RESEARCH PAPER

Office Building Adaptability through Buildings’ Layers
(Office Buildings in Erbil city as case study)
Adeeb Nuri Ahmed¹, Sweyda Abdullah Aziz²

1- Department of Architecture, College of Engineering, Salahaddin University-Erbil, Kurdistan Region, Iraq
2- Department of Architecture, College of Engineering, Salahaddin University-Erbil, Kurdistan Region, Iraq

ABSTRACT:
A building has an average life span over fifty years through history, whereas adaptability in the building motivated by a number of factors, not least the desire to ‘future need’ or ‘future change’ for buildings against social, economic, and technological change. Adaptability is concerned with the capacity to adjust or be adjusted to suit new situations. A building as a composition separated in to a number of layers (site, structure, skin, space layout, services, stuff, social, surrounding) that together define building as a whole. Each layer is distinguished from others by special role it fulfills. According to previous studies, there are six types of adaptability that users ‘demands; adjustable, versatile, refitable, convertible, scalable and movable, can be linked to building layers through building design strategies and characteristics. This research will examine adaptability through analysis of office buildings according to their layers, to show ratio of adaptability in both public and private office buildings and explore needs of users for each type of changes. The aim of the research is to bring needed clarity to the concept of adaptability by providing more detail insight into what constitutes adaptability is in Erbil office buildings and the factors that give rise to different level of adaptability. For analyses of case studies using meta-model methodology of Robert S. and Simon A (2016). It showed that the average percentage of adaptability is half of total characteristics of building and the need for types of change are increasing in both public and private office building. For feasibility of building the problem mostly in layers such as spaces ,space plan, services ,stuff and structure. Therefore this research provides researcher, designers and other practitioners with the knowledge and tools to raise client’s awareness of building adaptability, helping to clarify their needs in future design.

KEY WORDS: Adaptability, Office , Building layers.
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1. INTRODUCTION :

This research analyses the buildings that have an average life span, whereas the society can change radically and repeatedly during that time and architects are faced with task of giving form to a building which fulfill the needs of clients, for a period during which the composition of the building, associated rituals will go through major changes

The word 'Flexibility' is often interchanged with ' adaptability ', due to their similar meaning. According to Collins Online Dictionary, the concept 'adaptability' refers to objects ability to change or be changed in order to suit new situations. Whereas 'Flexibility' refers to adaptability; in the case of a building, it is pliant and adaptable to new and changing situations. This research more concentrated on the concept of adaptability in office buildings of Erbil city. Adaptability due to its types of change through different layers in office buildings are key words in the approach of designing for the unpredictable

* Corresponding Author:
Sweyda A.A.
E-mail: sweyda.aziz@su.edu.krd
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needs in future. The methods of movement in design, which sought to further integrate architecture with other disciplines, especially the social and technology since both of them change rapidly over time. Venturi tried to improve the connection between science, technology, humanities and social in order make the architecture a more human social art. While Brand (1994) says "The unit of analysis for us isn’t the building, it’s the use of the building through time. Time is the essence of the real design problem." (Brand, 1994). Therefore a strategy that solves this issue, with a capacity to accommodate change, is the idea of fluctuating space, where the dedicated functional spaces, are linked with more ambiguous territory – a sort of buffer zone in which many things can happen. Leaman et al (1998) reflects our own experiences, suggesting that adaptability is “now commonplace in the vocabulary of briefing, building design, building management”. P. Russell and S. Moffatt in 2001, Adaptability refers to the capacity of buildings to accommodate substantial change. Robert S. and Simon A. (2016) argued that “the problem is temporary thus the solution as well”. As a result this research will investigate the study of adaptability through buildings’ layers for office building adaptation, since adaptability has always been tested through office design, due to high levels of flexibility needed for this program, to answer research questions through testing research hypotheses by using research methodology. The aim of research is to explore the aspect of adaptability that allow a building to adapt itself to the time and need of individuals (in changeable configuration), determine its level of implementation and its opportunity and constrain toward flexibility to adapt itself change by time.

