

An Analysis of Transformable Space Saving Furniture

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ABSTRACT

In most metropolises in the world, people's average living area is getting smaller and smaller. More and more young people tend to move to large cities for more opportunities and more active life style. However, this phenomenon decreases the average living area gradually. Now in Beijing China, the average living area is only 21 square meters per person. Moreover, high population density leads many other problems such as high gap between rich and poor, high energy cost and house price. These are common problems in metropolis nowadays. Transformable space saving furniture is one of the options to solve these problems.

In this report, I will introduce the innovation designs, the hard wares, the application and future development, cost and price, and the important markets of transformable space saving furniture. This report will help people to understand the importance and the potential value of transformable space saving furniture in metropolises.

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1. INTRODUCTION

Transformable space saving furniture which uses less space and provides dual functions is also called dual-function furniture. It has a large potential market in large cities, such as Beijing (China) and New York (the US). These large cities have a lot of features in common. They have large populations, large gaps between rich and poor and a large portion of small space apartments. These features provide a good opportunity for the development of transformable space saving furniture.

Transformable space saving furniture is designed based on the concept that the furniture's design must involve at least two forms of appearance and function. It should have both an ordinary appearance and transformed appearance. A simple example of function would be that you can transform your sofa into a queen sized bed for a guest to sleep on when staying overnight. This saves the owner time, space and money. There are many kinds of transformable space saving furniture, such as coffee tables which convert into dining tables and bookshelves which transform into beds. Transformable space saving furniture is a revolution and innovation. For people who have small budgets for furniture expenditure and who live in limited spaces, transformable space saving furniture might be their only option. One of the challenges for designers of transformable space saving furniture is that the furniture needs to be both aesthetic and functional.

Most people who live in small apartments in large cities are from the middle or lower classes; they might either be young people or new employees. These people

often lack sufficient funds to pay for or mortgage large apartments or fancy furniture. The appearance, price and function of transformable space saving furniture makes it the best option for such people.

In this report, I am going to analyze transformable space saving furniture both mechanically and financially. Mechanically, the important aspects of transformable space saving furniture will be described in detail, and some popular designs will be provided. To cover this furniture's financial aspects, I will analyze some important markets for this product based on numerical data. Moreover, the cost and the price of the transformable space saving furniture will be compared with normal furniture.

2. DESIGN

There are many kinds of classic transformable space saving furniture designs from which customers might choose. In general, these include space saving beds and tables, and other space saving furniture. Space saving beds and tables have more functional properties than any other types of furniture because they are the most frequently used furnishings. These furniture types are useful for conserving a room's space. In this report, I am going to focus on beds, tables and chairs as examples.

2.1 Space Saving Beds

Space saving bed can be divided into two categories, regular beds and bunk beds. A regular space saving bed might be a shelf; desk; or combined bed and desk, in which the desk portion is capable of being transformed into a bed. The bed size can be various depending on the customer's request. Figure 1 gives an example of a shelf, a

desk and a single bed. Figure 1 shows how the desk mode of the piece, employed for study or working at home, can be transformed into a queen sized bed when the owner wishes to sleep. One of the most important parts of this design is that the furniture's owners do not need to move items from the desk when transforming it into a bed, as shown in Figure 2. This design helps owners to utilize the furniture efficiently and expediently. The most important function of this design is that it increases the available space of the room as compared with when the room houses a regular bed and desk. This kind of design is very helpful for people who live in small apartments, and it is also a good choice for small guest rooms.



Figure 1.Examples of space saving furniture: A desk and a bed

<http://www.resourcefurniture.com/space-savers/queen-space-saving-beds/ulisse-desk>



Figure 2. The feature of the design

<http://www.resourcefurniture.com/space-savers/queen-space-saving-beds/ulisse-desk>

Bunk beds are designed mainly for school dormitories or families who have more than one child. This kind of bed is usually formed from two single size beds and a ladder. As shown in Figure 3, both beds can be incorporated into a frame, so that more space is made available for the children to use or play in. The ladder can easily be folded kept on the top bed when folding the bed back into the frame. The bed is also very easy to open out, so that children can do so by themselves. This design is a good choice for families who live in apartments, in cases where each child does not have his/her own room.



