Second life of great American parking garages: Exploring the potential of adaptive reuse of urban parking structures in the American cities

Ming-Chun Lee, Manasi Bapat
Departament School of Architecture, University of North Carolina, Charlotte, NC, USA
E-mail: Ming-Chun.Lee@uncc.edu, mbapat@uncc.edu

Abstract. *Research The structure of American cities has been greatly influenced and transformed with the onset of the car culture and its ever evolving impacts to the everyday life of American people. The early 1900's experienced a noticeable growth in the demand and need for automobiles resulting in the increasing need for parking spaces in the city. However, better public transit options in downtown cores; growing public awareness of reducing automobile dependence in order to address issues of sustainability; advancement in autonomous vehicles and demand-based traffic management, all are making existing parking garages obsolete and useless. The era of designing cities as if car access alone was sufficient appears to have ended. An opportunity lies where the existing underused parking garages can be repurposed into residential, entertainment, or work spaces. This paper examines three past projects that have converted existing urban parking garages to other uses around the world. It then analyzes their design and construction approaches and discusses the implications of this* type of conversion to the urban form of the areas surrounding these projects.

Keywords: Parking garage, adaptive reuse, automobile, building repurposing, retrospection.

Introduction

The structure of American cities has been greatly influenced and transformed with the onset of the car culture and its ever-evolving impacts to the everyday life of American people. The early 1900's experienced a noticeable growth in the demand and need for automobiles resulting in the increasing need for parking spaces in the city. Eventually, multi-level parking garages were built to suffice this requirement of the ever-growing city (Mohl, 1997). However, increase of parking spaces around urban fringes; raise in gas prices; better public transit options in downtown cores; growing public awareness of reducing automobile dependence to address issues of sustainability; advancement in autonomous vehicles and demand-based traffic management, all are making existing parking garages obsolete and useless (Andreotti, 1995). The era of designing cities as if car access alone was sufficient appears to have ended. An opportunity lies where the existing underused parking garages can be repurposed into residential, entertainment, or work spaces rather than paying up for demolition and construction costs of an altogether new structure. It can be projected that this technical and architectural retrospection of existing parking garages can prove as a catalyst in resolving existing issues of the city.

This paper traces past projects around the world that have attempted to convert existing urban parking garages to other uses. It then analyzes their design and construction approaches and discusses the implications of this type of conversion to the urban form of the areas surrounding these projects. Our initial investigation concludes with an analytical framework that includes the following criteria:

http://dx.doi.org/10.4995/ISUF2017.2017.5908

type of garage structure; vertical circulation and ramp configuration; material and construction method; floor plan arrangement; size in relation to block and street orientation; surrounding area condition in terms of land use and street network. Furthermore, implications of garage conversion to urban form of surroundings can be examined by these measures: remediation of building façade; alternation in setback between public right of way and building footprint; change in active usage along building frontage.

A brief history of urban parking garages

Transportation has always been determined as the backbone in the evolution of cities. The convenient facility of private means of transportation such as cars and motorcycles has predominantly occupied the long connecting tendons of cities. Since Progressive Era in the early twentieth century, parking structures and garages have been added to the urban fabric in American cities. Eventually, parking garage has turned to be one of the universal structures, which knit together and address some of the irreplaceable essentials of a city such as transportation, sustainability, and architecture (Guiney, 2001).

Unlike other man-made elements in a city, parking garage has been adding up to the problematic dilemmas of architecture and urban fabric of a space. While serving as an absolute accommodation to one of the user-friendly, dependable, and undisputed mobility factor, it also creates a huge vacuum in a city thus pressing down the marks of modern car culture. It is the need of ever-growing car culture that has given rise to the dreadful unwelcome spaces, which push this technological dependency into human societies' daily routines (McDonald, 2012).
Dedicated to the technology, user needs and specifications, the parking garages have always been circumscribed by the parameters related to design, engineering, and construction. As the technology took its pace in the twentieth century, many new urban forms and spaces started evolving by setting the parking garages as the foundational elements. However, it would not be wrong to mention public parking as social spaces as they provide an alternative identity and functionality of it. The invention of car ultimately gave birth to the exceptional blend of architecture and exclusive motorized shelter space, which added a new term to the configuration of modern architecture. Adhering to the traces of history and rendering its compatibility with different influential factors of function, style, aesthetics, engineering and urban design, the parking spaces have gained a significant voice in the regulatory city plan (McDonald, 2007; Smith, 1988).

