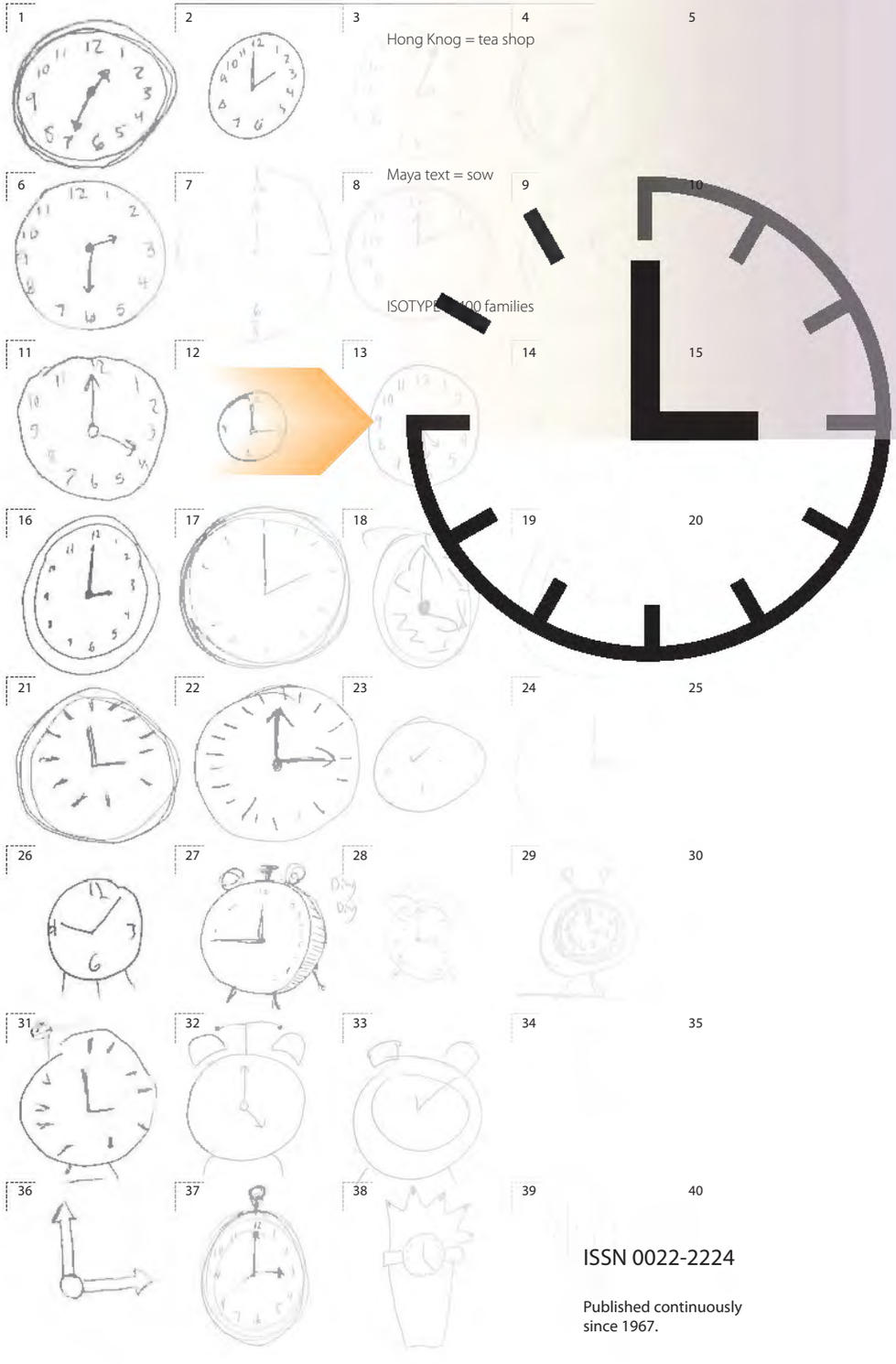

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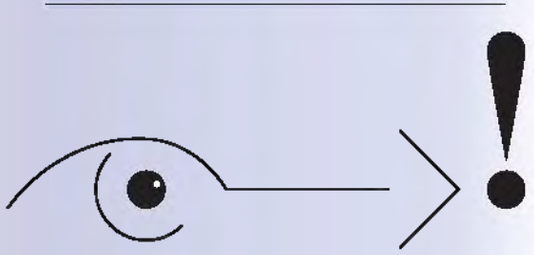

51 . 2

Visible Language

the journal of
visual communication
research

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Before there was reading there was seeing. *Visible Language* has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

If you are involved in creating or understanding visual communication in any field, we invite your participation in *Visible Language*. While our scope is broad, our disciplinary application is primarily design. Because sensory experience is foundational in design, research in design is often research in the experience of visual form: how it is made, why it is beautiful, how it functions to help people form meaning. Research from many disciplines sheds light on this experience: neuroscience, cognition, perception, psychology, education, communication, informatics, computer science, library science, linguistics. We welcome articles from these disciplines and more.