2. CHANGE IN OFFICE BUILDINGS

Now, office buildings are developing and changing over time. Since office work continues to change within introduction of new technologies. In addition to building technology innovation with opened up new possibilities, the structural steel frame, the elevator and electric lights were important elements in the development of office buildings. “A study of the history of office buildings reveals how building technology enabled the evolution of the office building, and how new work-technology such as telephones, typewriters, contributed to the development of office work” (Blakstad, 2001). Also, he mentioned two things in the history of office building, first office building has changed a lot during the years, each of them are products of their time. Second, there is a strong relationship between the office work which is performed and the office building. Buildings are physical structures that represent the social structure inside them. “Far the greatest rate of change comes right at the building as it does with everything that lives. It starts before the building is even complete.” (Brand, 1994, p.164). On the other hand the organizational learning theorists such as Gregory Bateson and Chris Agyris refer to it as ‘single-loop learning’, double-loop learning’, and ‘learning to learn’, which consist of these three levels. Single-loop it respond to a simple feedback loop which define habit. Double-loop it is the kind of learning which threatens the habit it up level, in another word change habits. The third level is “learning to learn” changes how we change habits, raised floor is an example” (Brand, 1994, p.167). As a result, the office work continues to change from the introduction of new technologies to a clear understanding of the task required becomes a significant motivating force. Designers can influence all aspects of the working environment good design is extremely, and has a strong influence on job satisfaction. (Researcher)

3. OFFICE INNOVATION

The development in business, organization and new work styles causes office building to have the ability to accommodate or adapt to this high level of changes. These changes appeared in the way office work which carried out in organization, changed with new ideas about management and work, existing new types of office work. In addition, technological innovations in both the building and the utility which are used by organization, and the structural changes in office’s work, the time affect the requirements and standards for both building and working environments, also the most important change in the market, design, construction and management of buildings. (Researcher).

While, Frank Duffy 1992 has remarked on the absence of long view research in this area ‘one of
the most dominant learn facts of 20th century life is the huge increase in the importance of the office. We have had a massive change from less than 10 percent to over 50 percent of people occupied in offices, and no one has studied physical evidence of that change from an organizational and social perspective. He mentioned three wave of innovation, the first innovation which swept the world in a decade is ‘open office’. The second wave of innovation is in office furniture, completed the revolution. The third element in innovation wave that making office environments forever liquid was the arrival of information technology. Information equipment kept taking more space, but office managers gradually realized that the computer equipment was going to keep needing replacement. The uses of specialist and technician have increased. (Brand, 1994).

In 1980s a new innovation was invented, that is “smart building” which was based on the idea of electronically integrating all the control of a building and offering tenants a full menu of built-in information services. This idea failed since integrating all the building components (climate control, security, lighting, and communication all were supposed managed by a bank of computers) only the specialist could understand it and a problem in one area could infect the other area. The new office building idea comes that the Frank Duffy has the story of what happened to it during 1980s in Scandinavia, Holland, and Germany where open office began. Guess what they don’t like? They don’t like open plan. And guess what they do like? They like windows that they can open, and door shut, and walls they can bang on. The new northern buildings, instead of being 120 feet deep, are 30 feet deep. They’re like hotels—millions of individual rooms, each with a window,’ See figure (3-1)
Branding in 1994 claimed that best adaptation he has ever seen of the open-office idea is partial retreat from it. People want acoustic privacy so they can talk on the telephone, but visual privacy is not as important—they like being able to see what’s going on.

This have led to a very satisfactory compromise called “cave and common”. Each office worker has a private office, often small, which opens into a generous open area surrounded by many other private offices. The open area has a kitchen, some couches, sometimes tables for sitting around informally, and sometimes a working library, or at least a rack of current periodical. You can shut the door of your cave and concentrate, or you can leave your door open and keep an eye and are on whose coming and going in the common. The feeling is congenial and homey, and it encourages the casual encounters which, research keeps showing, are at the heart of creativity in offices.

