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How Transit Management Can Change the World

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Advancements in technology will ultimately allow for more creative building designs. Smartphone-based technology tied with elevator destination technology can be the glue to meld disjointed groups of tall buildings into a true urban community. The evolution of technology will allow users to become unconstrained by the century-old elevator-driven building configurations of the past.

A New Source of Urban Renewal

There are four basic types of product innovation:

1. Make it cheaper
2. Make it better
3. Create new values
4. Enable your customers to create new values

Examples of each category in, say, the telecoms industry might be:

1. The adoption of digital switching and fiber optics to radically lower the cost of land line calling
2. The adding of digital features to business phones to add, for example, functions such as forwarding and messaging previously only available via a manned PBX
3. The launching of first generation mobile phones to permit calls on the move
4. The invention of the smartphone, permitting countless companies to develop new services and, in many cases, totally new businesses based on its technology.

Obviously number 4 is the one objective that all great companies strive to achieve but it has been conspicuously missing from the elevator industry for about a century.

In the early 1900s, of course, elevator companies were major enablers of an urban renewal that saw cities soaring to new heights across the globe. They played a conspicuous role in these early buildings since their products were required in large number, to make them work. Each elevator at that time was driven by an individual operator and in order for that person to see and be seen by the next load of prospective passengers on the ground floor, it was necessary to have the units arranged so that they all faced out into a common area. This in turn led to a cluster of elevator shafts, normally in the center of the building, which required a structure to support it. This building core, as it became known, could be harnessed to transport other services into the facility and, importantly, be designed such that it formed the main support point for the floor plates. All that remained was the addition of a cladding system and the building configuration was complete. This "core, floor plates, cladding" model largely figures in tall building construction today and represented at the time a clear case of innovation level 4, where a new innovation by the construction industry, the high-rise building, had been made possible by the elevator companies. But then the sights of the elevator industry were lowered. They focused on making better elevators and forgot their real mission which was to enable their visionary customers, the architects, developers and investors to continue to develop the urban environment to suit the changing demands brought about by the explosion of world population.

Thirty years ago, Dr. Paul Friedli joined Schindler. He had already enjoyed a successful career in the medical world, following up his award-winning PhD from ETH Zurich by becoming an MD and co-founder of the world's first bio-engineering laboratory, a joint venture between ETH and the University of California, Palo Alto. Unsurprisingly Dr. Friedli was convinced that the company had to get back to this highest level of innovation. His view was that it was not the (already highly optimized) elevator itself that would make the difference, but the way in which they were utilized as part of an overall transport plan for the building and beyond.

An example of how effective this approach can be is given by examining the innovations that have been made in the airline industry over the last twenty years. During this period, the aircrafts available to the industry have barely evolved at the functional level even though, without question, they have made great strides in such areas as engine performance and avionics. It is a fact, however, that airline travel has become simpler to organize and much more widely available during this time. Let us consider the process by which the airline traveler would go about booking and undertaking a flight in the early 90s. An initial enquiry would be made at a travel agency where large books full of timetables would be used to construct a potential itinerary which, upon final agreement, would be booked by means of either a phone call or computer exchange between the agent and the airlines. There would then follow the issuance of a complex book of flight coupons to the traveler, which had to be hand written by the agent. Once the passenger arrived at the airport there would be the necessity to check-in whether or not hold baggage needed to be deposited, in practice nearly always the case because of the small amount of cabin storage available. The check-in was a relatively long process involving the flight coupon being detached from the book and added to a boarding pass which had to be printed from the cross referenced reservation. Eventually the passenger could board and the journey commence. Today the contrast could not be more stark. Passengers themselves can easily work out an itinerary via either a general purpose or airline-specific booking app. Flights can be booked and boarding passes obtained from the same location and within minutes the traveler is ready to go. The size of suitcase that would be required for a business trip of several days can be accommodated on board, meaning that, armed with a printout

Right: A Miconic 10 Terminal. Source: Schindler

or phone image of the boarding pass, the journey involves a walk directly through security to the gate and onboard.

Thus, by examining the process of utilizing their transport assets in the light of current technology, the airline industry has been able to place significant innovation before the public.

It was clear to Dr. Friedli that, over the same period, similar gains could be made in the urban environment. As a starting point he formed a group which set about tackling the elevator control itself. The early 1990s were a good time to get involved since the industry had recently reached an impasse with respect to this subject. Building developers wanted to go higher and this implied more elevators to maintain good levels of service. The problem was that this increase meant larger and larger core sizes and at a certain point not enough rentable space was left to make the structure financially viable. The solution was, of course, to make elevator control more efficient and therefore require fewer units. The achievement of this had, however, remained elusive meaning that an increase in the height of tall buildings was effectively stalled.

