Abstract

This paper introduces an approach to explore an assumption and a question. The assumption concerns reclaiming Ramses Station in Cairo, Egypt taking into consideration behavior attitude can come over users' problems. The question is: “If Ramses Station is a Hub in the city, how the designer (before and afterwards) deals with it regarding urban design paradigm to solve the problems of the users?” The contribution gives a tool to improve the traffic movement in Cairo, taking into account, the design principles and the dimension of urban design discipline. It collects between the different scopes of criteria in other fields.

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Keywords: Transportation hub; smart transportation; urban design; universal design; urban typology

1. Introduction

Generally speaking, the central station operates the city infrastructure. It aims to provide a quality and range of facilities across the stations that will ensure stations continue to contribute to the success of transportation in this country. Stations, their facilities and amenities, together with the multi-modal transport connections they offer, form an essential part of their passengers’ overall journey experience. They also perform an important role for local communities, which regard them as civic buildings in their own right. Ramses Station is the central mode of transportation in Cairo metropolitan city. Today, the most users in Ramses Station (RS) and Ramses Square are holding problems such as permeability,
connectivity and inflexible exchange with other modes of transportation. It seems as the center connects northern and southern parts of Egypt. The problems take place in Ramses Square configures the framework of the research justifications. The paper aims at introducing an approach to explore an assumption and questions. The assumption concerns reclaiming RS hub taking into consideration behavior attitude and principles of the temporal dimension can come over users' suffering. In addition, it revolves around three primary questions as: Is RS seems to be designed to accommodate the concept of the Hub? What are the indicators, determinations, considerations and principles used to explore this issue? If RS is a Hub in the City, thus how the designer (before and afterwards) deals with this issue to solve the problems of the public users in Ramses downtown? The paper starts presenting a deeper understanding about the concept of the hub, historical transformation of this term, and the crucial determination, criteria and principles that govern the Hub success. In addition, the study of different Avant projects performs different ideas in Ramses square to explore the extent of using these considerations. Generally speaking, the research outcomes reinforce the principles of the sustainable transportation hub that moderate the Square context through comprehensive plans and viable/deliverable environment. The contribution comes from introducing a tool to improve the traffic movement in the big cities, taking into account, the design principles of the functional dimension in the urban design discipline. It collects between the different scopes of criteria in other fields as city planning, traffic movement and transportation systems.

1.1. On concepts: Literature review

Specially speaking, this issue discusses some common concepts; hub, typology and robustness. Some literatures describe the Hub, in the area of computer science, as "the central portion of a wheel, propeller, fan..., through which the axle passes", (Collins, 2005) and (Grammarly, Inc., 2013), Figure 1. In addition to another concept, the hub is "... a hardware device to network multiple computers together. It is a central connection for all the computers in a network Information sent to the hub can flow to any other computer on the network....." (Hub Definition). In Urbanization field, the hub concept is the network of urban corridors that link and cross in and around a city or town. Hub functions, namely, interchange with other modes of public transport, where traffic exchanges across several modes of transportation. The Central Station as a Hub is the most significant bottleneck in the city. It limits the capacity, performance and connectivity of commuter and long distance passenger services terminating in the city or passes through the Hub, (Henry). It, therefore, adversely affects journeys between the city’s regions. It also limits the amount of trains, from across the district and beyond, that can serve to the airport, as well as those that can access relevant distribution centers for freight. Smart hub networks various transportation moods in a safe, efficient, and environmentally sound manner, (Figure 3). Hubs, as an interface structure, provide a greater versatility within the transportation system, through a concentration of flows, (Siemens Mobility, 1996).