4. HISTORY OF ADAPTABILITY

The start of architecture from the primitive hut. The architecture starts to develop into different types of building, as temples, market hall, offices, apartments, amphitheater …etc. these all existed within the grow of civilization. Since the house is first building type in architecture become a sample of adaptability for other buildings types. According to Sennett (2008) and Brand (1994) the vernacular process was simple, direct, and evolved out of a shared experience between owner and builder, unlike today’s complicated multi-stakeholder process. For Brand (1994,p14) evolutionary forms will always adapt better than visionary solutions as they are based on trial and error, embodying of understanding the culture, climate and convention. In general, from the history it become clear that pre-modern buildings without regarding the culture and geography their buildings benefited from simple, mature construction techniques and spaces that can be typified as polyvalence .Figure (4-1)

At the turn of 20th century the idea of adaptability or flexibility became explicit in the modern movement. In the mid- 19th century during industrial revolution, this revolution increased pace of social change along with new building material types, type of buildings and spatial standards all together gave rise to urban condition and the demand for buildings to accommodate changes. Its principle clears enough in the works of architects such as Le Corbusier, Frank Lloyd Wright, Alvar Alto, Mies van de Rohe and later on the works of Louis Kahn and James Stirling.(Robert S.III& Simon A.,2016,p15).

The characteristics of modern buildings are simple, cubic forms, by structure and mechanism systems expressing the “truth”. their structure composed of frame construction that separate the space plan and structure, allowing for the development of free plan, and the use of light weight cladding systems that separating exterior skin from the structure. In this style the architects should express contemporary technology through the use of new materials and new ways of building. Jencks (1973) stated that “what the building want to be”. In addition, Hertzberger (2005) mentioned that the modern movement created over-specified solutions in mono-functional buildings and neighborhoods. One of the modernism bigger failure is mono-functional buildings as Pawley (2007) argues this sought to correct condition for use rather than usefulness itself” thus created demand for flexibility and now towards adaptability. Again Rabeneck et al. (1973) mentioned that “an artificial understanding of occupant’s behaviors. Also Schneider and Tills (2007) modernist portrayal that the used is merely another design element that would perform the same function again and again with no possibility of changing or combining of the functions, not to mention doing things differently. Watkins(2000)
mentioned the better solution sit within traditional architecture, suggesting a need to reconnect architecture with its pre-modernist history. For Habraken (1998), modernism principle removed the idea of separation between stakeholders and physical form. In general modernism’s desire for using contemporary technology failed to understand user needs at the expense of technological fetishes. However; many of the negative aspects identified remain today as dominating perspective, suggesting a lack of evolution towards situating architecture in its real context.

Figure (4-1) The start of architecture through history to the concept of adaptability by researcher
5. DEFINITION OF ADAPTABILITY

At the moment the definition have changed subtly as “to make suitable for the requirements or conditions; adjust or modify fittingly” ( Random House 2010). Olsson and Hansen (2010) found that “Stakeholders either used different terminology or the same terminology with different meanings, each of the projects tended to develop its own terminology. Therefore, adaptability in this research paper is concerned with the capacity to adjust or be adjusted to suit new situations.

5-1 Five interpretations for adaptability:

In the book of Adaptable Architecture (theory and practice) by Robert Schimdt III and Simon Austin (2016,p43), which is the final conclusion of many research explorations on the adaptability. They found there are five interpretations within adaptability in the construction literature as follow:

1. **Adaptive architecture or responsive structures**: is the building’s capacity to change with changing conditions through dynamic facades or transformable structures.

2. **Adaptive reuse**: this is referring to finds new uses for underutilized or vacant building by changes in social perception or desire. Adaptive reuse is commonly associated with converting office building to residential and vice versa, or other functions.

3. **Accessibility for all or inclusive design**: is particularly strong in designing homes or buildings to accommodate a diverse range of users and their changing capabilities throughout life. In the UK its driven by government policy such as lifetime homes, but in the Australian Standard (AS4299, 1995) define adaptability as “a move away from designing special accommodation for different community groups with different needs.

4. **Increased user control (user customization)** this is referring to separating parts of the building physically according to decisions levels between stakeholders. This development (e.g. shell and core construction) and a client- driven practicality to accommodate changing work conditions, that allow for spatial configurations at minimal disruption and cost.

