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## **RESEARCH ON THE EVOLUTION OF AUTOMOTIVE INTERIOR AS A LIVING SPACE: DRIVE-BY-WIRE TECHNOLOGY AND NEW SPATIAL SOLUTIONS**

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ABSTRACT - A complexity of cultural and socio-economic concerns has gradually diminished the pioneering spirit of democratic mobility first introduced by the motorcar a century ago, with the average speed on today's congested road networks barely surpassing that of walking pace. As we are less enthralled by the car and more entrapped by it, our attention has turned inwards, the design attempt being to duplicate the feeling of our static dwelling place, the home. Nothing could be more substantiating of this statement than the rise of the Multi Purpose Vehicle (MPV) in the nineties.

Even if predominantly present in the last 15 years, the MPV can hardly be considered a new concept. Its streamlined, aerodynamic monovolume (single-box) form can be traced back to Alfa Romeo di Castagna of 1913, Norman Bel Geddes's teardrop-inspired vehicles of the 20s and Buckminster Fuller's Dymaxion cars of the 30s, while the concept of the so-called *voitures à vivre* can well be found much earlier than the pioneering Renault Espace production car, in the 1949 VW camper van, the folding back-seat of the 1965 Renault 16 or in more conceptual microcosmic "living-rooms" on wheels, like Mario Bellini's 1972 Kar-a-sutra.

This conference paper, part of an extended PhD research on social issues in car design, attempts an in-depth investigation on the evolution of the automotive interior as a living space. Starting from flexible seating configuration systems, multi purpose storage spaces, retractable tables with cupholders, and moving to sophisticated on-board multimedia systems incorporating GPS, DVD and internet access, the concept of automotive interior livability has developed to now face a forthcoming revolution with latest drive-by-wire technology eliminating design constraints imposed by conventional driver controls and creating a whole new interface between man/machine, as well as new spatial solutions for the interior.

MAIN SECTION - One could hardly underestimate the fact that car is much more than merely a means of transportation; it is a locus of intense emotional activity. Within its confines lives are lived. It can offer isolation from telephone, kids and colleagues; thus being the only place many of us find ourselves alone. Distinct from the rest of the world, it is a place where personal conversations can take place freely, a place where dreams are imagined and plans are hatched. With most of these attributes being typical of home life, it is no surprise that domestic space is the major paradigm for the design of car interiors. Taken into account that even when at home, we are not entirely relaxed or able to achieve privacy, it seems that only inside a vehicle we can feel secure and free to be ourselves.

The potency of car interior as well as all it evokes, has often inspired artists to explore its psychological and physical aspects. As early as 1917, Henri Matisse, entranced by this mobile, glass-enclosed space, painted *The Windshield (Road to Villacoublay)*, a piece of work

in which he posits the complex nature of this particular space. “For Matisse, car interior is a place of contemplation and creation, a private place offering protection from, yet allowing mastery of, the exterior world. The windshield, this delicate membrane between two distinct realities – inside and outside the vehicle, organizes the world into discrete, manageable segments. Through this literal lens, the artist focuses on his view: vast fields, water and the endless road. Occupying the driver’s seat as his surrogate in the painting, a canvas in progress rests against the steering wheel. For Matisse, the car interior is the domain of the artist” (1).

In 1951, Pablo Picasso takes the idea of the car interior as an expression of self even further. By adopting the form of a toy automobile for the head of a monkey in his sculpture *La guenon et son petit*, the car interior emerges as an analog of the self, a site of psychic activity and expression. If we accept the fact that car interior, although bland and anonymous, can be a deeply personal space, questions arise on its privacy.

### Private or public space?

Any kind of inhabitable construction, whether static or mobile, is a physical boundary between private and public space. Glass comes as a means to allow visual contact inside out when desired. While degree of privatization is adjusted in case of houses, not the same applies for other inhabitable places. Car interior is neither an exclusively private, nor a public space. Under normal circumstances, drivers and passengers of different cars can see each other, far more in the case of urban commuting when they move next to each other.



Figure 1

Art historian Pierre Schneider, in his discussion of Matisse’s *Windshield*, connects the artist’s fascination with the car to his delight with goldfish in glass bowls. “In our cars we become goldfish: protected, unaware, disengage. We behave as though we were in seclusion. By literally turning the car inside out (figure 1), artist Dan Devine expresses this paradox: what is experienced as private can be exposed. We are uncomfortable when our eyes meet those of passengers travelling in the next lane; children are surprised when their waves are returned ... The character of car interior is both dual and contradictory. The privacy it offers is both real and compromised”(2).

Within this complex phenomenon, role of glass seems to exceed the paradox of a material that becomes invisible or reflective according to the viewpoint, permeable to light but impermeable to air, water, noise or energy. Apart from being a selective membrane, which both is and is not a limit, glass defines a sociology of space, in the sense that transparency between private and public space may patronize or discourage models of social behaviour. Relevant research (3) has shown that, while visual isolation behind tinted glass may serve unacceptable actions, transparency as a way to un-privatize car interior leads to more socially conscious driver profiles. Certain paradigms of car design concepts incorporating solid and aggressive styling cues with limited glazing, may be considered to express socio-cultural trends of uncertainty, defence or fear towards a future that “is no more what it used to be” –to quote French poet’s Paul Valéry famous words.

### Historical Overview

From the early automobiles, recalling images of horseless carriages and sharing the symbolisms of the carriage world, up to the ultra-modern Multi Purpose Vehicles focused on

the quality of our travel time, car interiors have undergone vast changes. Starting from the automobile that was partly covered by a folding canvas top, industry took a long time before creating the first closed car. That was undoubtedly a major landmark in the history of auto interiors.

