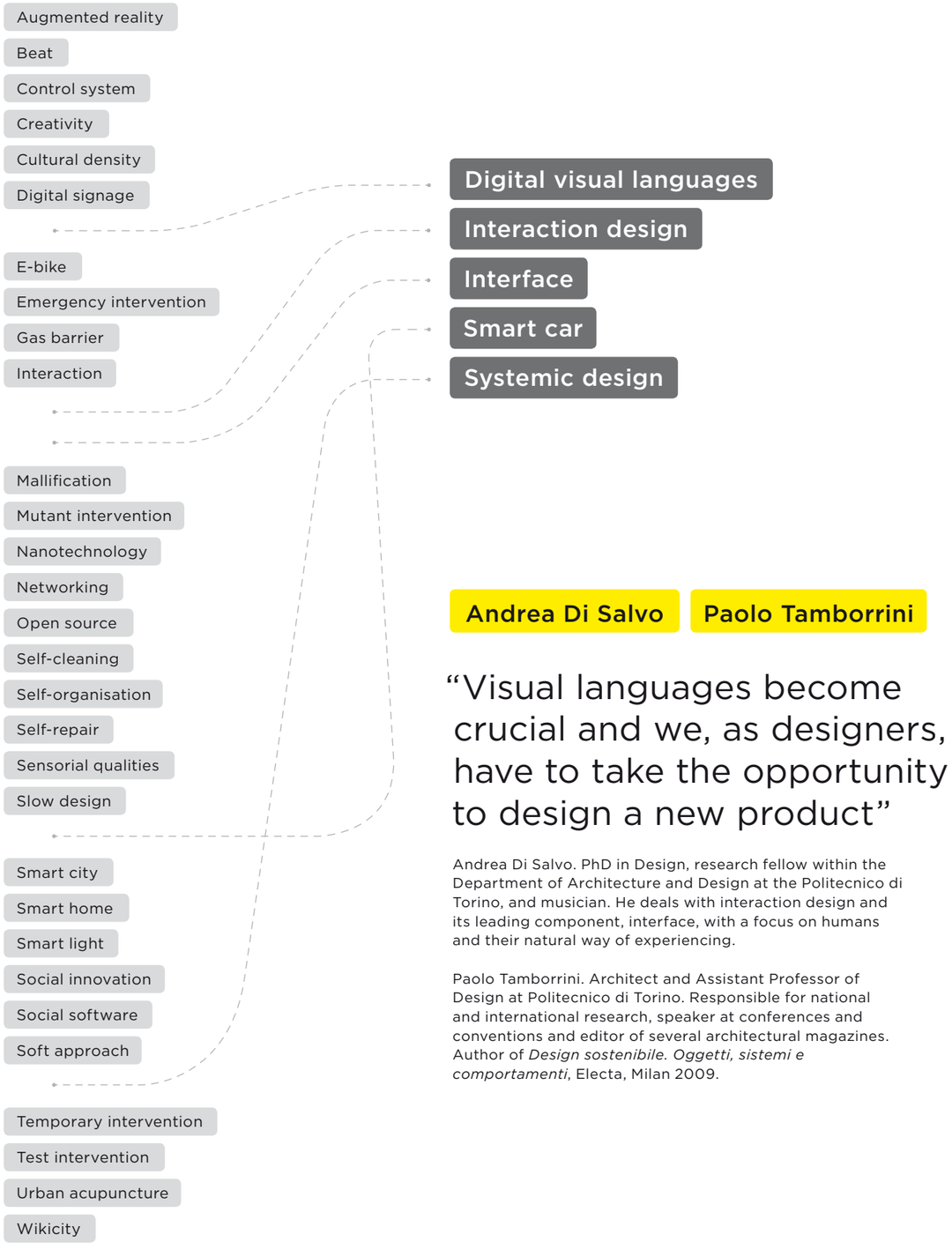


Andrea Di Salvo Paolo Tamborrini

“Visual languages become crucial and we, as designers, have to take the opportunity to design a new product”

Andrea Di Salvo. PhD in Design, research fellow within the Department of Architecture and Design at the Politecnico di Torino, and musician. He deals with interaction design and its leading component, interface, with a focus on humans and their natural way of experiencing.