5. **Climate adaptation**: is the most recent appropriation of adaptability to understand how building can adapt to significant changes with their surrounding environment, including the capacity to reduce their burden on the environment by lowering energy consumption.

Overall this research more concentrate on the adaptability of “Increasing user control in the office space”.

5-2 Characteristics of Adaptability:

Robert Schimdt III and Simon Austin (2016,p45), give adaptability the following definition: “The capacity of a building to accommodate effectively the evolving demands of its”

They suggest main theme for the adaptability of performance-based design; which they identify four underlying characteristics:

1. **The capacity for change**: this refer to either physically responsive or a passive accommodation to an internal or external change, the object of change might be structure, space or environment.

2. **Fitness for purpose**: this match between the building and its users.

3. **Value**: can be summarized as maximizing productive use, to fit both the use and the stakeholders’ desires, at a minimum cost hence minimizing the effort (Time & Cost) of change is defining facet of adaptability.

4. **Time**: is described in two ways to indicate speed of change (e.g. quick transformations) and through life times
6. ADAPTABILITY IN OFFICE SPACE

During the past years the importance of adaptability in office buildings has increased, mostly due to factors like rapid change, both in private and public organizations, new and innovative work place design and growing environmental concerns about building redundancy. Also it has always been tested through office design, due to high levels of flexibility needed for this programme.

Adaptable building can adopt new function and accelerate to adjust to fast development and thus be revitalized in uses and functions. Independency of building elements appears to be the most important key principle for enhancing adaptability. The building becomes more adaptable if each its feature more uncoupled from the other. According to Francis Duffy, co-founder of a British firm that specialized in advance office designs, a building over its lifetime changes as a single entity, but rather as four separate layers: Shell, Services, Scenery and Set. Each layer has a unique time period for repair and replacement. As describes the differences in the table (6-1).

<table>
<thead>
<tr>
<th>Layers</th>
<th>Description</th>
<th>Average life time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Shell</td>
<td>Structure of buildings, including skin if load-bearing</td>
<td>~50 years</td>
</tr>
<tr>
<td>2. Services</td>
<td>Pipes, ducts, cables, machinery, elevators, escalators.</td>
<td>~15 years</td>
</tr>
<tr>
<td>3. Scenery</td>
<td>Partitioning, ceiling, finishes.</td>
<td>~6 years</td>
</tr>
<tr>
<td>4. Set</td>
<td>Furnishing, furniture, computers</td>
<td>monthly</td>
</tr>
</tbody>
</table>

The challenge is to achieve functional independence, without loosening the independent features that enhance adaptability. Brand (1994); showed that how office worker interested in changes monthly, yearly. Frank Duffy has remarked on the absence of long-view research in this area:” One of the most dominant facts of 20th century life is huge increase in the importance of the office. We’ve had a massive change from less than 10 percent to over 50 percent of people occupied in offices, and no one has studied the physical evidence of that change from an organizational and social perspective.” Particularly worth examining is the history of the “open office,” an innovation that swept the world in a decade.(Brand 1994, p167)

In 1958 near Hamburg, Germany the idea of open office—the scattering of desks and work groups around huge open floors- was a deliberate invention by a couple of professional who were brothers Eberhand and Wolfgang Schnelle were neither architects nor planning consultants: they were organizational designers. In their view organizations were severely restricted by small offices strung along lengthy corridor where was poor communication, nearly impossible flexibility, and the wrong size groups were always stuck in the wrong size space. So they thought in different way and started to throw away walls and straight lines and created what was called Büronlandschaft-“office landscape”- Later Americanized to “open office”.

Over all adaptability in the office space focuses on the change which is the quality of a space that can be easily adapted to harmonize with the changes of use (function) that it undergoes and adaptable building using the same amount of space more efficiently on average over entire life of building. Duffy claimed that all layer of building should be independent from each other because each layer has different period of time. And developing the concept of open offices by Duffy, Bernard which is first invented by German brothers since open office can adopt many function through life time of building.