Figure 3. Bunk beds

<http://www.resourcefurniture.com/space-savers/queen-space-saving-beds/ulisse-desk>

2.2 Space Saving Tables

Tables have a variety of functions. People usually chose tables that fit the size of their dining rooms. However, sometimes a table may not be large enough to entertain extra guests, or take up too much space for small families or in small apartments. Space saving tables can solve this problem due to their transformable features.

In Figure 4 depicts a space saving table that can be utilized as a lamp table when

it is not needed, and can also be used as a large dining room table when guests are visiting. This table has five extension stages and can be extended up to 9.5 feet long. The main impact of this design is its space saving ability when it is not in use, and its provision of a large entertaining space when the owner needs a dining room table. Figure 5 shows the fully extended version of a transformable space saving table. It has a very nice design for people who live in apartments. It is also a choice for people who already have regular dining room tables but do not often receive guests.



Figure 4. Space saving table

<http://www.resourcefurniture.com/space-savers/space-saving-tables/goliath>



Figure 5. Extended space saving table

<http://www.resourcefurniture.com/space-savers/space-saving-tables/goliath>

Figure 6 shows another type of space saving table which can be changed to a billiard table from a dining room table. This is a classic design of dual-function furniture. However, since a large space is required to play billiards, this table maybe not suitable for people living in apartments. This design is very fashionable which makes it attractive to young people. It can also form a part of a house's décor.



Figure 6. A dining room table that can be turned into a billiards table

<http://notesofanarchitect.blogspot.ca/2012/12/nice-billiard-table-space-saving-re-use.html>



Figure 7. Space saving chairs

<http://www.internethomealliance.org/modern-rocking-chairs/>

2.3 The Space Saving Chair

The space saving chair has become very popular in recent years. The main function of this kind of chair is that it saves space when not in use. Figure 7 is one example these chairs; the chairs as illustrated can easily be assembled and taken apart.

Such chairs are very useful for people who are in a habit of inviting friends to visit their homes. The one in Figure 7 is a very new product designed by Dripta Roy, which he calls the “Magic Chair”. These chairs can be assembled by fitting their parts together. However, only the back of the saving chair is made of wood because the other materials it utilizes are easier to assemble. In addition to its functional advantage, the space saving chair is less costly than a regular one.

The designs of space saving furniture pieces not only make them transformable and space saving but are also aesthetically pleasing and resemble works of art. Transformable space saving furniture is a revolution in furniture design. Since transformable space saving furniture is new, it possesses much room for innovation in both its design and on the future market.

3. ASSEMBLY HARDWARE

Special hardware required to assemble transformable space saving furniture are not usually used on regular furniture because they have different functions. The main functions of the special hardware are to ensure the transformable parts can be moved smoothly and safely, and it also needs to be sufficiently strong to resist the forces involved in its regular use.

3.1 Special Hardware

In the red circle of Figure 8 is one of the examples of special hardware that have been used on transformable space saving furniture. This type of hardware is mounted on the sides of bed frames in order to connect the shelf and bed frame. The specialty

of this hardware is the items on the shelf can be remaining in place when the shelf is moved up or down. The shelf can also be used as legs when the bed is in use, as it shows in figure 9.



Figure 8. Special hardware

<http://www.baraldiarreda.it/altri-mobili-trasformabili/rete-cf97/>



Figure 9. Special hardware

<http://www.baraldiarreda.it/>

Furthermore, in the red circles of Figure 10, it indicates another type of special hardware. It is an auto-lock system which is placed between the gaps of the frame and the bed, in order to give the entire piece of furniture a clean look. The function of this

special hardware is to provide safety after transformations. When the user wants to place the bed back into the frame, the small handle will be automatically locked on the frame. Because of these functions, this type of hardware not only needs to be able to facilitate smooth assemblies and transformations, but also needs to be sufficiently stable to resist the forces involved in its regular use.