These emergent parking structures in the modern American cities have been under the knife for incorporation of innovations and experiments before the turn of the twentieth century. Employment was one of the factors that influenced the arrival of nearby inhabitants thus lashing in the problem of overcrowding. Soon when the mechanical replacement was invented, it brilliantly cancelled out the environmental factors linked to the animals-powered transportation. At the same time, it offered a reasonable access to the peripheries of the city, which still occupied a major part of the country. In the end of nineteenth and the beginning of twentieth century, the downtowns started emerging as powerful social, commercial and business districts thus turning into an indispensable part of the evolving city. The uptown part of cities however remained as the residential and domestic part, which stayed interdependent with the core downtown area (Jackle and Keith, 2004).

The invention of steam engine and electricity proved to be a turning point in shaping the fabric of the city as it connected two extreme extents of a city within lesser or equal amount of time. An organized change in the module of the city was observed when home and work got diverged in uptown and downtown areas respectively. The concept that residential places could be placed away from the workplaces in downtown rendering a high real estate value set forth the path for horizontal development of the city. Even though the automobiles strengthened this separation, it was observed that the horizontal growth induced social isolation, traffic congestion, environmental, financial as well as land use burdens in the city vibe. The birth of parking garages was

essentially triggered by personal automobiles, which required a place for shelter. Not only has the parking space formulated as a crucial public-use building type, but it also points to issues related to social and environmental factors (Wormster, 1997).

In the making of sustainable environments, which acknowledges the scale of an individual as well as the city, vital and repurposed urban forms need to be planned as options to drive in city transformations. Those aging urban parking garages ought to take their fair shares and find ways to morph themselves into a more sustainable form of urban amenities.

A shifted paradigm – repurposing parking garages

After the World War I, parking structures essentially began to take a major role in the American landscape. They became a necessity to the city. Surface and garage parking both occupied a substantial area of the downtown of almost every city. The multi-story cage garage came with the rewards of open deck system which had no maintenance and construction costs thus making it an attractive system for parking developers (McDonald, 2007).

In the early 1950's three primary ramp systems came into use, including spiral, continuous opposed, and modified split level. There was an increasing need of spaces near the downtown commercial areas with walking access to shopping districts. It was generally believed that this downtown parking crisis was practically unsolvable without simultaneously tackling the issue of mass transit. However, parking garages continued to be built with new construction systems thus making them more efficient to fit into tight urban sites (Klose, 1965).

A trending fashion in the parking industry for the last decade in downtown, urban or educational setting included some type of mixed use in new projects where retail is located on the ground floor where an interaction area could be created. It was estimated that the inclusion of this retail on the ground floor could greatly influence the design from the typical standalone garage typology. Several types of parking garage came into existence, including single level parking garage where just one floor serves the purpose. The multi-storied parking garage has multiple floors to park with connecting ramps and/or lifts to move from one level to another. The underground parking garage, mostly located in the city centers where there is not much of space to build a parking facility, has levels below the ground surface (Martin, 2003; Mayer, 2005).