As Harley Earl was bringing styling from Hollywood to Detroit, dashboard started to appear as something more than the interface with a mechanism; it became a visible symbol of car's quality and technology. Therefore, while wood was -and still is- signalling luxury due to the persistence of the carriage legacy, fancy glowing instrument panels were employed to create a high-tech atmosphere. That was the start of a long battle between two conflicting metaphors to rule the design of auto interiors. The first one, conceived the automobile as a rolling living room and was largely applied to luxury and sedan cars, while the other considered it more of an aircraft cockpit and was applied to sports cars.

The notion of the self-contained parlor was epitomized in the famous Rolls-Royce advertisement that boasted "at 60 mph the loudest noise is the ticking of the clock"(4). While also typical was industrial designer's Henry Dreyfus comment that "seats in most automobiles were superior ergonomically and in engineering to those in the average home". With the introduction of mechanically adjustable seats in the 1950s, interior design entered the era of custom personalization that gradually led to flexible seating systems incorporated in modern cars. At the same time, electronic gadgetry starting from the car radio pioneered by Motorola in the 30s, expanded to include cutting-edge technology systems aiming at passenger's comfort and entertainment.

As car interior is increasingly penetrated by the outside world through cell phones, e-mail, mapping devices, temperature and more, and as our ability to personalize it also increases, its distinctive character recedes. It blends with the spaces of the office, waiting room and living room.

In this paper, part of a PhD researching social issues of automotive design and styling, we attempt an in-depth investigation on the evolution of auto interior as a living space, considering social, psychological and even phenomenological issues that led to new typologies of this particular space.

## THE BIRTH OF THE MPV

As early as the beginning of the 20<sup>th</sup> century, the motorcar introduced the idea of democratic mobility: since you had a car you were a free person, able to go wherever you wanted. A complexity of cultural and socio-economic concerns has gradually diminished that pioneering spirit, with the average speed on today's congested road networks barely surpassing that of walking pace. As we are less enthralled by the car and more entrapped by it, our attention -as well as that of the designer- has turned inwards. Taken into account the time we everyday spend in the car, the design attempt has become to duplicate the feeling of our static dwelling place, the home. Nothing could be more substantiating of this statement than the rise of the Multi Purpose Vehicle (MPV) in the nineties.

Modern MPVs are no less than microcosmic living rooms, as functional and comfortable as the domestic spaces they tend to duplicate. However, apart from offering the sense of well-being in a habitable space, the MPV idea seems to have achieved something much more important. It re-empowered drivers that had gradually lost control of the external

environment, to regain control – this time on the inside.

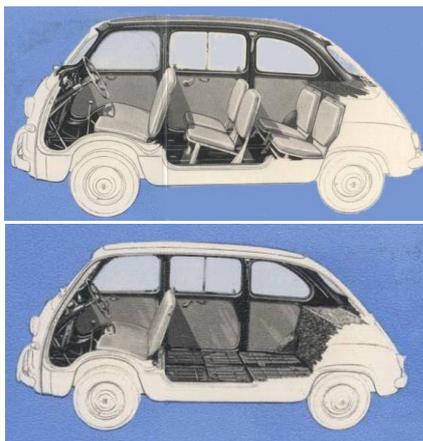
“If a car can be the symbol of an era, then the Multi Purpose Vehicle is the 1990s psyche objectified”, mentions Heather Buttock in his article “Bring your own space”, included in Jonathan Bell’s “Carchitecture”. Indeed, the MPV assimilates all the fixations of the pre-millennial age: safety, control, individuality, celebrity and leisure. However dominant in the last 15 years or so, the MPV is not a new concept. Its single-box, aerodynamic form can be traced back to Alfa Romeo di Castagna of 1913, Norman Bel Geddes’s teardrop-shaped vehicles of the 20s and Buckminster Fuller’s Dymaxion cars of the 30s. While the ‘People Carrier’ idea is also found in the 1949 VW Camper Van or the 1956 Fiat 600 Multipla.



**Figure 2**

more, society was first to define the needs around which, vehicles had to be made and used.

Camper Van (figure 2) was a minibus, able to carry up to 9 people in 3 row of bench seats. Despite the lack of any advanced flexible systems able to change the interior according to needs, the minivan idea soon grown to a cult icon, mainly thanks to the social trends of the 60s and 70s. Though not by intention, the Camper Van became strongly associated with the hippie universe, as a whole generation –the Woodstock generation- recognized in its practical package the ideal shell for their communal living. For once



**Figure 3**

The Fiat 600 Multipla launched in 1956 as a cheap, ultra-compact people carrier. Despite its compact dimensions (wheelbase: 2,00m), it had a seating ability of six passengers in three rows of two seats (figure 3). As contemporary brochures of the automobile reveal, promotion was based upon the concept of a versatile interior incorporating folding seats on the middle and back rows, ideal to transport –as relative photos portrayed– 3 couples of users to a picturesque scenery for a picnic. Alternatively, a 4-seat version was also available, featuring two bench seats in the front and middle row, thus leaving the luggage space free.

### Voiture Minimum

Bearing in mind architects’ education as well as their intuitive approach towards functional solutions, it was no surprise to trace the first approaches of car interior as a livable space in the designs of architects, rather than those of mere car stylists or engineers.