7. RESEARCH METHODOLOGY

7-1 .Meta-Models

The model is by (Robert Schmidt III and Simon Austin, 2016), show the relationships between design strategies, and six types of adaptability with, building characteristics, layers and guidelines. Therefore, the first and second part of the meta-model are used as checklist to examine each case study for showing the ratio of adaptability in each building. In addition using radar chart (using Microsoft Excel for calculation, and Edraw max software to create radar chart) to visualize the adaptability ratio in each cases due to strategies.
through characteristics. The third part of the meta-model can be used by designers to check or establish pathways of interest or with the client to highlight the design intent or possible conflicting demands that need resolution.

7-2. The scenario planning

There is a tool called scenario-planning by Brand 1994 who claimed that ‘the product of skilled scenario work is not a plan but a strategy, where a plan is based on prediction, a strategy is designed to encompass unforeseeably changing conditions. A good strategy ensures that, no matter what happens, you always have maneuvering room.”

As a result, the scenario planning used to prepare the research questionnaire to find out user need due to types of adaptability in general for office design in future by using variable of meta-model.

7-3. Research Case Study:

The study was conducted at office buildings in Erbil city. The data are gathered from private and public offices to show the highest and lowest ratio of adaptability of office buildings. Administrative staff, managers, employees who use building answer the questionnaires. The office building which are selected for this research are as below: Table (7-1).

Table (7-1) Case studies that have been selected for this research by researcher

<table>
<thead>
<tr>
<th>Public office buildings</th>
<th>Private office buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Directorate of Erbil Holding no.2</td>
<td>B1 Darin Company</td>
</tr>
<tr>
<td>A2 Directorate of Erbil Holding no.1</td>
<td>B2 Ster Tower</td>
</tr>
<tr>
<td>A3 Board of Investment</td>
<td>B3 Jouhayna Center</td>
</tr>
<tr>
<td>A4 General Directorate of Erbil Retirement</td>
<td>B4 Ara Apartment</td>
</tr>
<tr>
<td>A5 Presidency Appellate Court of Erbil Region</td>
<td>B5 Gulan Park</td>
</tr>
<tr>
<td>A6 Directorate of Erbil Urban Planning</td>
<td>B6 Justice Tower</td>
</tr>
</tbody>
</table>

7-4. Sample size:

Through analysis of research methodology on adaptability; the number of buildings samples which have been assigned in the research, its range from 10 to 15 buildings. Therefore, number of building’s sample in this research is 12 is mid-range. The samples divided into two groups, which are public and private office buildings to find or differentiate the lowest and highest ratio of adaptability in the office buildings of Erbil city. For the questionnaires sample size (from, source: Rea, Louis, and Richard A. Parker. Designing and Conduction Survey Research: A Comprehensive Guide. 2nd ed. San Francisco, CA: Jossey-Bass, 1997, page 121). Number of users for these 12 office buildings reaches 10,000, therefore for 95% level of confidence with±5% of error it need 357 users to respond the questionnaire. As a result, sample size for questionnaires used in this research paper is 360, which divided on 12 office buildings, each group of users in buildings have to fill 30 questionnaire forms.

8. RESULTS AND DISCUSSION

In practical studies, the percentage for adaptability of office building in Erbil city, its development due to (building characteristics, layers, strategies, and types of change) are explored; need of users for each type according to time and feasibility of buildings (public and private offices) also explored. The average percentage of adaptability approximately half of characteristics (32.5%). Both groups A and B, mostly concentrated on the modularity and increase & interactivity strategies according to characteristics for those strategies. The weakest strategies are aesthetic and loose for each use them in different way. The radar chart showed that each building has been designed in different way. For building layers most architects tried to fulfill the client requirements instead making balance between all parameters of building, since time changes, need of users changes due to time and development of technology, therefore demand for changes in office building will increase. The problem mostly in layers as spaces, space plan, services, stuff and structure, each have different problem in each project.