All parking structures are not the same. They differ in physical characteristics, land value, coverage, boundaries, associations and size, as well as aspects of use, programs and peak periods. They differ also in both the constitutional order and representational order in relation to their potentials to enrich public space. On any given site, the combination of typologically specific strategies for each attribute will invariably result in a unique and comprehensive design strategy. Just as parking structures vary by type, so must strategies to improve and convert them into different uses or physical forms (Macht, 2014; Marshall, 2016). This study intends to identify effective ways in which urban parking garages can be converted or repurposed to other uses. To do so, this study employs case studies to examine three projects both in and outside of the United States. Each case has attempted to convert existing urban parking garages to other uses. The goal is to analyze their design and construction approaches and discuss the implications of the resulting conversion to the urban form of the areas surrounding these projects. The case studies are focused on understanding their design logics and various construction and engineering considerations, such as existing structure; ramp configuration; vertical circulation; material and construction technique; floor plan arrangement; size and volume with regard to block and street orientation; site configuration in relation to surrounding existing land uses.

Case studies

From Garage to Kindergarten, Berlin:

In 1974, a four-story parking garage was

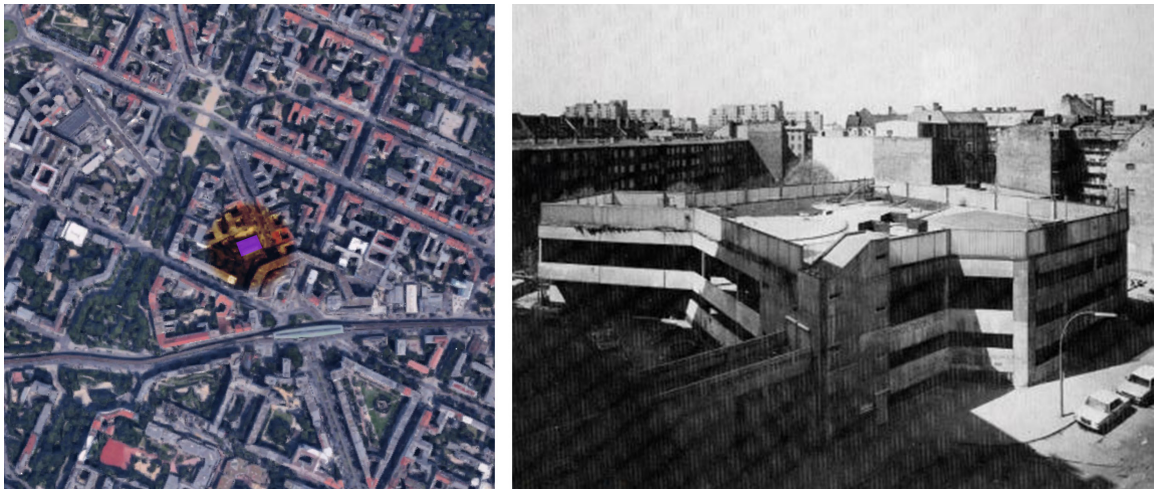

Figure 1. The INA kindergarten is at the east part of the Kreuzberg in Berlin (left). The exterior of parking garage prior to the conversion (right).

constructed in a predominately residential neighborhood in the southeastern quadrant of Berlin. The garage was built to provide parking for a large commercial development that never materialized. After six years of sitting vacant, it was determined that the structure could not be removed. The building continued to take up space in the neighborhood as the residential fabric filled in around it. The empty concrete clad building in the middle of the residential neighborhood quickly became a blight (Figure 1).

A design competition was held, and Berlin architects Dieter Frown and Gerhard Spangenberg were selected to convert the existing parking garage into a kindergarten. The neighborhood needed a school for young children, and the architects saw reusing the garage for this purpose to bring an element of nature and fantasy to the building that would help to counteract the ecological waste embodied in the existing garage, and the waste of space that it had been in the neighborhood for the past six years (Strasse, 1989).