Figure 10. Auto-lock system

http://www.baraldiarreda.it/altri-mobili-trasformabili/altea-book_cabrio/

3.2 The Sliding System

Transformable space saving table comes in many different designs. This system is mainly sustained by a sliding system which makes it possible for the table to be

extended and pulled back. The sliding system is usually hidden under or within the table, so that the table still possesses a clean appearance. Figure 11 is an example of a sliding system. In order to make the table extend as far as possible, the designer combines together numerous sliding pieces. The table in Figure 11 can be extended from 17 inches to a maximum of 115 inches. This provides many options for the length of the table.

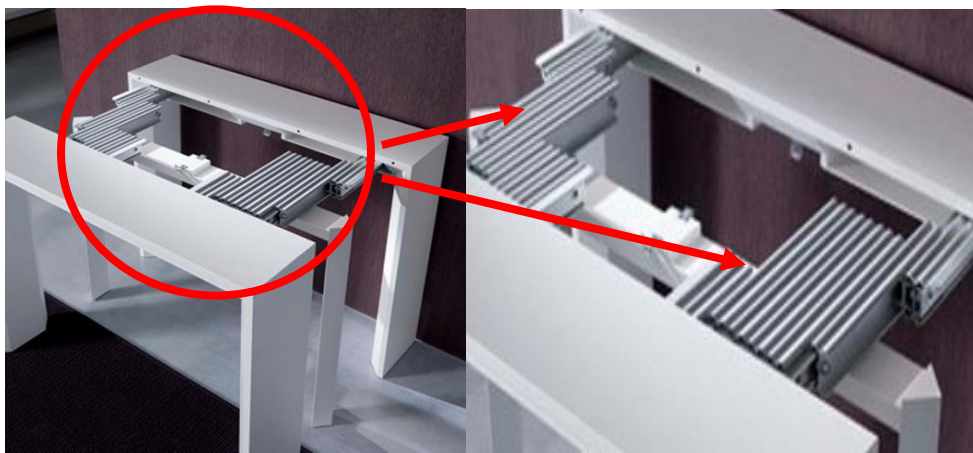


Figure 11. The sliding system

<http://www.resourcefurniture.com/space-savers/space-saving-tables/goliath>

4. APPLICATIONS AND FUTURE DEVELOPMENT

Building designers can cooperate with transformable space saving furniture designers, so that the furniture will sufficiently fit the layout of the apartment and save even more space. Recently, an innovation project for a passive house was designed and constructed by students of the Rosenheim University of Applied Sciences, in Germany. The building, which can be, “Assembled and disassembled several times”, is an energy saving house with a combination of moveable, structural and transformable furniture. This project won second place at the Solar Decathlon

Europe competition of 2010. It provides various functions and large spaces for a two-person occupancy house. This new design not only saves the house's energy, but also uses all the possible space of the home's limited area.

Transformable space saving furniture is one of the most important functions of this passive house design. Moveable wall structures; and transformable beds, sofas, desks and dining room tables; as well as hidden televisions and kitchenware make all of a home's space and furniture dual in function. Figure 8 shows a rough layout and the general idea of this design. The red circles indicate the transformable furniture present in the house which conserves its space and energy.