Paolo Tamborrini. Architect and Assistant Professor of Design at Politecnico di Torino. Responsible for national and international research, speaker at conferences and conventions and editor of several architectural magazines. Author of *Design sostenibile. Oggetti, sistemi e comportamenti*, Electa, Milan 2009.

New relationship between Visual Communication Design and Interaction Design

If the future of interaction design relies on movement recognition rather than haptic/vocal/muscle/brain interfaces, how will visual communication be able to guide people to perform tasks? Researchers and teachers have a very complex challenge ahead of them: on the one hand, they must follow continuous and daily updates to acquire and give a proper overview about the state of the art and future scenarios; on the other hand, the university must re-think design guidelines from a holistic viewpoint, avoiding fractures between product design, visual communication design and interaction design.

Digital expansion has forced a sudden U-turn in every field of application. At first, designers transposed contents and commands into a shape and language that were faithful copies of their analogue precursors. Is it now possible to design a completely digital-oriented language through new interaction modes driven by new technologies? Visual languages, in particular, play a fundamental role in human-machine interfaces inside control stations: this is a branch of research within the DAD (Department of Architecture and Design) at the Politecnico di Torino and it has led to important collaborations with companies like Alenia Aeronautica, to develop innovative HMI for UAVs (Unmanned Aerial Vehicles), and CRF (Centro Ricerche FIAT), to study interactive systems for electric and hybrid cars.

The goals of these research areas and collaborations are manifold, widespread and, above all, cross-disciplinary, because they include the study of a language which is no longer linked exclusively to signs or images; on the contrary, they have to measure themselves against new needs, new products, well-established habits and structures and innovative ways of interacting. In fact, for many production companies it is still usual to conceive (and imagine) the design phase as a separate element, in which the graphics are considered to be just an external layer; this kind of approach is not suitable when managing projects where graphic elements, interfaces and commands coincide perfectly within a surface that is smaller than a fingertip, such as, for example, in touch-screen devices. This phenomenon is developing and imposing itself not only within common market sectors, such as mobile communications, gaming and entertainment, in which technological development is the driving force that attracts new potential users, but also in very complex systems, like cars and aircraft.

Research and teaching within the university are also closely related and feed into each other; moreover, students are a dynamic resource that can have a positive influence on the methodological framework and on the need to update and follow those new technologies and applications that are widely used today within social networks.

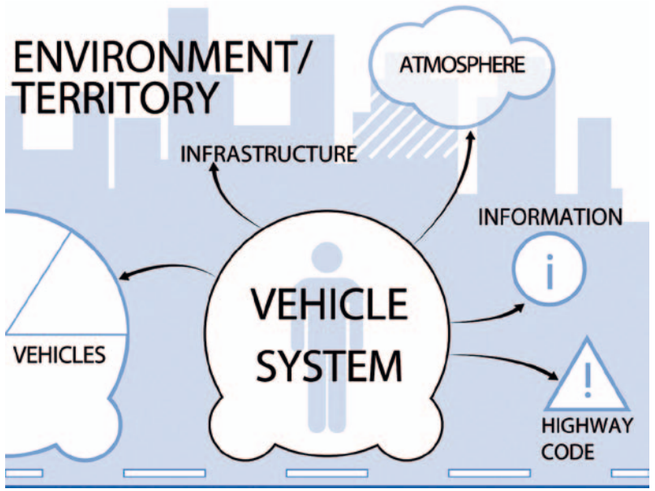
For many years, the well-established DAD research approach has integrated both HCD and System Design. In this way, first of all a human being,

as opposed to an artifact, is placed at the centre of a first delimited system. This process focuses on human requirements and needs, and on cognitive factors (such as perception, memory, learning, culture and experience) that come into play when interacting with objects[1].