As stated earlier, elevators were originally driven by operators, who utilized a car switch manual control to move them throughout the building. Coordination at that time was provided by a person in the lobby called a dispatcher who would stand beside a panel displaying where all the calls were in the building and instruct the drivers of individual cars when to leave. This approach prevented the bunching of cabins, which could lead to excessive waiting times but did little else to improve service. The late 1940s saw the introduction of automated elevator systems (initially made possible by the invention of the door safety edge/shoe) where for the first time a machine could obtain an overview of all the calls in the system in real time and attempt various strategies to serve them efficiently. These systems were initially relay-based and in the 1970s microprocessors were introduced. Each iteration provided gains in performance, however, the efficiency of handling up-peak traffic (the main determinate of the number of elevators needed) increased much slower than for other traffic conditions as technology progressed. The main problem was that, however good the algorithms became, they were fundamentally limited by their input devices (the familiar "up and down buttons" and car panel), which had remained unchanged since the beginning of automatic control.

It had been understood in the industry for some years that an approach based on knowledge of the passenger's destination requirement before they entered the elevator would bring significant gains in performance. This information would allow pre sorting such that a specific elevator could carry all of the passengers requiring a specific destination. This reduction in the stops each elevator had to make would allow each to complete its task quicker and become available for a new load, thus dramatically increasing the handling capacity of a bank of elevators. Well known though this "destination control" theory was, it had not been translated into a practical elevator system. It seemed, therefore, an obvious place for Schindler to start as the search for a more efficient elevator control commenced.

In 1992 a new system called Miconic 10 was released which was the world's first practical destination control. The system used a methodology whereby a keypad

Right: A PORT Terminal located outside an elevator bank. Source: Schindler

Opposite: Passenger, using a PORT Terminal. Source: Schindler

allowed each passenger to input their destination. Within 200 ms the system calculated the best car to serve them and this was communicated via a screen on the keypad. Designation letters were used which corresponded to those posted above each entrance. The passenger could then await their car and, when it arrived, check that the destination required was due to be served by consulting a "destination indicator" mounted on the door jamb. Once inside there were no buttons to press and the passenger could simply enjoy a ride, far less punctuated by intermediate stops than before.

The deployment of Miconic 10 made important improvements to building functionality. This was a good first step in that it led to taller buildings being made possible, but in order to make further gains, a totally new methodology was needed. To address this, a new discipline called Transit Management was developed by Schindler. This approach looks at each individual journey through the building, from entry to arrival at the final destination, and undertakes an optimization in terms of comfort, convenience, safety and security.

Six years ago Schindler introduced a product called PORT Technology into the market place in order to implement Transit Management. The concept of PORT Technology is to utilize a Personal Occupant Requirements Terminal or PORT to determine, using specific information about each individual, what their needs are and how to meet them in the most efficient way possible. Somewhat counterintuitively, catering to the needs of individuals in a personal way can also lead to significant gains in the overall performance of a system. One example of this is in buildings requiring security card access and employing a security barrier. A building such as this can be hard to enter during peak times due to the multiple transactions people have to undertake initially at the barriers and later at the elevator (a situation made even worse with conventional controls). PORT Technology can be added to a barrier system by placing two PORTs on each barrier, one to present a card reader upon entry and the other a screen – and on the way out the roles are reversed. A building occupant need only show the card at the PORT and their credentials will be checked by PORT Technology, thus negating the need for a separate access control system. At the same time the floor they like to go to on arrival is known to the system. So instead of trying to obtain this information, PORT Technology can simply work out which elevator is best placed to make the journey and allocate an elevator right at the barrier, typically in around 200ms. The transaction therefore becomes a simple placement of the card near the reader followed by the barrier opening and proceeding directly to an elevator car. In this way very high volumes of traffic can be handled in a most convenient and efficient manner.

PORT Technology has seen a lot of success in the market. Recently a new version of PORT, one based on a smartphone, has been released. Called myPORT, this product crystallizes the many features of PORT into a smartphone-based ecosystem. This not only significantly broadens the application of Transit Management, but also allows additional features to be provided. When a person enters the building carrying a smartphone with myPORT running in the background they are immediately detected by the local PORTs and their identity checked via a cloud-based server. If they

