.

As a result, we will get quantitative and qualitative data that we can use to put forward concrete and substantial suggestions for improving the communication problem. The design process for each and every project can start from absolute ground zero only under the provisions of the performance of actions to enhance the process of the communication. That does not only mean a fundamental change based on the current state of the orientation



Stage 1
DEFINITION

Stage 2
DIVERGENCE

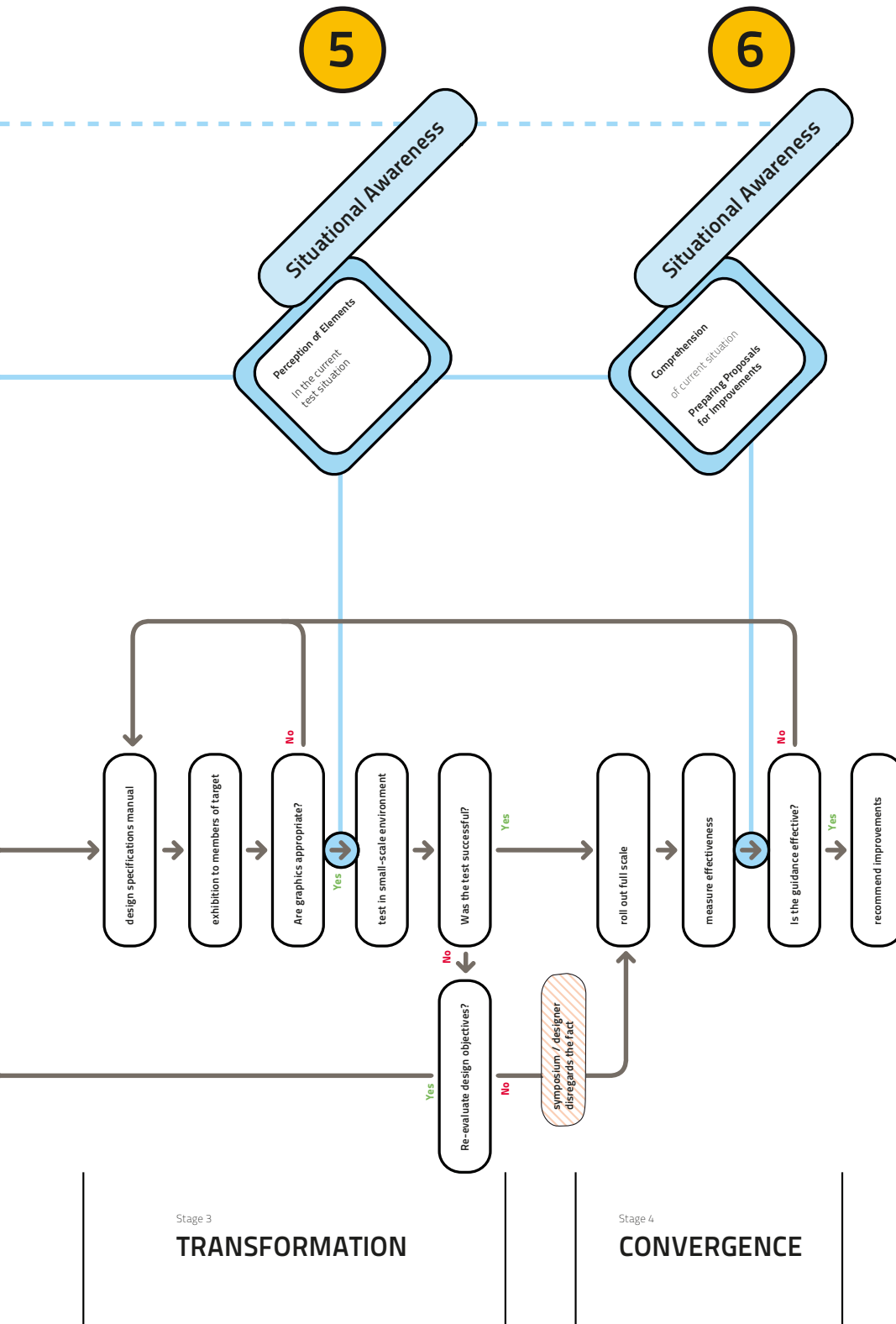


fig. 279
 example to introduce the
 design process using the
 situational awareness tests.

and signage system [in step (3)] but may also include other measures like pre-visit requirements. This test takes the different perspectives of ‘individual factors’, ‘task factors’ and ‘system factors’ of the guidance system as a whole into consideration.