The existing garage was approximately 40 feet tall, and contained 7 staggered half floors. The staggered floors were likely to reduce the vertical distance that needed to be spanned by ramps between each level. There was expected a ramp at each end of the building connecting the floors. The garage had a steel frame structure that was infilled, both floors and exterior cladding with precast concrete panels. The footprint of the building was approximately 125 FT by 115 FT, giving it around 50,000 square feet of enclosed space. The architects' primary design decisions for the building's reuse revolved around sustainability principles. The most important intervention was the insertion of a greenhouse-like atrium space. A portion of the roof and the upper three floors were removed to create a large open light-filled space, covered by a greenhouse-like structure. This atrium space dealt with several of the problems in converting parking structures. Not only did the atrium create double height space within the building, but it also helped deliver natural light into the central portion of the deep floor plates of the lower levels. The glass-roofed structure also acted as a solar heat collector in the cold months of the year, and could be opened to pull stack ventilation effect throughout the building. The building's steel frame structure and infilled precast concrete system made this intervention manageable without the need of new structural interventions and is an excellent example of a desirable system when considering the reuse of an existing garage (Strasse, 1984).

To add to the sense of nature, a green roof with grassy play area for the children and garden and compost area for their education was installed. To provide the necessary depth for larger plants, the architects added a steel lattice screen system to the original exterior of the building, which acted as an armature for plants to grow to the full height of the building while bringing their root systems and the soil they required

down to the ground where the building didn't have to support the added weight. The original ramps were converted to vertical circulation that took the form of both stairs and a stepped ramp that lent the space a sense of playfulness and engaged the children while they moved up and down through the building (Figure 2). The compact nature of the ramps was again ideal for reuse as they kept most of each floor area level and reusable. Its conversion to an energy efficient, vibrant, educational space for children provided a needed amenity to the community. This example, now 30 years old, highlights the vast potential for making sustainable, humane and desirable space by converting an existing parking garage.

From Garage to Newspaper Office, Paris:
The Liberation Newspaper office is located in Paris on an inner street running parallel to the main street, which takes its path from the place de la Republique, a public square, which lies in a quarter mile radius from the office. The neighborhood context of this newspaper office is quite dense with a set of residential, commercial and retail buildings. Also, the site is reasonably close to the means of public transportation. This internal road, which leads to the office space, is narrow with moderate parking facility thus making it quiet and less busy (Figure 3).

In the early 1980's, a Parisian developer became interested in converting the top five floors of this post-war era parking garage into office space (Ellis, 1988). Patrick and

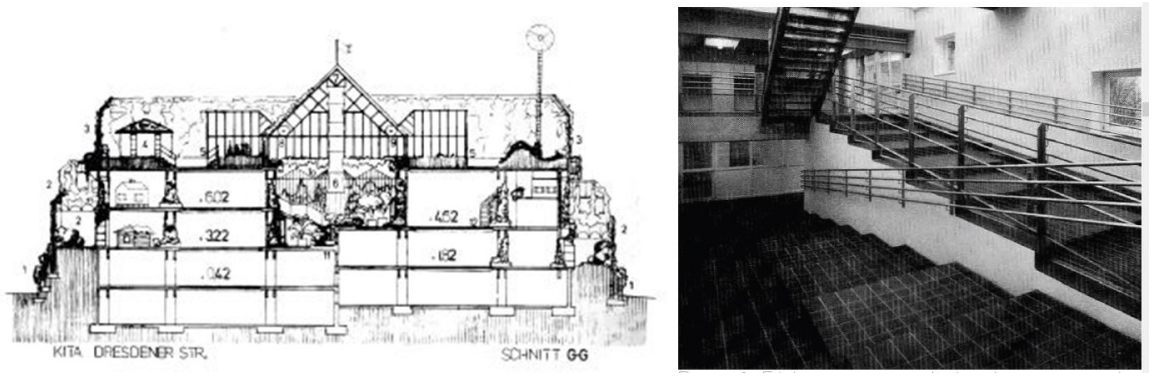

Figure 2. Conceptual sketch of repurposed garage space (left). Existing ramps converted to broad steps for children to play (right).

Figure 3. The Liberation newspaper office is located in Paris on an inner street running parallel to the main street which takes its path from the place de la Republique (left). Conceptual sketch of repurposed garage plan (right).