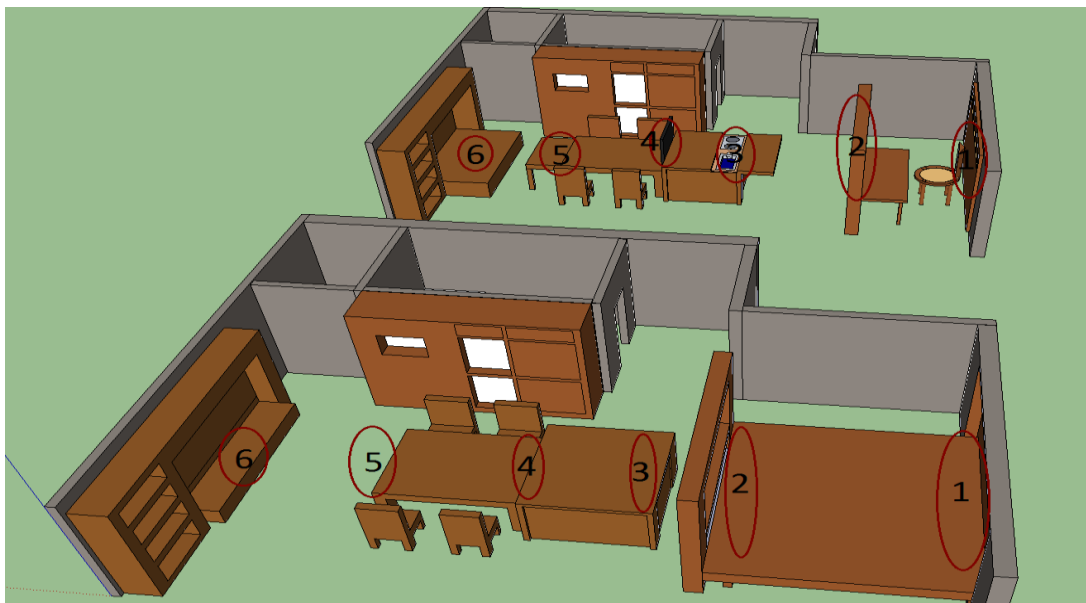


Figure 12. A simulation layout of the Ikaros Bavaria Team design (Drawn by Shiyao Wang)

The red circle around Number 1 indicates a transformable bed which can be pulled back into the wall frame for making more space in the bedroom. The other part of the bedroom has a movable wall and hidden desk which are incorporated under Number 2. The bedroom can be transferred into an office when the bed is replaced in

the wall and the desk is pulled out. Moreover, this wall can be moved toward the bed or in another direction depending on which room requires more space. In the living room, the kitchenware under Number 3 is beneath the surface of the kitchen island, and the movable surface also provides additional space for cooking. Number 4 is a hidden television which is also placed under the surface of the kitchen island, and which can be pulled out when needed. The dining room table, designated as Number 5, is an extendable table which can serve up to eight people. The last item is a sofa that can be transferred into a bed for guests. With so many items of transformable furniture and movable design, all spaces are adequately utilized in this limited area.

The main purpose of this design is to introduce an energy system innovation. [\(Building from the Rosenheim University team, 2010\)](#) However, transformable space saving furniture plays an important role in this energy saving house. This furniture makes it possible to design the smallest possible design the area of construction. The movable wall structure and the space saving bed and table are the key means by which two rooms can be easily transformed into one. This saves initial costs, and the building's energy and space. This design is also very suitable for small area condos in large cities. It offers an excellent opportunity for the development of transformable space saving furniture.

5. THE COST AND PRICE

Based on my research, there are only a few companies which design and produce transformable space saving furniture. These products are not yet popular or known to

the general public. The main reason for this is that the price of these products is too high for people who live in small apartments. The price range of a queen sized transformable bed with a bookshelf is from \$4,000 to 21,000 CAD, although a simple transformable sofa bed costs only around \$1,000 CAD. The huge price difference makes it difficult for these new products to be successful.

Resource Furniture, as an example, is one of the leading brands of this kind of furniture. The main material of their products is High Density Fiberboard (HDF), and all of their products are made in Italy. These are the main reasons that their products have a very high cost. According to David Hooper, who is a designer and a distributor for Resource Furniture in Vancouver, the products have not been doing very well in Vancouver. He discovered that most customers were only interested in their innovative designs, but were not willing to spend much on them. Moreover, because of their low selling rate, the company needed to move their showcase room from the center of Gastown to a cheaper townhouse on Richards Street.. In my opinion, moving the company's production factory to a developing country would be a good way to solve this problem. The consequent production cost would thus be much cheaper than in Italy.