Typology means classify each sample separately in addition, arranged these patterns in categorization without any exposure to the morphological relationships. Typology used to classify and file (categorize) types between a large number of things; that participate in the features, (Watson, Plattus, & Shibley, 2003, pp. 6-8.1). Spirally speaking, Hub can be categorized in many ways: by size, use, relate to the context, style, predominant function, architectural form, location, and so on. This article is concerned with the interplay of form and use, how the physical environment influences activities, socialization, or only repose. The classification is based on a mix of form and use, moving from smallest to largest in size. The typology is not necessarily exhaustive; rather it is presented as a starting point for design thinking about Hub areas.
Fig. 1. The concept of hub versus switch driven from computer science
Source: The Free Dictionary (2013)

Fig. 2. The concept of transportation hub
Source: Rodrigue (1998)

Fig. 3. The smart hub holds different mode of transportation
Source: Siemens Mobility (2016)
Several literatures manage the transportation as an entail component of in urban design elements. Edward Steinfeld gets the enrollment of urban transportation for Universal Design, (Watson, plates, & Shibley, 2003, pp. 7.1-2). He adds seven principles illustrated in Figure 4. Otherwise, the congress of New Urbanism mentions the Smart Transportation (ST) as a tool for raising the quality of life in cities and town, (Steuteviller, 2009); (Gordon, 2005). The ST aims to manage capacity by integrating land use and transportation planning. It has many purposes, including providing local and regional mobility, offering access to homes and businesses, and supporting economic growth, (Biehler & Kolluri, 2008).

![Fig. 4. Principles of Universal Design for Urban Transportation](image)

![Fig. 5. The ideal smart transportation](image)

Source: Biehler and Kolluri (2008)
1.2. The case of Ramses Square, Cairo, Egypt

Ramses Square holds the central Railway station in Cairo; it is the central rail entrance and the station for transportation where commuters arrive and leave. Today, the most users in Ramses Station (RS) and Ramses Square are suffering from three central problems, the permeability, connectivity and inflexible exchange with other modes of transportation. It seems as the center connects northern and southern parts of Egypt. The problems take place in Ramses Square configures the framework of the research justifications. Thus, the station was chosen as a case study according to set criteria based on its importance as public transport in Cairo. In addition, a number of transport facilities exist within Ramses Square (Figure 6).

The history of Ramses Square goes back to the early Islamic extensions of the Fatimid City. This area was the northwestern corner of the fortified city in the direct neighborhood of the old course of the river Nile. In the late Islamic period, this course moved to the west where the quarter of Bulaque was rising with the old port. A canal between the Nile and the northern boundary of the city served the inhabitants with water and a gate leading directly to this canal and to Bulaque. Today, this canal transformed into one of the urban highways (Ramses Street). In the process of re-planning Ramses Square, many urban design proposals, have taken place. In 2007, the Egyptian Governorate builds a parking garage in front of the square's train station. Through all historical periods, the use and functions of public space have changed. In medieval times, the area in front of the historic gate was more or less the edge of the city, but the square in front of the station played an important role at the entrance to the city in the 20th century.

Fig. 6. The Ramses Station and the surrounding context
Source: Radwan and El-Shahat (2012)

2. The Field Survey

The process of the field survey aims at reveals the opportunities and problems of the site. Table 1 shows the techniques and methods of the required task. They encompass three main phases: appreciate the context, site analysis, and getting out the concluded remarks.

Table 1. The survey techniques and their related methods

| Survey Technique                  | Methods.                                                                 |
|-----------------------------------|--------------------------------------------------------------------------|
| 1. Appreciate the context.        | 1. Data collection and content analysis.                                 |
| 2. Site analysis: site characteristics in Ramses Square | 2. Designing an approach followed by analyzing the collected data: the site problems and the site potentialities |
| 3. Concluded remarks.             | 3. Further interpreting of analytical the case study, survey outcomes.    |
2.1. The typology of problems and potentialities: Survey outcomes

Ramses Railway station in Cairo is the central rail entrance and the central station for transportation in Cairo where commuters arrive and leave all year round. The lack of well-developed transportation and communication systems made it difficult to diffuse development from Cairo to other parts of the country, (Rakodi, 1997). North east of the railway station lies a former warehouse (a Brownfield) area. This Brownfield zone displays exceptional potential for urban transformation. It connects heterogeneous realm of Central Cairo. In addition, it offers huge areas of abandoned former railway territory for a new city development.

The underpasses, leading to the underground stations and to the central train station building are uncomfortable, just the opposite of inviting. However, as an important hub it is a bustling place, bringing crowds of people together, providing opportunities for informal jobs and trade. The buildings surrounding Ramses Square are partly of high quality, above all the central station building itself and some others like the Railway Organization Building and the National Post Building near to the Railway Museum. Otherwise, a large extent the spatial boundary of Ramses Square is indistinct and of bad quality. To improve the situation means hard work in the future but offers many chances not only for the station itself, but for the whole inner city.