Daniel Rubin, of the architecture firm Canal, had a vision for reuse the structure. Their ideas included keeping the curving ramps connecting each level of the garage intact. This was not only important to the developer, as the removal of the ramps would create an insurmountable financial hurdle, but also Canal argued that the ramps could benefit the building's future tenants as well. The French newspaper, Liberation, became the new tenant. Presented with minimal daylight, low floor-to-ceiling heights and pre-existing ramps, Canal attempted to make the office space as open as possible.

The ramps connecting each half floor were kept intact as a physical and psychological link between department offices or workspaces. Wherever feasible, glass was used to partition space. This continued the sense of connection between departments and maximized the limited daylight available. Ultimately, an underused garage with prime real estate at the center of Paris was put to a good use with 58,000 SF of office space (Figure 4).

From Garage to Luxurious Condominiums, New York City:

The luxurious condos are located in New York City near the Union Square Park. The setting of this property is within many mid-rise and high-rise buildings basically of retail, commercial and residential nature. Parsons School of Design also falls on the same axis. This internal road adjoining the site cuts down the high traffic and noise from the main street thus making it accessible to the dwellers around. The street also consists of on-street parking and is one block away from the metro station (Brown, 2011).

With the increase in demand for the parking spaces for cars, Hertz Garage was built near the Union Square in New York City. However, this 1931-built eight storied Hertz garage building started going obsolete as the trend of public transit roared. Instead of demolishing this garage building, developers came up with the idea of repurposing this old structure and planned on to retain it completely with the addition of a new façade referring to the early area (Figure 5). The idea of adding four storied duplex penthouses was incorporated on the top of the building with the retention of few bottom floor garage spaces. This new form of reused space originally has a steel structure thus making it feasible for alteration and creating a townhouse-like appearance. High ceilings, large windows and unobstructed views make this re-adapted space a distinguished one (Figure 6). The topmost unit of this building is listed for a whopping price of $31.5 million. Prices of other apartments start from seven million dollars (Gross, 2013).

The building is featured with 67-foot-wide units with only four columns in the entire space for each of the eight full floor apartments below the penthouses. The neighborhood area would profit from this adaptive use of building as it lies within a busy context of surrounding activities. It influences the demand and character of the surrounding area thus making the building as a

Figure 4. New work space with glass wall to facilitate connections throughout the office and maximize natural light (left). Office space and lobby (right).

Figure 5. The former Hertz rental site at 12 E. 13th Street in New York City (left). It has been converted to a 12-story, 8-unit development (right).

Figure 6. The duplex penthouse on top of the original garage structure (left). The spectacular view from inside the three-story penthouse (right).

symbolic character (Hughes, 2014).

Discussions

The common feature that could be observed while comparing the three fruitful case studies is the workability of these adapted structures and their response to the user and the surrounding area. As early as the mid 1970's this idea of repurposing an existing outdated parking structure started booming up in Berlin's busiest areas. Similar is the cases in Paris and New York City as well. However, the intended use of these spaces varies greatly as per the needs of the nearby surrounding

civic/commercial establishments or individual dwellers in the area.

The prevailing site conditions greatly influenced the demand of newer structure in place of the existing parking garage. For example, in the case of Berlin the parking structure was converted to a kindergarten by cumulative voice of the neighborhood area. This new user space in the old rundown structure did not only acquire popularity within the context of the entire city but it also set a path for the many such old and unused types of buildings. Similarly, the office building in Paris was proposed regarding the necessity of the kind of user space anticipated in the neighborhood.