This first step shifts the focus of the project from technology (Technology-Driven Approach) to the concept of the user as an active, aware subject (Human Centred Design)[2]. This makes it necessary to involve humans in the whole design process, not only as testers, but as proactive stakeholders. Who better than future users to recommend solutions that better meet their needs? The second step involves building a wide scenario to identify and correlate not only all the stakeholders involved in the design and use of the product, but also those who may have an influence on the project or be influenced by it, and finally those who will benefit from or suffer the consequences of the project, such as the local community and the region. Therefore, subjects will get involved in the system not at the end of the process but, rather, they will be integrated as figures of reference from the very beginning and throughout the entire project.

The design process, applying both the systemic and HCD approaches, will become iterative and virtuous, developing a network of interconnected relationships that are impossible to create using the linear or "cascade" design process[3]. If the linear process is in fact comparable to a straight line, the HCD process brings to mind the shape of a snail, and the systemic one looks like an endless spiral.

Going back to the DAD investigation, it is no longer possible then to talk about electric cars and their interfaces in isolation; it is necessary to expand the research field to mobility in the general and local context.



▲ New connections to and from the vehicle system

Placing the human being at the centre of the project and the methodology, however, also includes analyzing the different technologies with which man is in constant contact, highlighting opportunities, special features, limitations and critical aspects, questioning the role that designers should have. The feeling is that designers are often forced to pursue a technology that stands out as the driving one and as the one able to impose project specifications according to relevant needs. In order to avoid this mistake, perhaps we need to remember the factors and conditions that accompanied the massive integration of digital technology. Digital natives did not experience the whole process and some aspects seem to be fully obsolete, even if they were prevalent just thirty years ago. The introduction of digital technology at home and in the workplace rather than in control stations was dictated by the incredible performance of devices that allowed, on the one hand, a considerable amount of information to be condensed into a very small space and, on the other hand, the ability to rely on a memory and a computing capacity that were not remotely comparable to those of humans.

Over time, digital technology has also absorbed the part of the day that it was supposed to free up, even revolutionizing interpersonal relationships. In the past, it was imagined that relationships would change over time through the construction of virtual environments or 3D avatars, but today we see relationships evolving based on applications which are not too different from blogs and traditional chat applications, where, with just a few clicks, you can show others your location (foursquare), or write short messages (Twitter), or share more or less important aspects of your daily life (Facebook).

In just a few years, products designed to be essential work tools have become a support that accompanies us every day, every minute, in almost all our activities, when we travel or use any means of transport. Indeed, the power of digital tools lies in the capacity to gather a wide range of functions in a single artifact, and to meet different needs. While, up until a few years ago, many different objects, such as mobile phones, organizers, music players, laptops, etc., were required to perform the same tasks, they now consolidate and innovate personal connection and communication between people and information.

Digital media are being introduced to support our actions and not vice versa, creating different environments in which humans were supposed to immerse themselves.

Visual languages have played a crucial role in the evolution of digital technologies, promoting the acceptance and dissemination of products, making interaction with systems that were far from self-explanatory and not very clear to customers who were accustomed to mechanical or electronic objects simpler, clearer and more pleasant. The language of the first digital interfaces drew on the formal communication styles of those years: hand-written messages to convey orders, feelings, opinions, etc. The main difference, then, did not lie in using a conventional language, but in learning the exact sequence of gestures.

However, a significant development, characterizing the rise of digital technologies is the adoption of metaphors as the main language and the shift to an interaction based on instruments whose task is to reach metaphors and act on them.

Even if the introduction of GUI dates back to 1981, today it seems that conceptually there has been no revolution concerning graphics. Icons have experienced a continuous evolution, signs have been constantly updated and differ in style depending on the operating system and application but, only recently, with the introduction of gestures and interaction through movement detection systems, has it become possible to interact with them in innovative and, in some cases, very natural ways. In control stations, this type of communication between the user and the machine is still in its early stages. Visual languages function as labels or feedback control, and the criterion applied was what we might call correspondence of proximity: a key to press, a change in the system, a corresponding small light near the key that turns it on or off.