Published continuously since 1967, *Visible Language* maintains its policy of having no formal editorial affiliation with any professional organization — this requires the continuing, active cooperation of key investigators and practitioners in all of the disciplines that impinge on the journal's mission as stated above.

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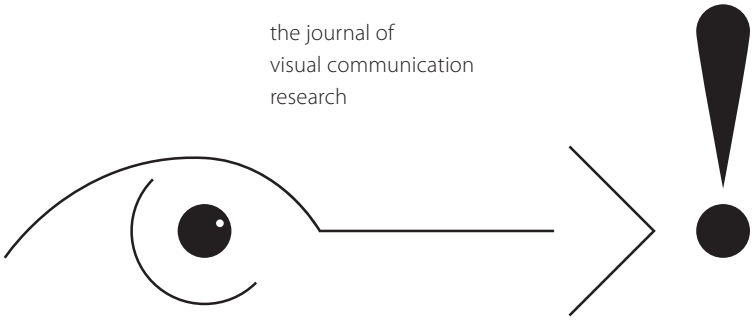

special issue:

Symbols _ Icons _ Pictograms

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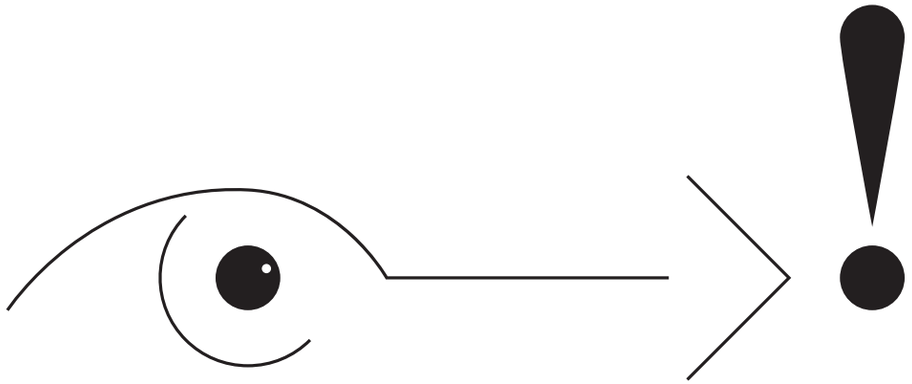

I noted in the previous issue, *Visible Language* 51.1, that people have communicated with visual symbols / icons / pictograms for thousands of years. To punctuate that point - four articles in these issues are on ancient Mesoamerican hieroglyphic communication systems: two in 51.1 "Tz'ihb 'write/paint': Multimodality in Maya glyphic texts" by Agnieszka Hamann, and "Signs of resistance: Iconography and semasiography in Otomi architectural decoration and manuscripts of the early colonial period" by David Charles Wright-Carr, and two in 51.2 "Metonymic and metaphoric series in the *Codex Borgia*, Plates 33-34" by Angélica Baena Ramírez, and "The Written Adornment: the many relations of text and image in Classic Maya visual culture" by Daniel Salazar Lama and Rogelio Valencia Rivera.

These papers were first given as presentations at the conference *Sign and Symbol in Egypt and Mesoamerica: Exploring the Interrelationships of Writing and Iconography* held June 30 -July 07, 2016 at the University of Warsaw, Warsaw, Poland. The aim of the conference was to address a question that has received little attention: how graphic communication systems - traditionally known as notation/numeration, iconography, and writing - relate to, interact with, and exert influence on each other. The focus was on the civilizations of Egypt and Mesoamerica that provide abundant evidence for the interplay of systems in books and on monuments. The conference also sought contributions relating to cultures and systems beyond the bounds of the focal area, such as Mesopotamia, Anatolia, India, and China.

We appreciate the help of Katarzyna Mikulska, Daniel Tacacs, Gordon Whittaker, and conference organizers in bringing these papers to our attention and helping the authors prepare them for publication.

Mike Zender

Bespoke Wayshowing in Hospitals

Per Mollerup

Wayfinding in hospitals causes problems for patients, visitors, and staff. Applying the principle of least effort on wayfinding points at a three-tier set of wayfinding styles with increasing mental workloads. These styles are walk-and-see, walk-and-read, and stop-and-study. While traditional wayshowing technologies facilitate the two first wayfinding styles, the third wayfinding style is best supported by individual wayfinding assistance, which is not given by traditional wayshowing technologies. This paper suggests addressing this problem by introducing bespoke wayshowing enabled by adaptive mass-customisation.

Keywords

hospitals
wayshowing
principle of least effort
interaction design
mass-customisation
touchpoints
information design

1

Wayfinding in hospitals

Wayfinding in hospitals can be a burden for already worried patients and visitors as well as for staff that on the top of their own wayfinding problems are frequently approached by other wayfinders who cannot find their destination. The wayfinding problems in hospitals result from three causes: the complexity of the built environment, the shortcomings of the hospitals' wayshowing (wayfinding assistance), and the users' limited wayfinding abilities. No matter what cause, wayfinding problems may stress already worried patients and visitors and make them feel less welcomed. Add to this, the cost of staff using their time for wayfinding and wayshowing rather than health service and the cost of staff and facilities waiting for patients late for appointments. These hidden costs have apparently never been calculated precisely, but they may be considerable (Michael McCarthy, 2004; Per Mollerup, 2009).