Within the automotive history, there are no few examples of cars designed by architects. Sometimes mass-produced, but more commonly prototype (concept) cars, such examples are characterized by a holistic design approach, often functionally orientated. Among these, a strong place holds the Voiture Minimum (sometimes termed “maximum”), designed between 1928 and 1936 by Le Corbusier and Charles-Edouard Jeanneret and submitted to a competition held by the Société des Ingénieurs de l’ Automobile (SIA) in 1935 (5).

Quite different from the accepted idea of the moment, Voiture Minimum was a rear-engined

car with aerodynamic form and great interior comfort. Authors themselves comment (6): “the main aim was to assure the maximum comfort for the passengers; the mechanical and structural characteristics must yield to this fundamental requirement”. As Penny Sparke points out (7): “the body, like the shell of one of Le Corbusier’s buildings, was more a result of the inner requirements than an exercise in styling. It served to show the extent to which architectural thinking could provide an alternative route into car design to that of the stylist”.

Indeed, despite the two-dimensional styling and the superficial engineering approach, which shows no real understanding of essential car mechanics and structure, Le Corbusier’s Voiture indicates a rather revolutionary interior layout. Within a short and wide body shell, three seats were arranged in the front, with a fourth one placed transversally in the middle. The rear section was used for luggage, a spare tyre and the engine, allowing the best possible use of interior space. The importance of the ‘livability’ factor in Le Corbusier’s design is quite evident in the possibility for the seats to be arranged into sleeping couchettes, with no interference with the luggage space.

Beyond any formal similarities with the later presented VW Beetle, and the detachable fabric roof which is said to be carried over to the Citroen 2CV, Voiture Minimum holds a significant place in the automotive history, being the first attempt to recognize car interior as an inhabitable space. Its original three-seat linear arrangement would only retrieve after 1966 in paradigms such as the off-line Ferrari 365 P, the 1970 Matrá Simca Bagheera, recent niche sport models and the 1996 MPV Fiat Multipla. While, spatial solutions allowing alternative human on-board activity (like the Minimum sleeping couchettes) would only later re-introduced, giving birth to the so-called typology of voitures a vivre.

#### Renault 16 – The first “voiture à vivre”

Modern, functional and modular, the Renault 16, launched in 1965, was the precursor of what would later become Renault’s “voitures à vivre” (*cars to live in*) – Espace in 1984 and Twingo in 1992. Indeed, 16 was the first mass-produced car with special considerations boosting interior practicality.



Figure 4

Following sociological observations concerning the increase in buying power and leisure time in the 1950s, as well as the spread of supermarkets that created new consumer demands, Renault decided to launch a model in the upper-medium range that would combine the elegance of a saloon with the convenience of an estate (8). The outcome of this effort was the 16: a car that apart from all its technical innovations, was revolutionary in terms of practicality. This early crossover concept of top-range vehicle and practical family car, incorporated a highly original body style, a two-box hatchback shape featuring –for the first time in car history- a “fifth door” allowing easy access to the luggage area (figure 4). Interior versatility was further enhanced by the movable (sliding and reclining) rear seat, capable of creating seven different interior layouts according to needs. The introduction of this flexibility, synonymous to a moving inhabitable space far from car interior stereotypes, prompt the “Architecture d’aujourd’hui” magazine to compare the car to an apartment with mobile partitions.

Perfectly in tune with contemporary social trends, Renault 16 became a huge commercial

success, produced in over 1.8 million units between 1965 and 1980, and managed to earn itself the title of the very first “voiture à vivre”, in a sense of a multi-purpose saloon.

### Kar’ a Sutra – A nomadic human space

No other concept in the automotive history is more dedicated to the livability of the car interior than Mario Bellini’s Kar’ a Sutra. Presented in the historic exhibit entitled “Italy: the new domestic landscape” and held at MOMA in 1972, the biting and provocative Kara-a-sutra was designed within the context of the event’s imposed theme of future domestic spaces. With this prototype, Bellini intended to shift attention from the traditional domestic environment to that of a private means of transportation, to address the issue of the quality of urban living, afflicted by the mass presence and forced usage of the automobile.

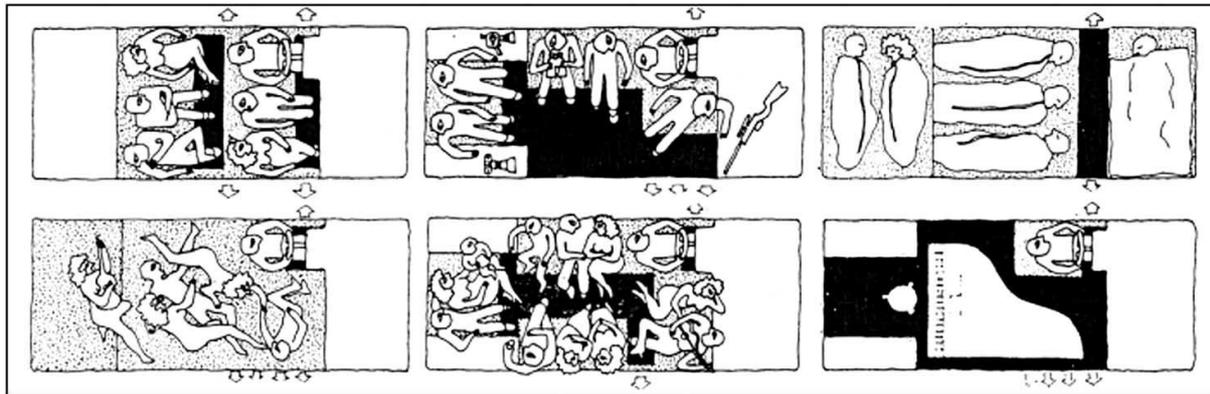


Figure 5

Based upon a systematic and playful analysis of the various activities that could be carried out within the limited spaces of a car (talking, smoking, listening to the radio, etc.), Bellini rethought the relationship between man and car to suggest the end of the traditional automobile interior in favour of a more “human” and less “car-ish” space (figure 5). Furthermore, he attempted to move away from the model of the mobile home (camper, etc.), viewed as a grotesque miniaturization of the vacation home. Instead, he created the prototype for a new vehicle within which it would be possible to carry out activities that could be completed from a comfortable sitting position. Such activities involved face-to-face conversation, standing, playing cards, lying down to sleep or even altering one’s sitting position – facing forward, backward or sideways. In short, he aimed at creating a travel space that would best meet man’s needs.