"Placing the human being at the centre of the project and the methodology, also includes analyzing the different technologies with which man is in constant contact"

Keys were then transferred to a monitor, interaction was mediated firstly by a single keyboard (through lines of code), then by a mouse (pointing and clicking on an icon-metaphor), then by keys on the screen border, now by tactile devices; all these components rotate around the main physical control instrument: a steering wheel, a stick or other.

However, if the future of interaction design provides invisible rather than haptic, vocal, muscle or brain interfaces, how will visual communication

1 Preece, J. *Interaction design, beyond human-computer interaction*. New York: John Wiley & Sons, 2002.

2 Germak C. (ed.). *Man at the Centre of the Project: Design for a New Humanism*. Turin: Umberto Allemandi & Co, 2008.

3 Bistagnino, L. *Systemic Design: Designing the productive and environmental sustainability*. Bra (Cuneo): Slow Food Editore, 2011.

be able to guide people in performing tasks? If we think about aeronautics, command interfaces are not comparable to the analogue systems used, for example, to browse the web, because they have always been designed by experts for highly specialized and trained users.

This resulted in a design process which was often not interested in innovating visual languages, which tended both to maintain already adopted and certified standards and to distinguish its product category from common tools and projects that were considered to be home entertainment.

Keys, switches, knobs and indicators were, in fact, replicated on a display trying to recreate their three-dimensionality without considering the differences in interaction or the complete absence of the natural and necessary tactile feedback.

This does not mean that control station interfaces are not usable, but we can interact with complex systems through more human-scale interfaces to obtain a dialogue mode with a look and feel which is similar to the tools we use every day, that will work whether the user is on board the vehicle or on the ground monitoring it. Many aircraft are now remotely monitored by qualified staff, sitting at a desk in front of a personal computer, maybe in a base far from the operation area. It is equally possible to plan the route you want to travel by car while you are still at home; in this case it should be possible to transfer the virtual path to the inside of the car using a common language. Therefore, many actions can be performed in this sector and they are not limited to redesigning symbols but include studying information layout and accessibility. In this way, to fly an aircraft rather than monitoring areas of land through a sensor will become easier and as viable as accessing content on a web page. Factors such as proper use of colour coding, readability, grid, and information hierarchy can and should be applied to a greater extent in situations where immediacy, usability and security coincide.

One might think that such reasoning cannot be applied because human beings, faced with any object, device or machine, expect a specific type of

▲ Aplicación para Smartphone *My City Way*, de BMW i

▼ *BMW ConnectedDrive*, New generation Navigation system Professional

▲ BMW i8 Concept, Central information display

communication after creating a map of possible operations in their minds, based on their experiences and cultural aspects.

Over the years, machine aesthetics have changed radically and the introduction of digital technology in almost all products has helped to eradicate mental maps and expectations in relation to the languages used in interfaces.

Behaviours, feedbacks and consolidated languages, which refer to mechanical imaginary, such as inserting the key into the dashboard of a car and turning it to start the engine, are changing due to technological reasons, and they require appropriate communication.

The new hybrid electric cars, for example, are started by a simple button that looks like the power button on any household appliance or PC; however, the problem is not the loss of well-established gestures, but how to give the driver feedback which is accurate and consistent with their expectations, as the characteristic sounds and vibrations of the common internal combustion engine disappear.

In cases like this, where automation is changing habits, visual languages become crucial and we, as designers, have to take the opportunity to design a new product, for example an electric vehicle.

Even if the outer shell remains similar to other vehicles, the functioning of new cars is completely different and we should not make the mistake of thinking that a simple interior redesign is sufficient.

Digital visual languages will firstly communicate the current status of the vehicle, but they will also clarify some aspects, such as starting and waiting.