As a result, the practical study showed the adaptability percentage in offices building of Erbil.
city, and its development. The weakest and strongest point in strategies of office building both public and private. In order to improve design, use of strategies, characteristics, layers and type of changes increasing feasibility of office buildings which answered all research questions and hypotheses.

Table (8-1) Building characteristics mapped against case studies by researcher

<table>
<thead>
<tr>
<th>Design Characteristics</th>
<th>Public Offices</th>
<th>Private Offices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>CAR1 - Reversible</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR2 - Movable stuff</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR3 - Component</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR4 - Function</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR5 - Service zones</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR6 - Configurable</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR7 - Multifunctional</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR8 - Not precious</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR9 - ‘Extra’</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR10 - Durability</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR11 - Mature</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR12 - Efficient</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR13 - Good</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR14 - Overdesign</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR15 - Readily</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR16 - Standardized</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR17 - Standard</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR18 - Off-site</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR19 - Simple</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR20 - Open space</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR21 - Support space</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR22 - Oversize space</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR23 - Typology</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR24 - Joinable</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR25 - Modular</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR26 - Connects</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR27 - Standard</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR28 - Spatial</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR29 - Space</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CAR30 - Spatial</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Character</td>
<td>CAR31</td>
<td>Spatial proximity</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>CAR32</td>
<td>Simple plan</td>
<td>X</td>
</tr>
<tr>
<td>CAR33</td>
<td>Standard grid</td>
<td>X</td>
</tr>
<tr>
<td>CAR34</td>
<td>Simple form</td>
<td>X</td>
</tr>
<tr>
<td>CAR35</td>
<td>Multiple ventilation strategies</td>
<td>X</td>
</tr>
<tr>
<td>CAR36</td>
<td>Shallow plan depth</td>
<td>X</td>
</tr>
<tr>
<td>CAR37</td>
<td>Passive climate control</td>
<td>X</td>
</tr>
<tr>
<td>CAR38</td>
<td>Building orientation</td>
<td>X</td>
</tr>
<tr>
<td>CAR39</td>
<td>Good day lighting</td>
<td>X</td>
</tr>
<tr>
<td>CAR40</td>
<td>Space to grow into</td>
<td>X</td>
</tr>
<tr>
<td>CAR41</td>
<td>Phased</td>
<td>X</td>
</tr>
<tr>
<td>CAR42</td>
<td>User customization</td>
<td>X</td>
</tr>
<tr>
<td>CAR43</td>
<td>Multifunctional Spaces</td>
<td>X</td>
</tr>
<tr>
<td>CAR44</td>
<td>Use differentiation</td>
<td>X</td>
</tr>
<tr>
<td>CAR45</td>
<td>Mixed demographics</td>
<td>X</td>
</tr>
<tr>
<td>CAR46</td>
<td>Multiple/ mixed tenure</td>
<td>X</td>
</tr>
<tr>
<td>CAR47</td>
<td>Shared ownership</td>
<td>X</td>
</tr>
<tr>
<td>CAR48</td>
<td>Isolatable</td>
<td>X</td>
</tr>
<tr>
<td>CAR49</td>
<td>Multiple access points</td>
<td>X</td>
</tr>
<tr>
<td>CAR50</td>
<td>Physical linkage</td>
<td>X</td>
</tr>
<tr>
<td>CAR51</td>
<td>Visual linkage</td>
<td>X</td>
</tr>
<tr>
<td>Character</td>
<td>CAR52</td>
<td>Attitude and character</td>
</tr>
<tr>
<td>CAR53</td>
<td>Spatial Quality</td>
<td>X</td>
</tr>
<tr>
<td>CAR54</td>
<td>Building image</td>
<td>X</td>
</tr>
<tr>
<td>CAR55</td>
<td>Quirkiness</td>
<td>X</td>
</tr>
<tr>
<td>CAR56</td>
<td>Time interwoven</td>
<td>X</td>
</tr>
<tr>
<td>Context</td>
<td>CAR57</td>
<td>Good location</td>
</tr>
<tr>
<td>CAR58</td>
<td>Contextual</td>
<td>X</td>
</tr>
<tr>
<td>CAR59</td>
<td>Circulation (neighborhood scale)</td>
<td>X</td>
</tr>
<tr>
<td>CAR60</td>
<td>A communal place</td>
<td>X</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Ratio of Adaptability %</td>
<td>40</td>
<td>41.6</td>
</tr>
</tbody>
</table>
Figure (8-1) Case studies visualized. This supports; find out every project will require its own mix of strategies and characteristics
8-1 Comparison between Group A and B

The bar charts figure (8-1) and (8-2) illustrate total percentage of employees’ needs and feasibility of their buildings for these changes, to show the difference between group A and B.