Hospital settings are often large, complex, and complicated. Large hospitals provide many kinds of specialised health care in many facilities not necessarily located in some immediately understandable pattern. Patients must sometimes navigate long distances along complicated routes between facilities. Additions of new buildings and repurposing of existing buildings often lead to further complication. New buildings may be squeezed in between old buildings rather than located in the most logical position. Repurposed buildings may be configured less than ideally seen from a wayfinding viewpoint. The ideal wayfinding process where wayfinders immediately and intuitively understand where to go is not common in hospital settings.

Many patients and visitors are novices in the hospital. This together with the scale of the hospital and the unfamiliar names of facilities may stress already stressed patients and visitors further. Some wayfinders, among them elderly citizens, may have reduced sensory, cognitive, and motor abilities. If patients and visitors (from now on interchangeably called 'wayfinders') have been in the same hospital before, something may have changed since their last visit.

In spite of the hospitals' efforts, the existing wayshowing far from prevent patients and visitors from losing their way. This paper presents an innovative way of improving wayshowing in hospitals. Together with airports, hospitals feature some of the most complicated and stressful wayfinding situations thinkable. If the proposal for bespoke wayshowing developed in this paper will work in hospitals, it may also work in other, less demanding, environments.

2

Indoor wayfinding

Indoor wayfinding differs from outdoor wayfinding in at least two respects. One is that indoor wayfinding often includes vertical transport, be it by stairs, escalators, or lifts. Another difference is that several wayfinding technologies, WFTs, favour outdoor wayfinding. WFTs include any device that helps wayfinders orientate (determine where they are), and navigate (find their way) in unknown territory, and confirm that they are on the right track.

In contrast to indoor areas, useful maps to a large extent complement outdoor areas. Also, a rising number of on-board GPS, Global Positioning System, devices guide drivers visually, and often also audibly, to their specified outdoor destination. Further, several types of wearable/portable digital devices with wayshowing potential assist pedestrians' and bikers' outdoor wayfinding visually, sometimes also audibly.

Indoor signage may be of varying quality, and maps, sited or wearable/portable, cannot be taken for granted. On-board GPS devices are off limits and wearable/portable digital devices are not necessarily applicable, save effective, indoors.

In other words, the state of indoor wayshowing in hospitals raises important questions: Is the hospital planned with sufficient consideration for effective wayfinding? Can improved environmental features ease the problem? Can WFTs enable smoother orientation and navigation? Here it should be noted that reduction of the problem (making the environment more readable) of course is as valuable as, or even more valuable than, improvement of the wayshowing (wayfinding assistance), making better WFTs.

3

Wayfinding with least effort

Before discussing in some detail the potential of indoor design and WFTs, we shall take a look at the principle of least effort and codify wayfinding styles accordingly.

The principle of least effort (George Kingley Zipf, 1949) suggests that whatever humans and animals do, they try to do along the path of least effort. Several authors have applied the principle of least effort to information seeking, e.g. in libraries. The principle of least effort, however, also applies to the use of all kinds of tools (Per Mollerup, 2015). When we buy a new drilling machine many of us immediately try to get it out of the package and running without bothering about any instruction. If necessary, we shall look

for the labels on the tool: on, off, forward, reverse etc. If the labels also fail to help us, we shall, as the source of last resort, look for the user instructions, hopefully written in a comprehensible language for the model at hand. The three tiers of information give rising mental burdens to the user:

Tier	Medium	Mental workload
1	object	x
2	labels	xx
3	user instructions	xxx

Wayfinders also intuitively seek their information with the least effort. If they can 'read' the environment directly and intuitively find their way they won't worry about reading signs or consulting maps. They will just proceed through the environment. If wayfinders do need to consult wayshowing signs they prefer signs that they can spot from a distance and read and understand while moving in the right direction. This approach is almost as good as reading the environment directly. Often, however, there are so many and so complicated signs that the wayfinder cannot read, sort, and interpret the signs while walking. In this case, the wayfinder must slow down to read and, possibly, turn to the means of last resort, in other words, stop and study available descriptions, probably a site map. The same is the case if there is no signage. Applied to wayfinding, the three-tier model looks like this:

Tier	Medium	Wayfinding style	Mental workload
1	environment	walk-and-see	x
2	signage	walk-and-read	xx
3	description	stop-and-study	xxx

Walk-and-see

When Pablo Picasso allegedly claimed je ne cherche pas, je trouve, I don't search, I find, he serendipitously also described our preferred wayfinding style when navigating unknown territory. We want to advance intuitively and directly to our destination. The environment should encourage and enable seamless wayfinding. We want to walk while watching and understanding. Some building genres enable this wayfinding style.

Walk-and-read

Unfortunately, buildings of a certain size don't necessarily follow a pattern well known to the wayfinder and they are not organised in an immediately recognisable or understandable way. However, directional signs and identification signs can sometimes make up for a building's lack of self-explanation and allow wayfinders to read and understand while walking.