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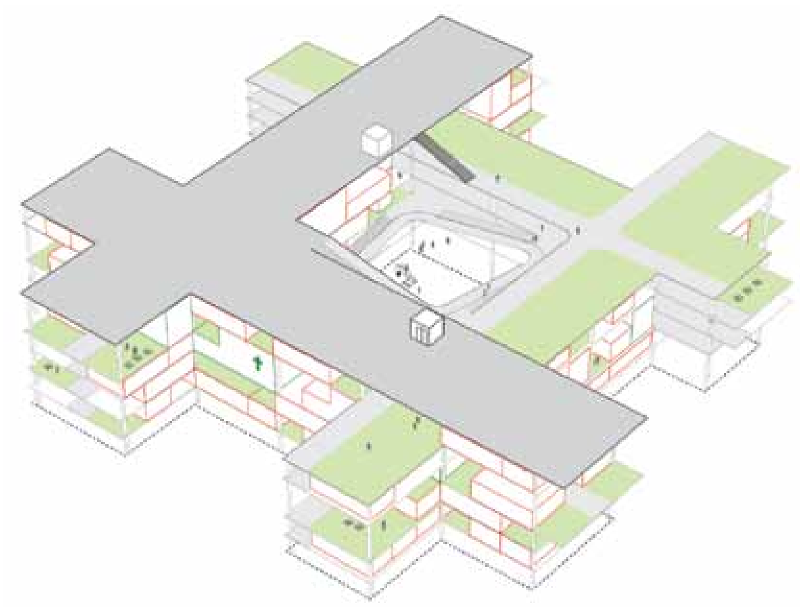
Opposite: Torre David, Caracus. Source: Schindler

Bottom: The Urban Shelf, in association with Studio Schwitalla, Berlin. Source: Schindler



are authorized to enter, a credential is then pushed to their phone via the cellular system, an entirely separate channel which requires the phone number to be known. At this point the credential is useless until the phone is opened, but after this is done, if it is presented to this buildings specific barrier group within a certain number of seconds, entry may be obtained. To the user this entry is as simple as taking out their phone, opening it (via PIN or biometrically) and showing it to the barrier. But the building owner has been able, during this time, to do a complex security check involving 4 levels of interaction:

1. The initial detection upon entering the building
2. The credential sent back via the separate telephone channel
3. The unlocking of the phone
4. The presentation of the phone to a known card reader within a certain amount of time

Thus, a very high level of security, or "e-banking security," has been obtained without the inconvenience to the user that is normally associated with it.

At this point we have an extremely high level of confidence that the person in possession of the phone is, in fact, authorized to be moving throughout the building. We can therefore make their journey completely seamless. As long as they have their phone with them (it may be in a pocket or bag, there is no need to take it out), doors to authorized areas will be automatically unlocked and elevators, where a destination requirement is already known, will simply be summoned with the allocated elevator being shown on the phone and its arrival being flagged.

This technology clearly has major implications for people with disabilities. An enormous effort has been made by smartphone manufacturers to make their devices accessible in a variety of ways and these can be supplemented when needed by third party suppliers. This means when a user with a disability masters the utilization of a smartphone, they automatically open the world of myPORT which in turn gives them the opportunity to interact with any building that has this technology without the problems associated with locating its specific fixtures and working out their purpose.

Schindler has already commenced working with people with disabilities to purpose-design features that can be most helpful to them. These features can, of course, be customized to fit needs since, unlike a general purpose disabled button, myPORT can be programmed to understand the specifics in each individual.

It should therefore be clear that the critical issue here is not the technology but what our customers can achieve with it. Schindler believes that Transit Management can drive architectural forms that are different than those currently defined by elevator companies. To this end, Schindler has formed close associations with a number of architectural groups around the world to explore opportunities.