Although Bellini’s prototype was no bigger than a regular sedan, it had a much more functional interior that could seat up to twelve people without luggage (or in any case, more people than usual even with baggage). This was made possible by a totally mobile set of equipment. Conceived like a living room, the car’s interior contained cushions that made it possible for passengers to relax, reflecting the aims of the 70’s domestic living style. Key elements of the car’s interior, these pillows could be “modeled” to meet specific needs or preferences, favoring the notion of a “sculptural” area that could be infinitely rearranged.

The concept of the flexible seating system was reminiscent of the chairs and armchairs that Bellini had already been creating for B&B Italia and Cassina, (who also manufactured the interior of the Kar-a-sutra prototype). While, the project’s emphasis on the livability and interior performance was counterpoised with an almost non-existent outline of the exterior. Kar’ a Sutra, which expected to be the product of a collaboration between Bellini, Renault



**Figure 6:** Mario Bellini's 1972 Kar' a Sutra versus Renault Espace, launched in 1984.

and Fiat, won Bellini a post of design consultant in Renault. Despite the lack of references on Kar' a Sutra in the Espace history (in both bibliography and periodicals), the obvious similarities in terms of interior flexibility and one-box exterior styling, favour conceptions of Kar' a Sutra as a progenitor of Renault Espace, 12 years later (figure 6).

### Renault Espace – A monospace MPV (Multi Purpose Vehicle)

However innovative was Kar' a Sutra as a concept, it was no other than Renault with Espace that gave birth to the mass-produced Multi Purpose Vehicle.

First conceived by Matra and the stylist Antoine Volanis, to be developed and finally produced in collaboration with Renault, Espace was the first saloon car to introduce a totally new conception of the passenger compartment. Volume and cabin space functionality came from the idea already applied to the experimental Toyota MP-1 of 1975, developed by Giugiaro in the Megagamma (1978) and produced by Mitsubishi in the Super Space Wagon and Nissan in the Prairie (both in 1982): four cars however, that maintained a two-volume exterior architecture.

Quite alike, Espace was the first to follow a single-box design. Never before, with the exception of Fiat Multipla 600 by Dante Giagosa, had a firm put such a car on the market that was not a commercial vehicle.



**Fig. 7 -** Above: 8 possible seating configurations. Right: Swivelling front seats and folding middle ones create a living room atmosphere.

Within a body shell of unusual exterior dimensions (4.30m long, 1.77 wide and 1.66 high), Espace could accommodate up to seven people in three rows of seats (2+3+2). The front seats were of "monotrack" construction, with built-in fastening so as to leave the bottom of the car free, and rotate facing backwards to the passengers occupying the middle and the back seats

(figure 7). Additionally, the middle seats were removable and could have their backs folded all the way down to form a horizontal plane that could be used as a table. This original flexible seating system was a worldwide first, that opened new horizons to the use of car interior space, allowing up to eight alternative seating configurations. Car interior was now more than ever a living space, able to accommodate many more activities than mere driving: socializing, eating, sleeping, playing.

In their attempt to re-invent the car interior, Renault designers had to work with features redolent of the utility vehicle, such as a nearly vertical rear hatch, steeply inclined front, above average vehicle height and a one-box design. However, they finally managed to avoid any connotations with commercial vehicles, and introduce a revolutionary alternative to the family saloon. Espace became “a car that was more relaxed, more practical, which you could put the surfboards in to go to the beach, or the bicycles in to go to the country. A vehicle which, quite simply, was an alternative form of car”(9).

With Espace, “recalling the comfortable carriages meant for long journeys of the XIX century”(10), Renault re-defined the term “people’s car” and launched the first campaign on the theme of “voitures à vivre”. As Serge Bellu wrote in his book on the Espace(11): “The car had grown controversial. It had become dominating, dangerous and profligate, but now, all of a sudden, it was on the side of people again”.

#### Renault Twingo – The livability concept down the range

The success of the Espace, soon moved Renault’s MPV (Multi Purpose vehicle) concept down range, with the introduction of a single-box car design in the small segment: the Twingo. However, it was not the monovolume architecture that was the new feature. According to the vice-president and director of Design Industriel Renault Patrick Le Quément: “What was new, were the features which the Twingo could offer because of its structure: a seat layout which gave rear passengers as much space as they would have in a Safrane, enough load-carrying capacity to transport a chest of drawers, a new instrument-panel layout and an innovative overall sense of style”(12).