Managing waiting is one of the most difficult aspects of the project. As a solution, splash screens, random musical loops, seductive women's voices, etc., are often used; this means using *ad hoc* voices or images to invite users to wait while they are already doing so, making the user feel that it is impossible to intervene. Jef Raskin obviated this problem this way: during Canon Cat booting, a saved image of the last operation performed by the user is loaded[4].

The introduction of digital technology and the resulting automation within control stations is not a recent phenomenon but one which began many years ago. Over twenty years ago, for example, car companies attempted to introduce digital languages within car dashboards, but these devices had not yet met with great success, despite popular films and television series contributing to the creation of a strong imaginary. Futuristic cars could fly, travel through time, speak and advise the hero driving them but, in the 80s, real cars were still very me-

4 Raskin, J. *The Humane Interface: New Directions for Designing Interactive Systems*. Reading, Massachusetts: Addison-Wesley, 2000.

chanical and not at all close to concepts such as "soft", "smart" or "eco". Today these concepts, together with the adoption of digital instrumentation, have become necessary.

However, how is it possible to satisfy both the formal and cultural needs that still exist, such as speed, strength, comfort, technology, sportiness, etc. and, at the same time, educate about a new, more responsible use of cars? The automotive sector is, therefore, currently one of the areas in which all the highlighted problems, but also opportunities, are converging.

In the course of our research, we are, in fact, trying to connect the cultural, well-established needs of users to the new emerging requirements and disrupting capabilities of new technologies. In such a complex system, driving still remains the main action and new technologies are working on the one hand to support and promote driver "empowerment" and, on the other hand, to try to make the car smart, fully automatic and able to drive itself. However, it is necessary to rethink the car as one of the pieces that create the mobility system.

In this way, digital technology becomes the means to connect and to create active communication between the different stakeholders, services and infrastructure; the innovative interfaces inside the car will not stand alone but they will rather be transportable even on devices that we wear every day, generating new digital products and services.

If, up to now, our discussions have suggested that cars should communicate like a personal computer or, better still, like a web page, it is now easy to see that a car should speak the same language as smartphones and vice versa. This scenario does not seem to be far away and experimentation both by car manufacturers and app developers is proliferating; our research, however, tries to imagine new tools and new interfaces.

Every object, including an architecture or, better yet, the human body, can become a projection surface and an interface, or it can contain and transmit information to other surrounding objects by increasing our capacity to perceive and communicate. Intelligent textiles, for example, can transform any object, including our clothes, into an interface.

Therefore, the aim of the research is not the application of technologies already present in aviation, such as the Head-Up Display, within the automotive field, but rather to design a system that will be integrated with the surrounding environment, a system in which humans can enjoy and interact with visual, sound and tactile information in a natural, satisfactory way.

The research tries to answer many questions, for example, in relation to the current trend toward replacing all hard controls present in the car tunnel with a touch-screen interface. However, to interact with the different menus, drivers would be forced to divert their attention away from the road and move one hand off the wheel to the panel every time they want to communicate a command to the system. The introduction of new technology is not a mistake in itself, but it may produce errors if it omits some crucial aspects connected to usability.

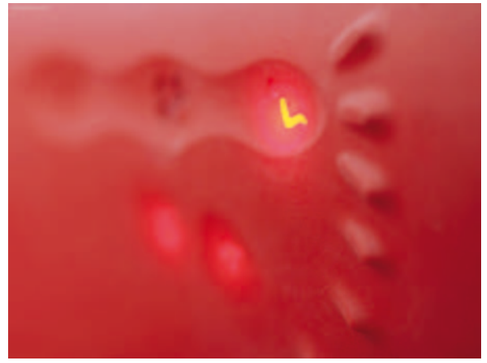
"Every object, including an architecture or, better yet, the human body, can become a projection surface and an interface"

The old and obsolete knobs can be replaced, of course, but we should keep in mind how easy interaction was: the driver knew what position every component occupied, because he learned and stored these pieces of information, and thanks to physical limits it was easy to understand the knobs.