In the divergence phase, the next step of the design process, the ‘situational awareness’ assists in acquiring an accurately aligned profile for the users of the forthcoming guidance. The different possible types of applied methods will help to keep hold of the big picture in the work process [in step (4)], but also to ensure the identification of groups who need special help or information, for example, physically disabled, language deficits, etc.

After the development of the design elements, the next step in the production process is (usually) to create the design manual. The results will be tested, evaluated and monitored first in a small-scale environment in field experiments with personas [in step (5)]. This procedure allows us to determine whether the situation gets non-transparent for the user at a higher stress level. The respective people responsible for the planning can, in cooperation with the designer, make adjustments that may be necessary. If the symposium of persons rejects this correction, there is a final test after the production and implementation of the visitor guidance system for consistency concerning the original design concept. This last step (6) in the convergence phase is also possible as a runtime test after a certain time of operation with a large user group involved. In this evaluation with the different perspectives of ‘situational awareness’ by visitors and staff, the same mistakes and omissions that would still occur can be detected and corrected. The result should be to guarantee a properly functioning guidance system of the hospital.

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Acknowledgements

This thesis has kept on track and been seen through to completion with the support and encouragement of numerous people including my well wishers, my friends, colleagues and family members. I would like to thank all those wonderful people who made these years an truly unforgettable experience for my studying. The warmest words of gratitude are going to my supervisor Professor Riitta Brusila-Räsänen, Ph.D. for her continually encouraging approach regarding this research and her trust in my capabilities to complete the work. I would like to give my sincere thanks to my second supervisor Prof. Dr. Hannu Vanhanen for his warmth and his wise advice. My gratitude also goes to the Ph.D. opponent Dr. Joyce Yee, Senior Lecturer and the second reviewer Dr. Hannu Pulkkinen for the constructive critique to look a little further. My gratitude goes to Philippa Zoë Koivu and David Hanrahan for reviewing the language of my thesis. I would like to thank Prof. Dr. Mauri Ylä-Kotola, Rector of the University of Lapland, who made the publishing of the thesis possible by his generous support. I should like to express the warmest of thanks to the Doctoral Programme CORE, Doctoral School of Communication Studies at the University of Tampere with Prof. Dr. Pekka Isotalus for training and support and the DAAD Promos Programme for a scholarship for lecturers and students for a one-week study excursion to Finland. I am taking this opportunity to express my thanks to Prof. Dr. Klaus-Dieter Schulz, Rector; Prof. Dr. habil. Martin Beckenkamp, Prorector; Prof. Dr. Ronald Freytag, Chancellor; Prof. Dr. Wolfgang Kothen, Campus Manager and Mr. Ameer Jillab, General Manager of the HMKW Hochschule für Medien, Kommunikation und Wirtschaft, University of Applied Sciences for the available time and the financial support to act as a speaker at various congresses and international conferences. My warmest thanks go to all the students and participants of the studies and examples. My gratitude also goes to all my colleagues and present and former fellow workers at the University of Lapland, Faculty of Art and Design and to all my colleagues at the HMKW, University of Applied Sciences. I always felt appreciated and accepted with my work, and received so much support and friendliness that still carries me on. The warmest words of gratitude go to my mother, Heidelinde, who believed in me and my work. All my love goes to my wife, Natascha, and our lovely daughter. I am ultimately grateful for our love and companionship. Her hard-working approach and availability to be with Charlotte, has enabled me to work on this thesis and do research abroad, and finally has helped me to place things in the right order of importance.

fig. 280
Markus Schröppel
working in the library;
drawing by Charlotte, 2014