Indeed, the monospace construction, allowed the size of the engine compartment to be kept to a minimum and thereby increased the interior volume by a proportionate amount to achieve an outstanding overall to interior volume ratio. Additionally, a modular seating system was incorporated as a strong point of the Twingo’s functional flexibility. Thanks to a rear bench



Figure 8

seat that could both fold and slide, different adjustments could be made in favour of either boot capacity or interior roominess, offering a useful interior length of up to 1.780mm. The back of the front seats could tilt all the way back to align with the rear seats in a form of a double bed. A feature which, combined with the soft-top version available, gave birth to the commercial classic of a couple laying under the stars (figure 8). It was an original conception of the passenger space, appealing to the needs of modern people. The same radical spirit conditioned the design of the dashboard itself. Centrally positioned controls were fresh and colourful (with clear influences from the Benetton fashion colours) to accentuate the fun atmosphere of the cabin.

Thanks to its front clusters, styled to resemble “eyes” and “eyelids”, Twingo gained a cheery “expression” to become a person-product. While, the great deal of attention paid to interior colours and trim as well as the modular seating, made it the first car-companion in our everyday mobility needs.

### Renault Scénic

It was to be expected that the idea would soon be adopted to the middle range. Indeed, Scénic was the third member in Renault’s single-box family. It started its life as a concept car presented in the 1991 Frankfurt show, as a follow up to the launch of the Twingo. Behind the design and development of the project was –for the first time- a powerful female presence, predominant and decisive for the practical and stylish profile of the vehicle.

Compared to the Espace, Scénic was shorter (4.15m), wider (1.85) and taller (1.85). With a name standing for Safety Concept Embodied in a New Innovative Car (Scénic), it featured double floored safety architecture, similar to that used in the Mercedes A-class some years later. Its modular interior offered 5 individual multi-adjustable seats (2+3), named after the five continents and personalized with colours and graphics evoking Africa, Asia, Australia, America and Europe. Being primarily a car for traveling, it responded to the concerns of the family car buyer who likes to drive something different and who was seduced by the idea of the “cocoon” car. Re-interpreting the term “family car” in a more powerful and modern sense, it intended to the family where a child is an equally effective member, and to whom travel appears more important than destination itself.

Or as Patrick Le Quément put it in a relative interview(13): “the big difference is that the travelling time from one point to another is life, time to live. You enjoy the journey as if it were part of your life. The Scénic’s “Invitation to the Journey” is an invitation to experience the car ride as something enjoyable rather than considering it a waste of time”.

Scénic found its way to production, in 1997, based on the Mégane platform to introduce the first MPV version in the C segment. The path opened up by the Renault “voitures à vivre” range, would not cease to widen anymore. In the years to follow, manufacturers, one after the other adopted the idea of MPV alternatives in almost all segments (Fiat Idea & Multipla, Opel Meriva & Zafira, Ford Fusion & Focus C-Max, Toyota Yaris Verso & Corolla Verso, etc).

Most followers recreated the standard 2+3 interior package, enriched by a third row of 2 seats in special longer versions (Zafira, Grand Scénic). Exceptional is the example of the 1996 Fiat Multipla.

### Fiat Multipla

Off-spring of the 1956 Fiat 600 Multipla already mentioned, the new Multipla introduced an exceptionally original interior package, seating 6 passengers in two rows of three, within an overall length of just under 4 metres. The front-centre seat, placed slightly back to form a V-pattern, provided three-person, side-by-side seating without excessive vehicle width. The dashboard incorporated a centrally placed control panel and dash-mounted gear lever. Most controls were in a visual disorder rather than in typical linear position, recalling functional customizations of our desk area. The innovative spatial solutions on the inside were reflected in a rather unconventional design of the outside, with vast glass surfaces, almost vertical side windows and an ultra-low waistline dividing the car body in two volumes, one upon the other.

Said to be inspired by the *Bialetti* espresso coffee machine, the exterior profile was too novel to prove commercially successful, recently forcing Fiat to restyle it in a single-box form, similar to that of the *Idea*. Despite the public reservation, one could hardly deny Multipla's unique reinterpretation of the car interior: feature enough on its own to win the Multipla a significant place among the mere imitators of the Renault spirit.

## CARS GROWING TALLER AND TALLER

However dominant the case study of Renault is in the evolution of the car interior as a living space, it is not the only one. Starting from Giorgetto Giugiaro's studies and followed by a number of car companies, the 1980s saw a rise of the "taller" car.

The major concern in car aerodynamics, forced up by the 1970s energy crisis, had gradually decreased overall height of the car, in favour of smaller frontal areas and consequent less wind resistance. With most "aero" models suffering problems of difficult ingress/egress and limited interior volume, car industry soon seek a solution in the direction of increasing the overall height of their cars. By adopting a more vertical seating position, passengers would occupy less space in length, with obvious advantages in terms of interior roominess and livability. The pioneer spirit of paradigms like the 1980 Fiat Panda and the 1982 Uno (both designed by Giugiaro's Italdesign), opened new horizons in car design history, drawing attention inwards and creating a whole new set of proportions on the outside. Even if never promoted as a totally new car typology, such cars led the way to more friendly, roomy and livable interiors.

Giorgetto Giugiaro in his argumentative as well as prophetic article "Shorter cars for next century"<sup>(14)</sup> points out the advantages of increased interior height, which finally made car manufacturers grow their cars taller by an average of 15-20cm in the last twenty years or so. With no impressively radical changes in proportions, makers gradually adopted the design trend for higher profiles. Even traditionally conservative makers, like Mercedes, where recently found entering this design area, notably by paradigms such as the revolutionary A-class, or through the increased height dimensions of more conventional saloon typologies.

## FROM GLOVE-BOX TO MODERN PIECES OF CAR FURNITURE

The evolution of car interiors, has often been co-featured with smart functional solutions. Note the sliding ashtray of the first generation Uno or the multi-functional rear bench seat of the Fiat Panda, folding into a cot. Apart from seating arrangement and the use of space itself, design started to explore a series of practical gadgets to enrich interior functionality.