There are many options companies like Resource Furniture can choose for relocating their manufacture factory. China and South Asian countries, such as India and the Philippines, have relatively lower labor costs and land prices, along with more regulated markets than those of other developing countries. As Chart 1 shows, Europe is the highest labor cost country, China is the lowest and the Philippines is the second

lowest. These countries are also the first choice for many other manufacturing companies. For example, China has the world's strongest manufacturing power, while its government extends financial support to foreign manufacturing companies. Chart 1 shows the labor costs of different countries in 2008 as compared with those of the US. As we can see, the labor costs in Europe are 33.5 times greater than those of China, which means that China's costs are only 3% of those of Europe. However, the new leaders of China have set the goal of increasing 30% of the minimum wages of Chinese laborers in 2015, so the future fixed labor costs may not be stable. ([China Vs Europe - study in labour competitiveness, 2011](http://gulzar05.blogspot.ca/2011/04/china-vs-europe-study-in-labour-competitiveness)) Taxation preference is another reason that many manufacturing companies choose China as their first option. This is since the Chinese government will return taxes and pay loan subsidies to foreign manufacturing companies. With these preferential policies, foreign companies will save many additional costs.

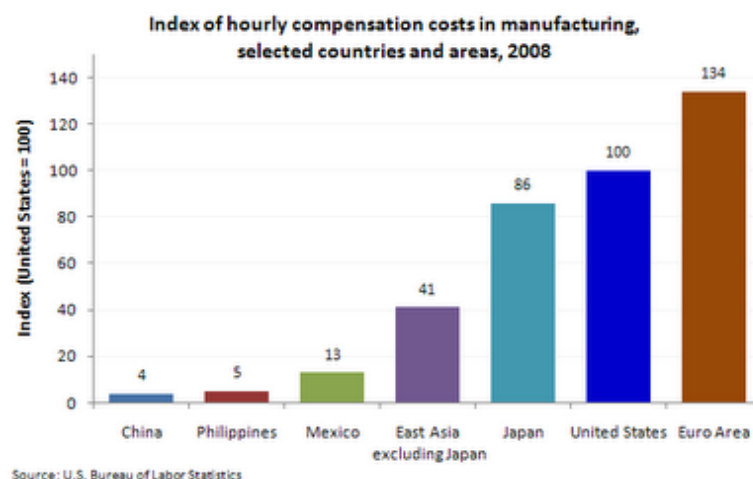


Chart 1. A comparison of labour costs in different countries

<http://gulzar05.blogspot.ca/2011/04/china-vs-europe-study-in-labour.html>

6. THE IMPORTANT MARKETS

Urbanization is increasing very quickly in developing countries, including China, and even in developed countries, like the US. Increasingly more people tend to move to the big cities for their careers. This is a good opportunity for the development of transformable space saving furniture in these cities. The purchasing power of a city or country directly affects the market of transformable space saving furniture. The price of transformable space saving furniture is from \$2,000 to \$24,000 US dollars, which means that the market should have a relatively high purchasing power. Moreover, in depending on the function of transformable space saving furniture, the target market should be cities having a high population density. Population density is measured by dividing the population by the total area of a city, and shows how crowded a city is. A city's population density will affects its average living area, and the smaller the average living area, the better will be its market for transformable space saving furniture. In the following paragraphs, some important markets will be analyzed.

6.1 The Chinese Market

China is the second largest economic entity in the world, with a rapidly increasing GDP in recent years. Even under the effects of 2008's global economic depression, China still has more than an 8% increasing GDP rate. (Tian, 2012) The Chinese market is one of the most important of the world's markets for many industries. Furthermore, in recent years, urbanization is developing at an unstoppable speed and will continue to do so in the next few decades. The urbanization level

increased from 18% in 1987 to 45% in 2010. Urbanization will decrease the average living space and increase the value of limited space. Also, due to urbanization, people tend to live in smaller space apartments. As Chart 2 shows, in China, the fraction of the urban population has been very high in the last decade. Some researchers predict that it will keep increasing in the next 30 years. This is the perfect opportunity for the development of transformable space saving furniture. It is also a good opportunity for introducing this kind of furniture to the Chinese people, who need such products to acquire extra space. In Table 1, we can see that four Chinese cities have been named the world's top 20 cities in terms of their population density. These cities are also the richest cities in China, with the highest urbanization speed and with relatively high average salaries, as is shown in Table 2. Thus, these cities are among the most suitable for the development of transformable space saving furniture.