Stop-and-study

The walk-and-read wayfinding style may be difficult or impossible to apply in large built environments with multitudes of possible destinations. There is simply not space for all possible directional signs, and if there is, the information provided may be difficult to filter for the wayfinder. To find their way wayfinders must stop and consult maps that provide an overview not given by directional signage.

The walk-and-see and the easier part of the walk-and-read wayfinding styles involve the kind of thinking, which Nobel Laureate Daniel Kahneman labels 'System 1':

> *System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control.*
> (Daniel Kahneman, 2011, p20).

The stop-and-study wayfinding style and the less easy part of the walk-and-read wayfinding-style involves the kind of thinking, which Kahneman labels 'System 2':

> *System 2 allocates attention to the effortful mental activities that demand it, including complex computations. The operatings of System 2 are often associated with the subjective experience of agency, choice, and concentration.*
> (Daniel Kahneman, 2011, p20)

Maps and verbal descriptions may be declarative or procedural. Declarative descriptions explain the lay of the land (what), while procedural descriptions (instructions) explain how to find the way. Declarative descriptions intentionally result in sense making, while procedural descriptions intentionally result in rule following. Sense making is more cognitively demanding than rule following. A site map (survey map) involves declarative knowledge, while a route map involves procedural knowledge. Another difference between site maps and route maps is that site maps are allocentric: they are neutral, while route maps are egocentric: they see the area from one wayfinder's viewpoint. In principle, route maps demand less mental effort than survey maps

Of course, distressed wayfinders may stop and ask any person nearby for help, in a hospital typically the first white coat passing. This behaviour, however, falls outside our business: assisting wayfinders in getting around on their own. Interpersonal help is not part of our inquiry.

To make wayfinders' navigation as easy as possible building owners should learn from the principle of least effort and invest in self-explanatory environments, in signage, and in description in that order. When planning signage, the goal should be to make signage usable in a way that emulates intuitive reading of the environment: letting wayfinders walk-and-see.

4

Environmental wayfinding support

The environment constitutes the core of the wayfinder's problem. The environment's inherent wayshowing qualities assist the wayfinder by reducing the wayfinding problem. User centred wayshowing includes all the characteristics that support the strategies, which wayfinders intuitively apply when navigating unknown territory. These strategies include track following, route following, educated seeking, sequential inference, screening, aiming, map reading, compassing, and social navigation (Per Mollerup, 2005, 2013).

Track following involves getting the needed wayfinding information along the route while route following means using information given before start. Route following depends on the wayfinder's ability to remember, assisted or not by written notes. Educated seeking implies using knowledge learned in other situations. Sequential inference depends on reading logical sequences of numbers or letters. Screening means scrutinising an area in full or in part. Aiming involves moving in the direction of visible destinations. Compassing uses cardinal directions without (sometimes with) the use of a compass. Finally, social navigation implies learning from what other people do.

Use of each of these strategies may benefit from one or more environmental qualities, most important of which is accessibility. It is not enough to know the position of one's destination if it is inaccessible because of a bridge-less river barring it from the wayfinder. Accessibility is paramount to wheelchair-bound users and other wayfinders with motor disorders. Transparency is a close contender to the position as the most important wayshowing quality. An environment bereft of transparency offers only few visual cues and leaves the wayfinder to rely on aural, olfactory, and other non-visual cues.

Environments following normal patterns and logical numbering of buildings, floors, and rooms support wayfinders' use of experience from other situations. Systematic floor plans support many strategies and so do landmarks, visual anomalies such as buildings or building parts that stand out from their surroundings. Strangely, the two opposites, repetition and variation, used with moderation, both help wayfinders. Building names and other names involving cardinal directions support compassing.

Environmental qualities moderate the wayfinding problems. WFTs contribute to their solution.

5

Wayfinding technologies, WFTs

Patients' and visitors' successful wayfinding in hospitals is the hospitals' responsibility. Hospitals' wayshowing includes pre-visit information, static (non-interactive) wayshowing media, and interactive assistance at the hospital. Pre-visit information in appointment letters may describe both the way to and around in the hospital by site maps, route maps, or verbal route descriptions. Hospital websites may contain site maps. In the hospital, static media such as traditional signage, guidelines, and site maps may guide patients and visitors. Finally, digital kiosks, information desks, and voluntary guides, may provide interactive wayfinding assistance. Digital kiosks are computer terminals where wayfinders traditionally type a destination or chose it from a menu to get a route description, on- screen or printed.

Three pairs of contrasting properties characterise the wayfinding technologies used in the hospital setting:

Communal / personal wayshowing

The wayshowing media used in hospitals are as a rule communal: they address, in principle, all users. Directional signs are examples of communal wayshowing media. So are printed handout site maps. Communal wayshowing may appear economical to the hospital, but the information given may be difficult to filter for the individual user. The information relevant to the individual user is surrounded, perhaps eclipsed, by information only useful to other people.

Personal wayshowing, information addressing one person's wayfinding needs, serves the individual wayfinder better. A map showing the route from the main entrance to the urology department is an example of a personal wayshowing medium. Some kinds of personal wayshowing may involve prohibitive costs.