Furthermore, several literatures discuss with the problem that the RS represented in functional and environmental issues (Radwan & El-Shahat, 2012); (BECT; AREP, 2009); (Quilligan Architects, 2009). The problems of traffic congestion and have linked to rev up environmental pollution. High levels of air pollution make a suspended particulate matter. It leads and is generated by traffic windblown dust (WHO/UNEP, 1992). As a result of rapidly increasing population, inadequate services and falling short government rejoinders, transportation conditions have determined, and the capacity of Transportation system to manage demand from the growing urban population is nearing the breaking point. The average travel speed in a business day does not exceed 10km/h, with many areas experiencing 5-6km/h during rush hours. In addition, the multi layers of traffic network: an elevated highway and loop ramps dismember the spatial continuity of the square. Highly frequented traffic lanes separate the central station and its square from Downtown Cairo and Old Cairo. The underpasses; leading to the underground stations and the central train station building, are littered, poor lit and lack ventilation. The current traffic system disregards the pedestrian flow entirely. This is evident in the undefined pedestrian paths and lack of oriented public activities. Thus, the concealed remark from these analyses reveals the need for new methods to design and analysis the hub to fit the Egyptian context. Not only, has it depended on functional and environmental problem but also to put attention towards the other contributions. The following topic discusses the hub principle gained from different paradigms and different field of practice.

3. Learned Lessons: The principles of transportation hub

Throughout the world, governments recognize the importance of safe transportation. In many countries, the emphasis of urban transportation planning has shifted from highway infrastructure to mass transit systems. New mass transit projects conceived regularly as part of showcase urban development as in Barcelona prior to the Olympics. Cities such as Sao Paolo in Brazil are rapidly expanding their public transport systems to overcome the massive congestion caused by unplanned growth. In the U.S., the prototypical automobile-oriented country, the environmental problems caused by overreliance on automobiles and fossil fuel consumption has led to an expansion of public mass and transportation systems like those in Los Angeles, Washington DC, Atlanta and the Bay Area of Northern California. Worldwide, station expansion projects often include connections to rail systems with “multimodal”
transportation hubs. Table 2 gives a short brief of urban design paradigm using Urban Typology as necessity principles for efficacy analysis. The systems of typology except that they cannot be a “one-size-fits-all” approach for planning and developing hubs. Each area offers possibilities based on its urban setting (e.g., urban vs. suburban), transportation function and level of development towards the hub notion. Many identified station areas offer little more than vast parking lots while others are easily accessible by many modes; they are already vibrant places of activity and destinations in themselves. On the other side, several literatures adopt a broad understanding of urban design, which sees urban design as more than simply the physical or visual appearance of development of any place in the city, and an integer (i.e. joined-up) and integrating activity, (Carmona, Tiesdell, & Oc, Public Places- Urban Spaces: The dimensions of Urban Design, 2010); (Ingarta, 2012, p. 8); (Grava, 2004). Typology of Principle provides several dimensions that give a contribution to Hub design. These dimensions are tangible with issues (i.e. Human attitudes). Carmona, et. el. (2010, pp. viii- ix) describes the better understanding of human attitudes through six dimensions (Table 2).

Table 2. The research framework in transportation Hub

| Universal Design for Urban Transportation | Smart Transportation (ST) | The Principles from intersected field of professional practice |
|------------------------------------------|---------------------------|---------------------------------------------------------------|
| Principles of Universal Design, (Watson, Plattus, & Shibley, 2003, pp. 7.1-2); (Steinfeld, 2001): Equality Providing for seamless continuity Way finding assistance Negotiating level changes in terminals Negotiating level changes in terminals Vehicle loading Ticketing and security Accessibility Affordability Safety and security Travel convenience Emissions and Noiseless | The principle of ST derivative from CNU: Multitude of mode of transportation Land Use Community Environment Station Accessibility Affordability Safety and security Travel convenience Emissions and Noiseless | The Principles gained from traffic engineering, (Metrolinx; IBI Group; Provincial Representatives; Arcturus Reality Corporation, 2011): SEAMLESS MOBILITY: Seamless integration of modes at the rapid transit station. Safe and efficient movement of people with high levels of pedestrian priority. A well-designed transit station for a high quality user experience. Strategic parking management. PLACEMAKING: A vibrant, mixed-use environment with higher land use intensity. An attractive public realm. A minimized ecological footprint. SUCCESSFUL IMPLEMENTATION: Effective partnerships and incentives for increased public and private investment. Flexible planning to accommodate growth and change. |