Although there were certain constraints, which proved to be a challenge while manipulating the existing structure for a different kind of use, it was over-powered by the desire of settling with an obsolete chunk of mass to a more substantial set up of a new type of space. In the case of Paris, the existing structure now enfolds the ramps as the connecting space between floors and minds of the people working over there. The case of the third case study in New York City totally differs from the other two where a parking garage is developed into luxurious condominiums. A high end residential place with addition of duplex penthouses on the top suffices the context of New York City. The wide spaced columns however proved as a boon to this project as it allowed more column-free space to roam around. Also, the existing structure is believed to uphold the additional penthouses at the top thus making this project quite unique and camouflaging with the busy and posh streets of the city.

Conclusion

The repurposing of existing parking garages brings about an unanticipated transition in the building industry, which aims towards the new trend of going car-less. The giant mass of parking garages whose sole function is just the storage of cars is a potential form of structure that challenges the outdatedness of it by reusing the same. Eventually it reaches out to the transition in the urban fabric and the society by encouraging better mass transit, involvement of mixed use typology of structures and increasing the density in the urban center. While conversion of parking garages makes use of the embodied energy in the existing structure it also at the same time saves time and money associated with the demolition and erection of a new structure. Perhaps more importantly, these converted structures, instead of housing motionless machines, now are filled with livid souls ready to claim and enrich their territories.

References

Andreotti, L. (1995) 'Rethinking Public Space', Journal of Architectural Education. September 1995, pp. 2-3.

Brown, A. (2011) Alternate Occupancy: Increasing Urban Density Through Reuse of Existing Garages, A thesis submitted in partial fulfillment of the requirements for the degree of: Master of Architecture, University of Washington, 2011.

Ellis, C. (1988). 'Car Park into Offices, Paris', Architectural Review, 183 (1094).

Gross, M. (2013) Find a spot: Old garages becoming luxe flats (http://nypost.com/2013/10/30/find-a-spot-old-garages-becoming-luxe-flats/)

Guiney, A. (2001) 'Parking Structures', Architecture, February 2001, pp.65-117.

Hughes, C. J. (2014) Buildings With a Past: Creating New York Apartments From Unlikely Buildings (https://www.nytimes.com/2014/07/06/realestate/creating-new-york-apartments-from-unlikely-buildings.html?_r=0)

Jackle, J. and Keith, A. S. (2004) Lots of Parking: Land Use in a Car Culture, University of Virginia Press, Charlottesville and London.

Klose, D. (1965) Metropolitan Parking Structures; a Survey of Architectural Problems and Solutions, New York, NY: F.A.Praeger.

Macht, W. (2014) 'Flexible Parking Structures as Civic Catalysts', UrbanLand, ULI (http://urbanland.uli.org/infrastructure-transit/flexible-parking-structures-civic-catalysts/)

Marshall, A. (2016) 'It's Time to Think About Living in Parking Garages', Wired (https://www.wired.com/2016/11/time-think-living-old-parking-garages/)

Martin, A. (2003) 'Space-Age Garages That Save Space', The New York Times. September 21, 2003.

Mayer, M. R. (2005) Parking Lots: An Investigation Of Public Space In The Contemporary American City, A Thesis Presented To The Academic Faculty, Georgia Institute of Technology, May 2005.

McDonald, S. S. (2007) The Parking Garage: Design and Evolution of a Modern Urban Form, Urban Land Institute.

McDonald, S. S. (2012) 'The Parking Garage: Design and Evolution of a Modern Urban Form', Journal of the Transportation Research Forum, Vol. 51, No. 2, pp. 127-129.

Mohl, R. A. (1997) The Making of Urban America, Wilmington, DE: Scholarly Inc.

Smith, T. P. (1988) The Aesthetics of Parking, Chicago, IL American Planning Association.

Strasse, K. D. (1984) 'Berlin : ein Parkhaus wird zum Kinderhaus', Architektur + Wettbewerbe, 1984 (118):65-67.

Strasse, K. D. (1989) 'Berlin = Children's Day Home Dresdener Strasse in Berlin', Architektur + Wettbewerbe, 1989 (138):22-23.

Wormster, L. (1997) 'Don't Even Think of Parking Here', Planning. June 1997, pp.10-15.