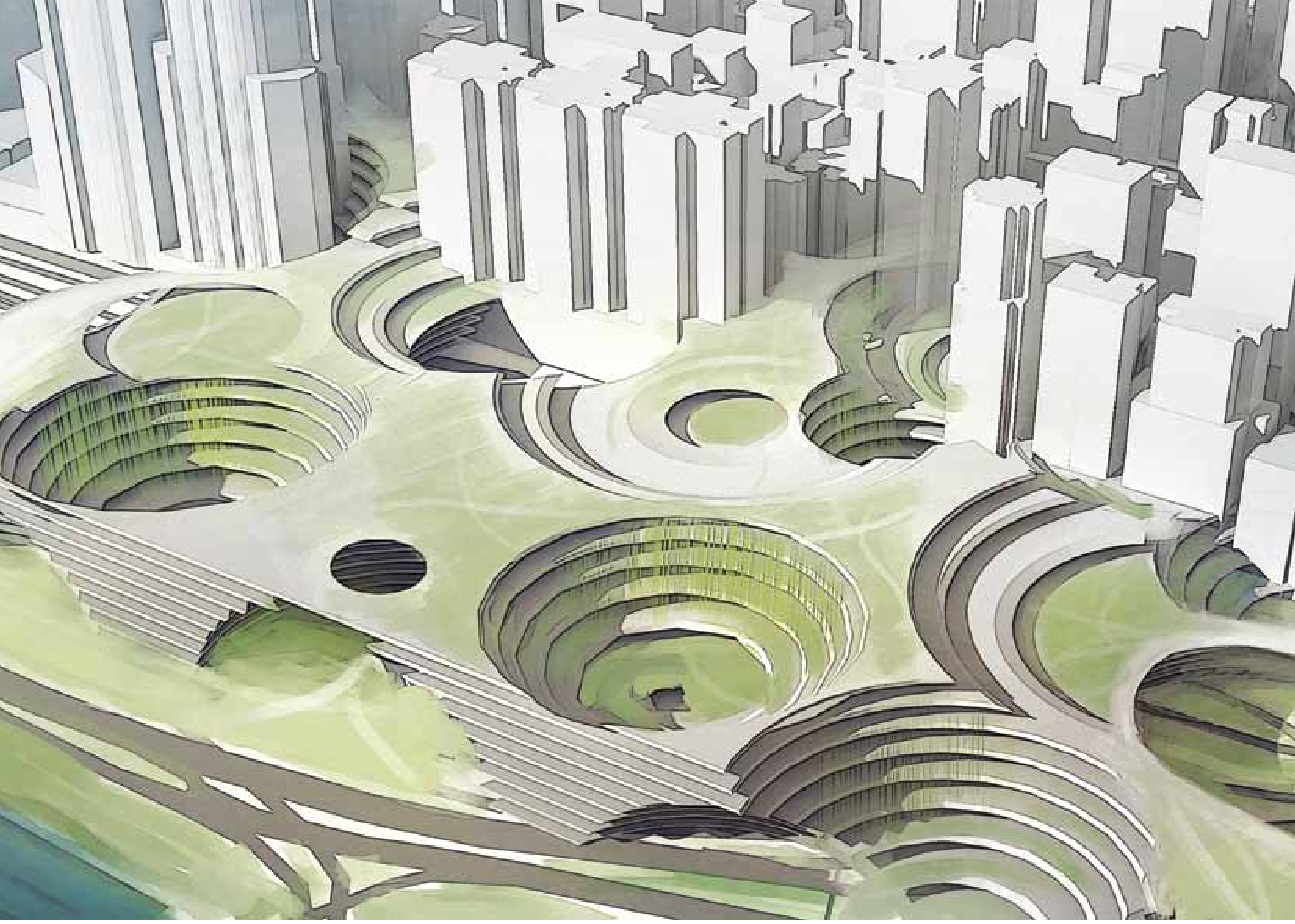
The first study that the company undertook was an attempt to understand the social impact of elevators. This was undertaken in partnership with ETH Zurich and consisted of award-winning research into what was until recently the world's highest informal settlement: a building in Caracas known as Torre David. Construction of the building began in the early 1990s, but due to a combination of an economic collapse in Venezuela and the death of its developer, it was never finished. The main structure was completed, but none of the internal fit-out was carried out. The building stood in full view of the many favelas (slums) and seemed to offer their occupants the opportunity for a better life. In September 2007, a group of people occupied the building and made their homes over 16 stories – living their lives without elevators. Many new ideas were generated by this research, but perhaps one of the most interesting is called the Urban Shelf. This is essentially a set of sheltered stacked platforms built to a high level of architectural design where communities can organically grow, and are subject to greater or lesser constrictions of urban planning. The concept is very broad in that it can be applied in many different socioeconomic settings.

In the developing world the Urban Shelf can be fabricated at a low cost and then, perhaps, occupied by communities whose only other prospect would be a favela. The increased security that the verticality of the platforms provide, together with the architectural rigor that allows them to resist natural disasters, means that with relatively low investment a great increase in quality of life can be provided.

Mature urban areas can also use this technology to great effect as it provides useful infill construction in difficult-to-develop areas. Since a shelf can easily be built over a roadway and a park can be added to the topmost level, additional development areas and green space can be added to enhance a city district.

Perhaps the most exciting application of the Urban Shelf is the potential it has to act as a "glue" to meld disjointed groups of tall buildings into a true urban community. In a city like New York, where districts have grown and matured over many decades, the ground level infrastructure already exists for communities to thrive. In newer city spaces where tall buildings have been built on relatively large lots, with many separated by highways, it is difficult for a community to evolve in a way that generates synergies between a group of buildings. Urban Shelf technology may be able to play a crucial connecting role here by spanning various roadways and large lots and allowing the growth of a vibrant district, which is more than the sum of its parts.

Whether it is the Urban Shelf or some other architectural design that is yet to be discovered, it is Schindler's belief that Transit Management has the power to return the innovation initiative to users who are unconstrained by the century-old elevator-driven building configurations of the past. And the company is excited at what unleashing such a level of creativity can bring to all levels of urban development as the industry wrestles with the challenges of the next few decades.



Left: Inside the Urban Shelf, in association with Studio Schwitalla, Berlin. Source: Schindler

Top: A Glue for the City, in association with Studio Schwitalla, Berlin. Source: Schindler