4. The Proposed Approach

The paper suggests a tool to design and analysis urban hub projects. This innovation considers hub as an exchanging point rather than a focal. It deals with principles gained from the interrelated field of practice. The typology of urban design paradigm can give a new contribution to fit the human needs in the hub projects. Therefore, it is necessary to make a tool to test the principles of the professional field of practice on an Egyptian transportation system. In addition, it extends to their relationship with the six common dimensions (Table 3and Figure 7). Thus, the paper formulates a comprehensive umbrella of principles. The comprehensive principles can be used as a tool for new design or analysis an existing project. In addition, the proposed approach is built to cover the problem in the Egyptian scene. It tries to mix between the technical principles of transportation in one side and the contribution of urban design through the behavior dimension. The proposed approach chooses to separate the collected principles into invariable that must be applied and variable principles which hold a wide modification in the Egyptian context (Table 4).
Table 3. The four common dimensions of urban design

| PD | FD | TD | BD | MD | ED |
|----|----|----|----|----|----|
| Perceptual Dimension (visual, Evaluation, Cognitive, Interpretation) (Carmona, 2003) (Carmona, et al., 2010): | Functional Dimension, (Bentley, et al., 1995): | Temporal Dimension, (Marshall, 2009, p. 77): | Behavioral Dimension, (Jehl, 1987); (Ilewelyn, 2010); (Evans, 2012): | Morphological Dimension, (The Community Redevelopment Agency of The City of Los Angeles 2012) | Environmental Dimension |
| What attributes are different to other cities and what is the same? Is your city the best option? How should it be done? Why should it be as it is? When should it be? If the skyline changes, which buildings you would miss? | Functional Dimension Accessibility/Permeability Diversity and variety Variety within Public Realm | Place elements are complex, dynamic, collective entities in which the parts are partly in cooperation, partly in competition. Environments constantly change over time and continue to adapt to local conditions and requirements. Interactions between local components give rise to larger scale outcomes that were not anticipated. | Enclosure/ Containment Clear edges Communication factors affecting the performance of such places and means of access and movement to the car parking space around the pool of housing units or positions of other activities. The quality within the space. Personalization; Individual's personality and attributes that distinguish it from others, and make it unique in the way it interacts with the surrounding environment. The social context. The cultural background Equality between all users. Right of the individual alone with his own. Freedom to act within the public spaces. | A carefully conceived interaction of building volumes and open spaces. A strategic arrangement of building forms. A project-wide organization which differentiates one zone of activity from another, while expressing their necessary interdependence within the whole of the project and the related downtown area. An integrated organization of all open spaces. A pleasant landscape environment unifying public and private areas. | Noise, air quality and water quality concerns. Traffic Mitigation will deal with the local traffic capacity improvements required |

Fig. 7. The four key dimensions and their six derivatives
Table 4. The proposed matrix urban design dimensions versus various types of principles

| Technical Dimensions | Urban Design Dimensions | Morphological | Environmental |
|-----------------------|------------------------|---------------|--------------|
|                       | Perceptual             | Temporal      | Behavioral   | Morphological | Environmental |
| Aesthetics            | Accessibility          | Complexity    | Enclosure    | A carefully   | Noise Air quality/ water quality |
| Meaning               | Permeability           | Dynamic       | Containment  | conceived     | Traffic Mitigation |
| Identity              | Diversity              | Cooperation   | Clear edges  | interaction of |
| Visual                | Variety                | Competition   | Communication| building volumes|
| Quality               | within                  | Adaptability  | Quality       | and open spaces.|
|                       | Public Realm           | Interactions  | Personalisation|
|                       |                        |               | Social Context|
|                       |                        |               | Cultural background|
|                       |                        |               | Equality       |
|                       |                        |               | Freedom        |