The glove compartment (glove-box), so old as its own name taken from the gloves used by the first motorists to protect their hands from road vibrations onto the steering wheel, was coupled with alternative storage containers, both on the dashboard and the door panels. Today, a cornucopia of storage areas and creative interior details reflect modern car's aspiration to create what Buckminster Fuller referred to as the "broken off part of the house": built-in child seats, medical kits, detachable handbags on side panels and seat-backs, coin holders, open storage in central consoles, drawers under the seats (and in some cases under the floor), door pockets, 1.5 litre bottle holders, rubbish trays, 12 volt sockets, retractable tables with cup holders, pen holders, nets in the boot area and cover for the rear luggage.

Practical solutions that enhance the livability of the passenger compartment, led to the

evolution of a new automotive culture that recognizes the car not only as a utilitarian tool but also as a piece of urban furniture and lifestyle accessory. Starting from the stylish colour and trim touches in the Twingo interior, and moving onto the toy-like controls of the MCC Smart, car industry experiences a crossover move into the world of product and architectural design. Typical example is the Ford 021C, designed by product designer Marc Newson. Finished in a bright orange or green colour inside-out, it paraded in numerous fashion magazines and furniture exhibitions to propose an alternative theme on car culture. The interior, produced in conjunction with furniture manufacturers B&B Italia, incorporates hi-tech gadgetry in the form of everyday objects like wristwatches and chronographs, while the practical drawer-like boot, containing a set of Prada-designed fitted suitcases, directly refers to home-based storage furniture.

Late years also saw the rise of sophisticated on-board multimedia systems incorporating GPS, DVD players, internet access, or even playstations, aiming to driver navigation or passenger entertainment. At the same time, various research prototypes deal with the concept of car interior as a working space. With modern people spending a considerable amount of time entrapped in traffic congestions and given the possibility of office work carried out online, vehicle interiors may effectively provide a micro office environment. Therefore, while cars like the 1998 Renault Vel Satis concept car, or the 2003 Mercedes F50 offer built-in laptops, other concepts adopt computer technology to provide more integrated solutions. Notable is the example of Ford 24/7 or Daewoo Flex, both featuring dashboards in the form of displays, where projected graphics that can be customized according to entertainment, driving or working needs.

## MODERN INTERPRETATIONS OF THE MPV

### Nissan Chappo – A living-room on wheels

Nissan Chappo is a tall, compact, asymmetrical, two-box city car that, apart from its uniquely innovative exterior, attempts a new approach to interior space. The concept was designed in anticipation of a future generation of young, sophisticated, city-car users who want their car to be more than a means of transport. A generation for which the car has also become a social space for people to gather: their mobile space. Indeed, Chappo was developed around the concept of a 'living-room on wheels': a place for one person to relax in calm surroundings, to meet with friends, to work, to enjoy music or videos, to surf the web or even play interactive games.



**Figure 9**

the sea or the river, maybe in the mountains.

The design was based on the idea of a house over-looking a Zen garden, where this garden can be anything from an urban cityscape to a beautiful bay. According to head of design Shiro Nakamura: "The car is designed to reflect the fact that across the world, youth demands increasingly personal and diverse solutions to lifestyle and recreational needs". The Chappo offers its users the opportunity to move their room, with its comfort and features, wherever they want to go whether that is near a city park, in a garden, by

The prototype features a dual-entry door that opens both ways to allow easy ingress and egress for all possible configurations of the versatile interior (figure 9). While, the ingenious L-shaped seating, creates a social space in the middle and is coupled by a similarly shaped

glass roof. Additionally, the steering wheel can be put flush with the dashboard when not in use.

Beyond being a comfortable and stylish place to meet and enjoy the view, Chappo offers many technical and practical features. Among these are the two information screens, a 7-inch monitor that pops up from the centre console, and a 15-inch monitor which folds down from the front passenger area ceiling. The 7-inch monitor is user-information orientated. It uses a combination of steering wheel thumb control and touch-screen operation, while it is also GPS-linked for full interactivity. Its functions include satellite navigation, air-conditioning, music-system controls, and practical information. The 15-inch screen comes with a laptop type keyboard, to offer a huge range of further options found in almost any home or office based rival. Those may include TV, DVD movies, games, internet access, working and link-up options.

### Isuzu Zen

The design theme of Nissan Chappo shows clear signs of its Japanese national identity interpreted in a futuristic way. It reiterates themes of a traditional tearoom and incorporates styling cues inspired by Japan's typical tatami texture and circular windows.

Similar aspects of Japanese philosophy and culture are reflected -as the name itself implies- in one more concept car: Isuzu Zen. According to Isuzu, the major design themes for the ZEN are Japan's ancient essence of harmony and interior volume enclosed by geometric lines that echo modern architecture.

Zen has been designed from the inside out, around a multi-purpose flexible interior, made of natural materials typical of traditional Japanese architecture: wood, bamboo and straw matting. All four individual seats fold down in a most unusual fashion. The front seats stow away so that to cover the dashboard while the rear seats disappear into the floor to leave a large unified interior space. Thus, the cabin is instantly converted into a "room mode".

The best use of this room can only be limited by imagination. Chief designer of Isuzu Motors Europe, Geoffrey Gardiner makes some scenarios according to individual personal needs and desires (15): "In Europe, ZEN could serve as a mobile artist's studio or gallery. In Japan, where many adults are forced to live with their parents by necessity, ZEN becomes a private place for meditation, relaxation or weekend rendezvous. In America, ZEN might serve as a plumber's van by day and a rolling sushi bar by night, complete with karaoke".