Moreover, the average property price of a city will also affect the market of transformable space saving furniture. Table 3 gives a ranking of the average property prices of a metropolis in China. The average property price in Beijing is 33,288 RMB per square meters and the Beijing people's average annual wage is 50,415 RMB. With these numbers we can see that it is very difficult for young people to buy a large apartment in Beijing. As people in Beijing tend to buy or rent small apartments, it is highly recommended to introduce transformable space saving furniture to people who live in large Chinese cities.

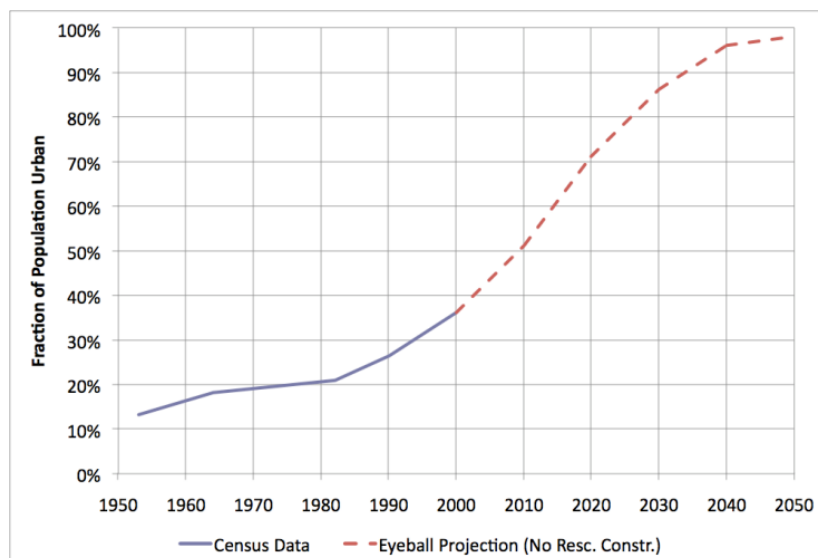


Chart 2. Chinese urban populations

<http://blog.chinasecurities.com/2010/11/chinas-rural-growth-spurs-demand-for-more-copper/>

Rank	City / Urban area	Country	Population	Land area (in sqKm)	Density (people per sqKm)
1	Mumbai	India	14,350,000	484	29,650
2	Kolkata	India	12,700,000	531	23,900
3	Karachi	Pakistan	9,800,000	518	18,900
4	Lagos	Nigeria	13,400,000	738	18,150
5	Shenzhen	China	8,000,000	466	17,150
6	Seoul/Incheon	South Korea	17,500,000	1,049	16,700
7	Taipei	Taiwan	5,700,000	376	15,200
8	Chennai	India	5,950,000	414	14,350
9	Bogota	Colombia	7,000,000	518	13,500
10	Shanghai	China	10,000,000	746	13,400
11	Lima	Peru	7,000,000	596	11,750
12	Beijing	China	8,614,000	748	11,500
13	Delhi	India	14,300,000	1,295	11,050
14	Kinshasa	Congo	5,000,000	469	10,650
15	Manila	Philippines	14,750,000	1,399	10,550
16	Tehran	Iran	7,250,000	686	10,550
17	Jakarta	Indonesia	14,250,000	1,360	10,500
18	Tianjin	China	4,750,000	453	10,500
19	Bangalore	India	5,400,000	534	10,100
20	Ho Chi Minh City	Vietnam	4,900,000	518	9,450

Table 1. The top 20 cities of highest population density in the world

<http://www.citymayors.com/statistics/largest-cities-mayors-1.html>

Average Wages and Social Security Contribution Caps Across China (Wages based on 2010 calendar year)				
City	Province	Avg. Annual Wages (RMB)	Avg. Monthly Wages (RMB)	Max Monthly SI Contributions
Guangzhou	Guangdong	54,495	4,541	13,623
Shenzhen	Guangdong	50,460	4,205	12,615
Beijing	Beijing	50,415	4,201	12,603
Shanghai	Shanghai	46,757	3,896	11,689
Dongguan	Guangdong	46,576	3,881	11,644
Suzhou	Jiangsu	45,566	3,797	11,391
Nanjing	Jiangsu	45,444	3,787	11,361
Dalian	Liaoning	44,617	3,718	11,154
Changzhou	Jiangsu	44,200	3,683	11,054
Nantong	Jiangsu	43,500	3,625	10,875