In this case, perhaps the use of smart textiles and materials capable of communicating with different textures the functioning of components, or the use of natural feedbacks, such as heat or cold, communicated from a metal material rather than stone, could easily substitute air-conditioning adjustment knobs. Car manufacturers are following another trend in their new concepts, which is inserting an overload of social applications and infotainment inside the car.

The same companies, however, perceive this as a risk, because turning the car into an app would move it too far from its core business, and the product added value would shift from the pleasure and comfort of driving, something we can see in any advertising campaign, to a dematerialized object. In this case, however, the car would not be denied or put in the background, but rather related to a wide range of other digital products and services characterized by a new user experience. In the face of a new product or service, we continue to extend the possibility of "doing something new". It is necessary to realize that the objects we are most fond of are the ones which allow us to develop a ritual, then to address the concept of "how". Genuine digital natives, the children who started to play with an iPod at three years of age, will find it hard to understand the beauty of a huge cardboard sleeve (315 × 315 mm) containing a peculiar kind of magic circle which was extracted and carefully placed on another rotating circle, followed by the application of a small needle, with a light, precise touch, looking forward to hear that characteristic crackling noise for a few, seemingly endless seconds.

There was no play or pause button, and it was not possible to skip even one second. Waiting was part of the rite. Similarly, for this generation, it will be difficult to explain to their children how extraordinary it was to have tons of music inside a tiny, portable square, as small as a little piece of chocolate. Every generation has a physical, emotional and affective object, even if contents may be dematerialized or not even present inside the object.



▲ The Citroën C-Airplay is a concept car presented by Citroën in December 2005 at the Bologna Motor Show
◀ Citroen C-Airplay Concept (Interior), 2005

Digital technology can transform well-established rituals, like the pleasure of driving, through its innovative potential, such as identifying in real time what the future developments of the current situation could be. We would then transition from a car that is capable of emitting signals through feedback to a smart car, able to advise and assist the driver through feedforward. This scope has yet to overcome some serious problems in technological development, despite the high computing power achieved, for example, by nomadic devices. How-

ever this really may be the trump card of digital control stations: the ability to predict behaviours, report them, and therefore anticipate or modify user actions. This perspective foresees complete automation; cars would be able to decide the safest action to take, but the way of reporting it to the driver is still an open field of discussion. Sound and visual languages will have to intervene to warn, advise and reassure users, relying on disciplines such as cognitive ergonomics and Human Factors.

The expected results of the research are manifold since they include: the study of how to reorganize the interior of the car and, as a result, an analysis of intervention/interaction/control areas for the driver or passengers, or both; the study of innovative technological interfaces that allow the car and its systems to be driven and controlled in a more "natural" way; the introduction of nomadic devices, such as a key component that enhances vehicle communication skills to predict and warn the driver about the vehicle status and travelling context in a feed-forward mode; and, finally, the creation of visual languages that will make it all possible. In particular, the contribution of digital visual languages will focus, in our opinion, on giving greater flexibility of style according to the different needs of the vehicle's occupants. Currently, cars are customizable by manufacturers only in relation to colours, materials and accessories,; in the near future, we will also be able to choose what visual language they should speak. It will be possible to design a city car as a sports car or a family car, or to transform it into a mobile, hyper-connected office, or to combine "eco" and hyper-technological needs by choosing and changing styles which have been specially created

"Digital technology can transform well-established rituals, like the pleasure of driving, through its innovative potential"

not only by the manufacturer but also by the network, on the basis of patterns and guidelines that protect safety aspects and regulations, just as it happens today in apps development.

This is not a simple restyling operation, aiming to change a few details inside the dashboard while leaving the outer shell unchanged; it instead aims to innovate the entire process of communication between human being, vehicle and the surrounding context, which can and will also affect the exterior architecture and the physical and virtual support infrastructures within the field.