Apart from investigating car interior as a domestic space, Isuzu Zen attempts to redefine Japanese national identity, based upon cultural rather than merely formal aspects.

### Sport cars featuring a 3-seat interior architecture

Although interior livability has never been a key factor in sport cars market, it seems that generalized interest upon this aspect has not left the design of such models uninfluenced. Therefore, apart from conventional 2 and 2+2 seating configurations, appeared sport cars featuring a 3-seat interior architecture, like the above mentioned off-line Ferrari 365 P and the 1970 Matrá Simca Bagheera.

The street version of MacLaren F1, also adopts a 3-seat configuration, with the driver placed

in a slightly-forward central position. Despite the obvious advantages of this approach in terms of driver's perception of space and vehicle's edges, this position seems inappropriate for everyday drive, where visual contact with the left edge of the car is crucial when overtaking. Based upon this issue, a design project (16) carried out in 1995 by the author, proposes an alternative 3-seat interior architecture for a sport car based on the mechanicals of Alfa Romeo GTV.



**Figure 10**

Here (figure 10), the conventional 2+2 interior architecture of Alfa GTV, is replaced by an innovative arrangement of three normal seats, similar the one adopted by Fiat Multipla one year later (1996). The third passenger is placed centrally and slightly back with his feet in between the front two seats. This position (beloved by children in the back seat of family cars) creates an impression of spaciousness, provides good visibility and emotional involvement to the act (or... art) of driving. The arrangement of three seats is possible within an overall width of 1.80-1.84m as the space needed between the two front seats for the rear passenger's feet, is comparatively less than the width of his shoulders.

Specially designed stylish suitcases (featuring the logo of Alfa Romeo) can be fixed (with clips for safety reasons) on either side of the rear seat, overcoming the problem of limited boot capacity.

This particular interior architecture is advantageous to the one with the driver placed middle-forward (e.g. McLaren f1 3seater) for three main reasons. First, it is more sociable, allowing a better contact between driver and passengers: element of importance in a GT rather than a race car. Second, it allows easier ingress and egress of the driver, who evidently is the most frequent user of the car, and third, it allows a trapezoid glass canopy and roof (tapering to the rear) in favour of aerodynamics.

Livability of the interior is further enhanced by the logo-referential symmetrical dashboard that allows flexibility through numerous functional conversions. Information and driving equipment are all housed in a binnacle that can be assembled in a cavity on either side of the dashboard, leaving the co-driver side free to accommodate a reversed baby-seat, a folding shelf or even a retractable handbag.

This mostly livable interior package differentiates the car from its competitors and extends the consumer target group to include families of up to three members. While compatibility with shorter wheelbases, makes it ideal for the lately popular small coupé segment.

## ADVANCED TECHNOLOGIES AND NEW SPATIAL SOLUTIONS

Despite the work has been done so far in the field of interior design and design research, there still exist engineering constraints imposed on position of certain controls. The necessity of fixed pedals and steering column on the driver seat has established some interior layout stereotypes, mainly regarding the dashboard and the driver and co-driver position. Both these seats not only have to face forward, but also to have access to a series of controls placed on an easy-to-reach dashboard. Only with the evolution of advanced Drive-by-Wire technology and Automated Highway Systems such constraints may cease, giving place to an unprecedented design freedom and leading to far more inhabitable car interior spaces.

### Drive by Wire

When it comes to advanced Drive-by-Wire technologies, no more typical example can be found than the innovative FILO concept, designed and presented by Stile Bertone in 2001. FILO was practically the first concept car to use Drive by Wire technology engineered by SKF, in order to attempt a radical re-evaluation of the man-machine interface and a consequent new approach to interior architecture.

In FILO, steering, accelerator, brakes, gear change and clutch are all controlled by wire, the same technology used in the controls of modern aircrafts. The abolition of mechanical links for all these functions thanks to wire creates new space that allows for the complete re-design of the interior, fully exploiting the broad freedom that the power of electronics bring.



**Figure 11:** Elimination of mechanical links for the controls thanks to Drive-by-Wire technology, is likely to produce radical changes in car interior architecture

Finally freed of the bulky and potentially dangerous presence of the steering column, the designers have been able to consider a dashboard free of obstructions and constraints, a large free surface, simple, clean and relaxing (figure 11). All information and driving equipment are housed in a central binnacle, while the air outlets disappear and the air conditioning is diffused evenly. The waved floor offers various possibilities for the driver to rest his feet, with no restrictions by the presence of pedals.

Both front and rear seats recall images of lounge sofas, with the rear positioned higher than the front one to give better forward visibility for the passengers. Ingress and egress is much easier due to the absence of central pillar, and by the swing-up steering/control unit.

According to Bertone, the Filo represents a vision of the not so distant future. Such innovations first applied in Bertone Filo and carried out in numerous other concepts, are very likely to emerge in future production cars – provided the development of adequate powered feedback systems.

### Chrysler Hy-Wire – Hydrogen fuel cell technology

Developed and built in close collaboration with Stile Bertone and SKF is also the Chrysler Hy-Wire, presented in the 2002 Paris Motor Show. Combining fuel cell and by-wire technology, Hy-Wire is packaged in a radical way, opening up a new world on chassis

architectures and customized bodies for individualized expression.

All propulsion and control systems are contained within an 11-inch-thick skateboard-like chassis, maximizing the interior space for five occupants and their cargo. For driver, there is no engine to see over or pedals to operate – controls are housed in a single unit called X-drive that may easily set to either a left or right driving position.