Wearable/portable / sited

wayshowing media

Wearable/portable devices, such as printed maps and PPDs, personal portable devices, have some advantages compared with sited wayshowing media such as wall mounted signs. Most important, wearable/portable devices are per definition always at hand. Also, wearable/portable devices are only visible to the user. One person using a PPD doesn't interfere with other people's wayfinding.

Disadvantages of PPDs to some degree outweigh the above advantages. These disadvantages concern the users' perceptive and cognitive workload. Users of PPDs must divide their attention between two places: the small wearable/portable device and the life-size surrounding environment. This shift in scale between the wearable/portable small thing and the environment may be especially stressful for wayfinders with less than perfect sight. Also, using the wearable/portable device demands mental energy. A wayfinder must turn a printed map manually or mentally when changing direction to align forward in the environment with forward on the map. PPDs make this manoeuvre redundant, but involve the keyhole problem: only a fraction of the needed information is shown at a time. The user must scroll or pan to see other parts of the total picture or zoom in and out to see a part or the total picture. These operations are time consuming and add to the mental burden. Wayfinders with mental or motor impairments may already invest some cognitive efforts in moving along and have less capacity for intricate wayfinding problems. Some wayfinders may use one hand for a walking stick, or both hands for crutches. Wheelchair users also have one or two hands occupied elsewhere.

Static / interactive wayshowing

Traditional wayshowing media work one-way, from sender to user, expecting no input from the latter. Traditional wayshowing media are static. Wall mounted signs, painted guidelines on the floor, and printed maps are examples of static wayshowing media. PPDs that tell the wayfinder in what direction to go and adjust the explanation as the wayfinder moves along, are interactive wayshowing devices, and so are digital kiosks. For the hospital, the choice between static and interactive wayshowing media is practical and economical.

Given the advantages of individual and interactive wayshowing and the drawbacks of wearable/portable devices, we would ideally prefer individual, interactive information given by sited devices: only-for-me big signs on the walls. Such devices would allow the walk-and-read wayfinding style. This solution would, however, only serve one person or several persons with the same start point and destination. Everyone bound for other destinations would not be assisted. The trick is to make the sign content a dependent variable that varies with the viewer and at the same time does not disturb other wayfinders. Information kiosks used in some hospitals and shopping centres meet these specifications.

The table below codifies WFTs according to the three pairs of contrasting qualities: communal/personal, static/interactive, and wearable/sited:

Wayfinding technologies typology		
	Wearable/portable	Sited
Communal	**Static:** Site maps (paper)	**Static:** Directional signs Marking signs
Individual	**Static:** Route maps (paper) **Interactive:** PPDs	**Interactive:** Kiosks

The weak point of existing wayshowing kiosks is that wayfinders to get a route description must specify their destination, e.g. Department of Gastroenterology and Clinical Nutrition, either by typing it or by choosing it from a menu with a large number of other destinations, some of them perhaps with similar names. This can be a time consuming and cognitively demanding task, especially to users who are not accustomed to typing and computing and to users who suffer from sensory, cognitive, or reading disorders. Also, this time-consuming characteristic reduces the kiosk's capacity. Several kiosks may be needed to reduce waiting time in crowded areas. Also, long waiting time and long processing time may both induce potential users to abandon the kiosk and approach the next passing white coat for wayfinding advice.

While the idea behind wayshowing kiosks is basically sound, identification of the wayfinder's destination is a weak point to be negotiated. Before dealing with this problem, we shall discuss the principle behind communal media that give bespoke assistance: mass-customisation.

6

Mass-customised wayshowing

'Mass-customisation' is a contraction of 'mass production' and 'customisation'. It stands for a happy marriage between mass-production's low unit

costs and adaption to individual needs and wants. The automotive industry has long since discarded Henry Ford's narrow view on car colours; they mass-customise to meet the wants of the individual buyers. Together with several other features including motor size, trimmings, and electronic equipment car manufacturers vary colour to give buyers their special car at mass production price. Mass-customisation is also applicable outside manufacturing, in the service sector for instance. Charter flight passengers finding their own accommodation at the destination combine cheap mass-transportation economy with individual lodging preferences.

James H. Gilmore and Joseph Pine II (1997) identified and named four distinct approaches to mass-customisation, each with its distinctive characteristics: collaborative, adaptive, cosmetic, and transparent mass-customisation. Collaborative customisation implies a dialogue to identify the offering that will satisfy the customer. Adaptive customisation means that the customers can themselves adjust the product to fulfil their needs. Cosmetic customisation deals with the presentation of the product. Finally, transparent customisation implies that the provider learns from the customer and adjusts the product without the customer knowing it.

Adaptive customisation suits our purpose:

Each customer independently derives his or her own value from the product because the company has designed multiple permutations into a standard, but customisable, offering. It is the product itself, rather than the provider, that interacts with customers.

(James Gilmore and Jospeh Pine II, 1997, p13)

In adaptively customised wayshowing, each wayfinder derives with minimal effort his or her individual route description from a digital kiosk designed for communal use. All registered users can use the kiosk to get an individual explanation. It is bespoke wayshowing.