Table 2. The top 10 highest average waged city in China

<http://www.citymayors.com/statistics/richest-cities-2005.html>

Rank	City Name	Average Price(RMB)	Increasing Rate
1	Beijing	\$33,288.00	2.11%
2	Shanghai	\$26,825.00	1.05%
3	Sanya	\$23,163.00	6.71%
4	Wenzhou	\$22,716.00	2.39%
5	Shenzhen	\$22,218.00	4.39%
6	Hangzhou	\$19,938.00	2.25%
7	Xiamen	\$19,559.00	6.21%
8	Guangzhou	\$17,488.00	1.30%
9	Nanjing	\$15,529.00	1.99%
10	Ningbo	\$14,265.00	17.00%

Table 3. A ranking of the average property prices of cities in China (1 CAD is around 6.2 RMB)

<http://www.cityhouse.cn/default/forsalerank.html>

Most Populous Places	
NAME	POPULATION
1 New York city, NY	8,175,133
2 Los Angeles city, CA	3,792,621
3 Chicago city, IL	2,695,598
4 Houston city, TX	2,099,451
5 Philadelphia city, PA	1,526,006
6 Phoenix city, AZ	1,445,632
7 San Antonio city, TX	1,327,407
8 San Diego city, CA	1,307,402
9 Dallas city, TX	1,197,816
10 San Jose city, CA	945,942
11 Jacksonville city, FL	821,784
12 Indianapolis city (balance), IN	820,445
13 San Francisco city, CA	805,235
14 Austin city, TX	790,390
15 Columbus city, OH	787,033
16 Fort Worth city, TX	741,206

Table 4. Rank of urban population in the US

<http://www.census.gov/2010census/popmap/>

6.2 The US Market

The US as the world's economic leader has a large market for many kinds of products. However, only some of the larger US cities are suitable for the development of transformable space saving furniture. Indeed, this furniture's market in the US depends on the area and population of each city. Table 3 shows the ranking of urban

populations in US cities, and it indicates that New York City has the largest population in the US. Just as in other large American cities, the gap between the rich and poor is very large in New York City. People who live in small area apartment with low wages are the main target customers.

7. CONCLUSION

Nowadays, people tend to move to metropolises for their greater employment opportunities and progressive lifestyles. This trend towards urbanization causes cities to have relatively less available free space, and also increases the price of their properties. People who live in large cities can only afford small apartments or condos. This provides a good opportunity for the development of transformable space saving furniture.

Transformable space saving furniture is an innovative product that has much opportunity for future development, and a huge potential market in metropolises. The designs of transformable space saving furniture can be even more variable than those of the beds, tables and chairs on which I focused for this paper. Transformable space saving furniture provides small properties with greater space and multiple functions. Furthermore, transformable space saving furniture can be made more effective and efficient were its designers to cooperate with architects and engineers in its manufacture. Its designs could then be combined with the structures and layouts of buildings, so that the functions of both the furniture and buildings could be maximized. These kinds of innovative buildings could also save energy and lower the

cost of living for people living in large cities.

Based on my research, the limitation of transformable space saving furniture is its overhead manufacturing costs and product price. Companies need to lower manufacturing costs so as to target a greater number of middle and lower class customers. Change the manufacturing location is one way by which the overhead costs and product prices might be decreased. Moreover, Asia and North America are two important sites for marketing transformable space saving furniture, since these two regions have the highest international population densities and the largest gaps between rich and poor classes.

In order to improve the future of transformable space furniture, its designers need to create more innovative ideas, and cooperating with architects and engineers is another way they might achieve success. Lowering overhead costs and furniture prices is another element for serious consideration.

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