**Figure 12**

By Hy-Wire, Chrysler establishes a new perception of luxury based upon the kind of space and visibility this car provides. As the design is built around the fact that there is no engine compartment (at least a conventional one), passenger compartment is free to occupy the whole length of the monospace car (figure 12). In order to highlight the openness of the interior and the range of possibilities offered by new technologies, both the front and rear panels of the prototype are made of transparent glass. Thus, onlookers can see through the car from front to rear, while driver may experience a greater visual command of the road. To reinforce this effect of transparency the seat backs are open. There is no B-pillar between the front and rear doors. Apart from excellent visibility, drivers and passengers are offered enhanced legroom, making Hy-Wire an original concept in terms of interior versatility and inhabitable space.

## OTHER CONCEPTS

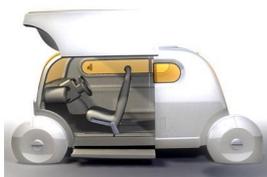
This research upon issues of car interior design could go further to include numerous noteworthy recent concepts such as the following:



**Citroen AirLounge.** Citroen was first to introduce an automotive use for a computer-chip-technology that controls the intervals at which light changes colour inside a translucent shell. By making most of the fascia and door panels of the AirLounge concept out of a translucent brown silicone, achieved to change interior colours at preprogrammed intervals. This is a typical example of interior customizing possibilities about to emerge in the near future.



**Renault Ellypse.** The interior of the Ellypse features a smart seating system: both front and rear seats fold down and disappear into the floor to form a waving surface that acts as a deck chair. Suicide rear doors combined with the absence of a B-pillar, allow easy ingress/egress.



**RCA One+ concept.** Winner of the 2002 Nissan Vehicle Design Competition to design a compact car for the year 2010, “One plus” concept was designed by a group of postgraduate students from the Vehicle Design course at the Royal College of Art, around the Japanese concept of tatami as an interior theme. Unlike products that offer a rigid layout by which the owner is expected to adhere, the team proposed a car designed entirely around the one constant that will always be in the car when in use: the driver. The concept was christened '1+', after the single standard driver seat. An optional

number of expanding seats could be arranged as required around an adaptable grid on the floor of the car. The number of interior solutions made possible by the 'tatami' grid, included storage systems and possible third party accessories such as a food cooler both secured and power-supplied by the grid system of the vehicle. One+ expels the notion of a pre-moulded 2 parents + 2 children compact car, to offer an adaptable, open platform on which one can live out his own unique way of life.



**Suzuki M Terrace.** Features a dashboard in the form of a horizontal electronic display, that can slide and swivel in a longitudinal position to be used as a table with the seats rearranged around it. One more concept exploring the total freedom introduced to the design of the interior, thanks to Drive-by-Wire technology.



**Nissan Beeline.** Its quadrant-shaped dashboard incorporates a folding steering wheel, a built in laptop computer and a writing surface enabling office work associated with the transportation of goods in this light utility vehicle.

## THE FUTURE

Since the recognition of car interior as a living space, many engineering restraints have gradually been eliminated, thus allowing a far greater freedom in the design of this "mobile inhabitable space". Production cars evolved MPV typologies with versatile interiors and flexible seating systems, while concept cars have undergone a far greater evolution to embrace latest technologies in favour of more spacious and livable interiors. Taken into account all the novelties applied in terms of car interior habitation, the only constraint that still seems to imply is that of the forward-facing driver seat. For how long though?

Obviously for as long as a driver will be required. Advanced research in the direction of Intelligent Transportation Systems, already suggest automatically navigated vehicles, programmed to reach destinations at request. Though still fruits of imagination or prototypes starring in science fiction films, transport capsules able to move onto magnetic fields and travel in long automated queues are not unlikely to emerge. In the 2002 Sci-Fi film *Minority Report*, urban mobility needs are covered by fully automated futuristic "Maglevs" (acronym for Magnetic Levitation), which move both horizontally and vertically on a magnetic road network. These capsules, able to climb building facades, will effectively form an organic part of our home when parked, to resolve existing parking problems.

Such a future scenario will obviously signify the end of almost any restriction imposed on human activities carried out on-board. The abolition of driver will cease constraints regarding visibility with potential users becoming mere passengers. Within this transportation capsule, time will further perceived as time to live, thus opening new horizons in traveling experience. While being transported, even a single passenger will be free to carry out communication or entertainment activities: working, playing, chatting, reading, e-shopping. Therefore, a pure inhabitable living space is likely to evolve, used either when parked or travelling.

Within the context of a module entitled "Designing for the Future", students from both

Industrial and Interior Design courses at the AAS (Applied Art Studies) College, were commissioned a project to design “the interior of a fully-automated mobility capsule, that will form an organic part of the home when parked”. Concepts produced, included extraordinary spatial solutions with almost any configuration possible, from L-shaped lounge sofas converted into beds, folding displays, retractable dining tables and en-suit wardrobes, to facing armchairs with multimedia facilities enabling work and entertainment.

Historical experience has repeatedly proved that design innovation not always finds its way to the production line easily. Therefore, scenarios on future mobility are quite difficult to forecast. However, as we move towards saturation in terms of number of cars and congestion problems increase, two possible scenarios are likely to happen. Either car industry will move towards alternative engineering solutions and totally new vehicle typologies, or we will find ourselves further entrapped by the car. In each case, new typologies of car interior space are likely to emerge, either from new design constraints imposed (or eliminated), or from our need to enhance quality of life and use of time on-board.

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