7 Bespoke wayshowing

In bespoke wayshowing, kiosks, called touchpoints, present the preferable route from the touchpoint's position to any destination in the hospital to registered wayfinders. If relevant, the touchpoints can present special routes for wheelchair bound wayfinders.

Patients' destinations are as a rule determined by the hospital. When informing the patient about an appointment, the hospital also delivers a code, which, when presented to a touchpoint, calls the relevant route description from this touchpoint to the destination. All relevant hospital staff can assign a wayfinder with a new destination. The information triggered by the code includes the wayfinder's name, destination, and route.

Codes can be carried by NFC, Near Field Communication, tags in the shape of a patient card, or they can be QR codes printed on an appointment letter or a patient card. When a patient card with NFC code or QR code or an appointment letter with a QR code is presented to a touchpoint, the touchpoint will show the user's name, destination, and a route description. The route suggested may lead directly to the final destination, or - if the route to the final destination is long and/or complicated - to another touchpoint.

Iris, face, or fingerprint recognition could be part of a more advanced solution, where the touchpoint recognises the patient directly and pairs this information with information about patients' destination (and possible use of wheelchair). This would demand a previous registration of the patient's identifying features.

The bespoke wayshowing touchpoints are vertical, wall mounted (or free-standing) computer terminals, conspicuous enough to attract attention, large enough to present route descriptions in readable size, and small enough to provide some privacy. When not in use, the touchpoints announce their presence and availability with a default message, readable from a distance, such as: FIND YOUR WAY - PRESENT YOUR CODE HERE. The touchpoint should also be visible, when in use.

The touchpoints should be placed strategically, importantly at decision points, places where wayfinders must make a choice: continue, turn, or go to level x. Important decision points are typically entrances, lift banks, and crossing corridors. Generous deployment of touchpoints makes bespoke wayshowing forgiving. Wayfinders having lost their way can always get back on the right track at the nearest touchpoint. At important positions, more than one touchpoint should be available. Perhaps with adjustable height, touchpoints should be positioned with a view to walking as well as wheelchair bound wayfinders.

Bespoke wayshowing includes an element of ball parking: Bespoke wayshowing takes the wayfinder to the right destination area, e.g. the right ward. When being there the wayfinder must find the wanted room by watching identification signs. As wayfinding strategy, screening or sequential inference will replace track following and route following.

8 Route description

Route descriptions are critical to the success of bespoke wayshowing, and to the costs involved. Costs considered here include production of route descriptions and procurement and instalment of touchpoints. The main consideration is that the route descriptions should be readable, understandable, and memorisable. Simplicity resulting in clarity is the core quality.

The touchpoint computer terminal will clearly indicate if a suggested route takes the wayfinder directly to the intended final destination, or to a new touchpoint.

The route description given by the touchpoint will use one of two formats: map+text, or text+arrow. Production wise a screen picture showing a map+text costs more than a screen picture with text+arrow. This study will present some initial tests concerning the efficiency of map+text vs. text+arrow.

How many route elements a route description should comprise is the planner's judgement call. The length of the route descriptions influences the wayfinding challenge as well as the need for touchpoints:

- Short route descriptions - with relatively few elements - are easier to read and remember, but the wayfinder may need more touchpoint visits before reaching the destination because the total route is divided into more legs.
- Long route descriptions - with relatively many elements - are less easy to read and remember, but the user may need fewer touchpoint visits before reaching the destination because the total route is divided into fewer legs.

The length of route descriptions influence the bespoke wayshowing costs:

Short and long route descriptions compared			
Route description	Easy to follow	Visits needed	Hardware costs
Simple	very	many	high
Complex	less	few	low

All destinations and touchpoints as well as turning points must be visually identifiable from a distance, by appearance, e.g. stairs, or by clear identification signs, e.g. UROLOGY.

Route maps

Route maps should show the present position (YOU-ARE-HERE) and the destination or intermediate destination marked verbally or by a pictogram.

Maps should comply with the principles of structure matching and orientation (Marvin Levine, 1982). Map orientation should always be forward-up, meaning that the maps will always be aligned with the wayfinder's position: left on the map means left to the wayfinder studying the touchpoint. Other possible map orientation principles such as north-up, entrance-lowermost, and all-maps-same- orientation should give way to forward-up. This will free the wayfinder from struggling with mental rotation.

Route maps should be designed with great care seeking a fine balance between clarity and detail. Simplification of shapes, colour, and text should be weighed against usability. Most route maps will benefit from a short text that confirms the route.

The position of the touchpoint and the position and direction of the wayfinder while studying the touchpoint, the destination or intermediate destination, and the route with route markers should be marked. Route markers are visual elements along the route that contribute to make the route distinctive and memorisable. Route markers can be any visual element found along the route that is easily noticed and is narratable, easy to describe in text or in picture, and easy to identify in situ. Route markers can be hospital facilities or landmarks. Eligible hospital facilities have fairly easy designations, for instance CAFETERIA, PHARMACY, or LABORATORY.

Landmarks are visual anomalies, something that sticks out and is visible from a distance, and is narratable. A three-meter high teapot is a better landmark than a delicate oil painting of Asclepius, the god of medicine. The teapot sticks out, can be seen from a distance, and is easy to talk about, understand, and remember. The nature of landmarks and their importance in wayfinding are described by numerous researchers, notably K. F. Richter and S. Winter (2014).