**Principles of Universal Design**
- Equality
- Seamless continuity
- Wayfinding
- Assistance
- Negotiating level changes in terminals
- Vehicle loading
- Ticketing
- Security

**Principles of Sustainable Design**
- Multitude of mode of transportation
- Land Use
- Financial
- Community
- Environment
- Station
- Accessibility
- Affordability
- Safety
- Security
- Travel convenience
- Emissions
- Noiseless
- Seamless integration
- Safety movement
- Efficient movement of people
- High level of pedestrian priority
- High quality user experience (Transit Station)
- Strategic parking management

**Aesthetic/ Functional Dimensions**
- Aesthetics
- Meaning
- Identity
- Visual
- Quality
- Accessibility
- Permeability
- Diversity
- Variety
- Respect
- Adaptability
- Cooperation
- Competition
- Enclosure
- Containment
- Clear edges
- Communication
- Quality
- Personalisation
- Social Context
- Cultural background
- Equality
- Freedom
- Noise
- Air quality
- Water quality
- Traffic Mitigation

**Variables**
- Financial Community/Affordability
- High level of pedestrian priority
- High level of pedestrian experience
- Mixed use environment
- An attractive public realm
- Accommodate growth and change

**Constants**
- Equality/Seamless continuity
- Wayfinding/Assistance/Negotiating level changes in terminals
- Vehicle loading/Ticketing/Security/safety movement/strategic parking management
- Higher land use intensity
- Higher land use intensity
- Effective partnership

**Principles gained from Traffic Engineering**
- A vibrant, mixed-use environment
- High land use intensity
- An attractive public realm
- A minimized ecological footprint
- Effective partnership
- Incentives increased public and private investment
- Flexible planning
- Accommodate growth and change
5. Conclusion

This paper introduced an approach to design sustainable Hub stations. It is based upon an understanding of travelers' needs and passenger concerns balanced by good proportion and skilful handling of exterior and interior volumes. There is general agreement across all stakeholders about the high importance of safety/security, information to passengers, car parking facilities, buying tickets and waiting for modes in reasonable comfort, the Hub station project comprehensively addresses the ecological, social and economic issues in the context of its surroundings. The sustainable approach would be to concentrate on; successful connectivity in the intermediate area, ensuring safety for traffic and pedestrian circulation, assessing the environmental design requirements for the intermediate project, ensuring equitable passenger services, and revitalizing economically healthy downtown areas and suburban centers. The railway station has to be modernized for high speed trains and the reorganization of inner-city bus lines, extended tram lines, taxes and parking space in connection with the relocated highway in the form of a new building a central hub is one of the proposals.

The paper presented a deeper understanding about the concept of the hub, historical transformation of this term, and the crucial determination, criteria and principles that govern the Hub success. In addition, the case study hold different ideas in Ramses square to explore the extent of using these considerations. Generally speaking, the research outcomes reinforce the principles of the sustainable transportation hub that moderate the Square context through comprehensive plans and viable/deliverable environment. It extended to provide for integrated hubs network in Egypt. The problems take place in Ramses Square configured the framework of the research justifications. In addition, it tries to answer three major questions: Is RS seems to be designed to accommodate the concept of the Hub? What are the indicators, determinations, considerations and principles used to explore this issue? If RS is a Hub in the City, thus how the designer (before and afterwards) deals with this issue to solve the problems of the public users in Ramses downtown? The research outcomes reinforced the principles of the sustainable transportation hub that moderate the Square context through comprehensive plans and viable/deliverable environment. It extents to provide for integrated hubs network in Egypt.

In the current paper, the four common dimension of urban design provided a wide range of principles. This gives a contemporary paradigm to make the urban design contribute in adding its human value in the professional specialization as transportation field. This, also, can give a future research concerning a research project testing the proposed approached. The contribution comes from introducing a tool to improve the traffic movement in the big cities, taking into account, the design principles of the functional dimension in the urban design discipline. It collects between the different scopes of criteria in other fields as city planning, traffic movement and transportation systems.

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