On the map, hospital facilities should be represented by their name, while landmarks should be represented by simple, easily understandable, pictures: naturalistic, but simple, drawings. Understandability and memorability are the relevant criteria. Designers' idées fixes should never take control.

Verbal route descriptions

Verbal route descriptions should be short. The vocabulary should be basic. Hospitals with users with different languages may consider bespoke wayshowing with language options. The text should whenever possible be supported by an arrow that confirms the route.

While several researchers have investigated route maps, researchers seem to have ignored verbal route descriptions. Why? Because they are not 'design' solutions? What if pure text messages are as good as, or superior to, maps?

9

Route map vs. verbal route description

Which route description, map or verbal, is best for the user? Some wayfinders love maps, others hate maps. What is easiest for most people? We are not sure, but have done some testing. We have compared how efficiently people

follow a route in a university setting described by a route map and by a verbal route description.

Instead of mounting a great number of touchpoints and testing route maps vs verbal route descriptions in a hospital setting we, for practical reasons, tested the two modalities by using paperboards emulating screens in a university setting: Swinburne University of Technology, Melbourne.

Research design

In a between-subjects experimental design we asked different groups of people to find four targets in a specific order, 1) assisted by route maps, and 2) assisted by verbal route descriptions.

Participants

48 people, 24 aged 19-32 years and 24 aged 50-68 years were recruited outside Swinburne University of Technology and had no knowledge of the buildings concerned. They were all proficient in English. They were rewarded a coupon worth 40 Australian dollars equalling 30 US dollars redeemable in a local department store or supermarket chain. Had a participant left without completing the wayfinding task he/she would also get the reward.

Test site

The test site was a cluster of four interrelated buildings on the Hawthorn Campus of Swinburne University of Technology. The four selected buildings named TA, TB, TC, and TD are generally considered complicated to navigate. They provide space for class rooms, laboratories, and lounges. They have four levels connected by several staircases and lifts. Buildings TA/TD and TB/TC are pairwise directly connected on level 2 and level 3: You can walk directly from one building into the other. TA/ TB and TC/ TD are pairwise connected by bridges on level 2 and level 3. All suggested routes were restricted to and involved level 1, 2, and 3.

Materials

Route maps, verbal descriptions, and target markings were given on A4 portrait paper boards in size similar to a 14" monitor.

Map+text:

The route maps used by participants were designed with great simplicity. Only essential information was shown: Surrounding building parts, YOU-ARE-HERE symbol, route, destination, supporting text (see *figure 1*).

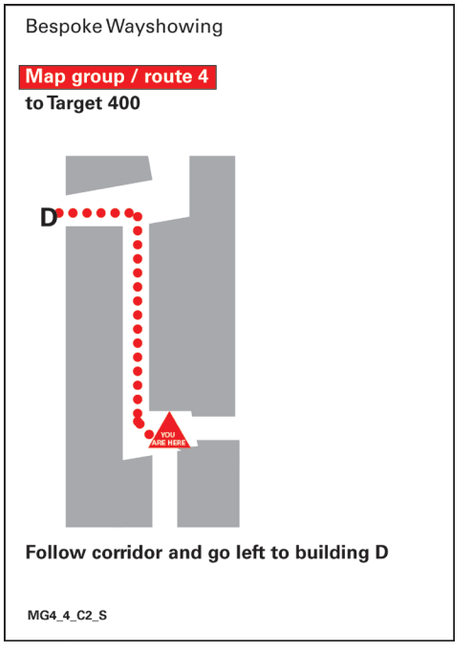

Figure 1

Map+text

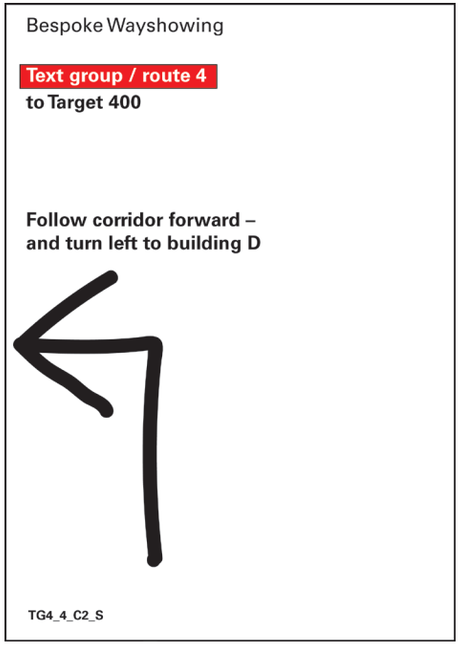

Figure 2

Text+arrow

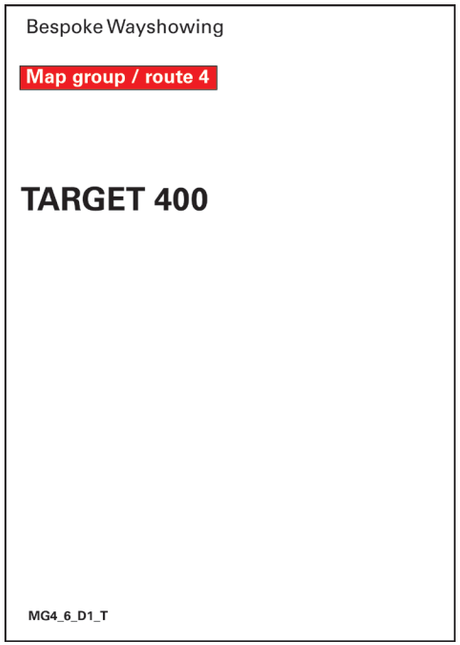

Figure 3

Text+arrow

Text+arrow:
The verbal route descriptions used by participants were written with as simple - yet unambiguous - language as possible. An arrow complemented the text when appropriate (see *figures 2 and 3*).
The targets were marked with TARGET + target number.

Procedure

The map+text and the text+arrow group participants were individually met by the research assistant, instructed, and taken to the first touchpoint 'screen' on the first route. After reading the route description, participants would follow the indicated route to the next 'screen', and so on. After five or six 'screens', they would arrive at their target. The wayshowing followed the progressive disclosure principle. The four routes followed each other in a relay pattern. The target destination of route 1 was the starting point of route 2, and so on. The researcher would follow each participant, take the time, and note hesitations and errors.

Results

The results show no significant difference in the efficiency of maps+text and text+arrow route explanations:
We first tested 24 participants 9-32 years. 12 participants (6 male, 6 female) walked four routes assisted by map+text and 12 participants (6 male, 6 female) followed the same four routes assisted by text+arrow. The text+arrow group performed slightly better M=737.17 sec than the map+text group M=760,17 sec. The difference 23.00 BCa [-36.96, 84.84] was not significant $t(22) = 0.724$, $p = .476$.
To see if this result was age related we did the same exercise with participants 50-68 years old. 12 participants (7 male, 5 female) text+arrow participants performed better M=780.75 sec than 12 participants (6 male, 6 female) map+text participants M=793.83 sec. The difference 13.083 BCa [-52.749, 78.040] was not significant $t(22) = 0.371$, $p = .714$.
The similarity between map+text and text+arrow results is remarkable. If simple verbal route descriptions work as well as, or better than, simple route maps a lot of time consuming map design can be avoided.
Future research should include more tests map+text vs. text+arrow including older participants. Also, great efforts should be taken to develop simple ways of route maps and verbal route descriptions. Could other more efficient maps be designed?

10 Total wayshowing solution

Bespoke wayshowing will not make traditional wayshowing in the hospital obsolete. Bespoke wayshowing will assist wayfinders who would otherwise look for a map or ask staff for wayfinding help.
After introduction of bespoke wayshowing, traditional wayshowing media will still provide the bulk of wayshowing in the hospital. Those who can will intuitively understand where to go or read the signs and walk.
Wayfinders who have consulted one or more touchpoints to find a ward will when having arrived in the intended destination area consult door signs or other signs to find the right room. Excellent identification signage is paramount.
Also, patients and visitors looking for the exit will be guided by traditional signage. To signpost the way to exits is a considerably easier wayshowing task for the hospital than to show the way to hundred different facilities.
Bespoke wayshowing will probably be of greatest interest to hospitals but may also be interesting to exhibition centres, airports, and shopping centres.

11 Summing up

The hospital will automatically issue all wayfinding patients with a personal identification code. Visitors can require a code. A code is related to a destination. Codes can be in NFC or QR format.
When a code is presented to a touchpoint, the touchpoint will confirm the wayfinder's name and destination and suggest a route to the wayfinder's destination. The route description may in simple cases cover the full route. In less simple cases, the route description will cover the first leg of the journey. After this the wayfinder must consult a new touchpoint.
The touchpoints are connected in a system with centralised storage and updating. The system can be expanded to suggest special routes for wheelchair bound wayfinders and wayfinders preferring an alternative language. Staff at the destinations and elsewhere can change the destination related to a code or issue a new code.

12 Future development

The future development of bespoke wayshowing will include five parts before presentation to the market:

1 (Continued) international search of academic papers and commercial kiosk solutions
2 (Continued) research on route description modality (map or text) and efficiency (simplicity vs. complexity)
3 Development of route descriptions for a hospital test
4 Development of technical working model
5 Tests of the working model

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Per Mollerup has written number of books including: *Marks of Excellence: The history and taxonomy of trademarks*, 1997, 2013; *Collapsibles: A Design Album of Space-Saving Objects*, 2002; *Wayshowing: A Guide to Environmental Signage*, 2005; *Brandbook: Branding, Feelings, Reason*, 2008 (in Danish); *PowerNotes: Slide presentations reconsidered*, 2011. Downloadable from http://hdl.handle.net/1959.3/191214; *Wayshowing>Wayfinding: Basic & Interactive*, 2013 (revised and expanded version of *Wayshowing: A Guide to Environmental Signage*, 2005); *Data Design: Visualising quantities, locations, connections*, 2015; and *Simplicity: A Matter of Design*, 2015.

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