Both groups prefer changes during first years, but the average percentage in group B is 62.2% which is more than group A, 52.4%. Since most of the companies trying to apply their goals to increase their income, therefore they are going with daily needs and technologies. After these years the average percentage dropped dramatically as shown in bar charts of both groups. Moreover, both groups average percentage of needs for change are at the same range, group A is 53.3% and group B is 50.4%.

<table>
<thead>
<tr>
<th>GROUP B</th>
<th>(1-5)</th>
<th>(5-10)</th>
<th>Yes</th>
<th>No</th>
<th>Feasible</th>
<th>Somewhat feasible</th>
<th>Not Feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>62.2%</td>
<td>23.6%</td>
<td>50.4%</td>
<td>48.7%</td>
<td>19.8%</td>
<td>19.2%</td>
<td>10.1%</td>
</tr>
<tr>
<td>Median</td>
<td>63.3%</td>
<td>24%</td>
<td>48.3%</td>
<td>51.1%</td>
<td>18%</td>
<td>20.4%</td>
<td>9.4%</td>
</tr>
</tbody>
</table>

It’s clear that the feasibility for each group’s buildings have different average and median of feasibility level in their projects as shown in table (8-1) and table (8-2). For group A, somewhat level of feasibility has the most average and median percentage for change than other levels of feasibility. In contrast group B, both (feasible) and (somewhat feasible) nearly same percentage of average and median than (not feasible) level of feasibility.

Overall, this shows that both groups have same percentage for change during first five years. Whereas the feasibility percentage is different for each groups in some layers of building. But some of them have problem in space program lack of some spaces, proportion of spaces, floor to floor heights and shape of spaces which have negative effect on layers such as spaces, space plan, services, stuff and structure. In group A they have problems in some layers such as site, surrounding and social, but these layers have very few or no affects.

9. CONCLUSION

9-1. theoretical part

a) This research has dealt with concept of adaptability, which become an important issue in architectural design. The importance of
adaptability in the office buildings has increased mostly due to factors as rapid change in technology, economic, and users’ needs over time.
b) From the previous study conclude that increasing level of difficulty in adaptation of building to fulfill user demands and buildings have to be studied in time for solving problem, since user needs change radically and repeatedly over times. As a result, aspiration on the adaptability is common but rarely given proper attention in design. Therefore, for increasing the proper attention of design towards adaptability to fulfill the requirements of user in office buildings of Erbil city, through this research on multi-layering approach for office space adaptability in the offices of Erbil.
c) The methodology which are used in previous studies show that for increasing proper design attention towards adaptability, the architects, and researcher categorize building composition in to layers which rely on building characteristics and strategies for enhancing concept of building adaptability to respond to changes and fulfill users’ needs over times. This research used final update of this methodology which is concept of “meta-model” in the book of Adaptable Architecture, theory and practical by Robert Schmidt III and Simon Austin (2016).

9-2. practical study:
The following conclusions are the results of analysis and questionnaire as practical studies in this research field, in both public and private office buildings chosen in Erbil:
a) From the analytical parts of case studies get that office building which are designed in both public and private; the architects tried to fulfill the requirements of client due to the budgets of organization there are no balance between option (clients) and range (architects) and users (the one who use building) need to get high level of adaptability in office buildings. The ratio of adaptability for private office building is more than public office buildings, that tested first hypothesis.
b) From the radar charts which tested hypothesis number two in chapter two, concluded that even some characteristics due to strategies repeated in most projects but each of them have different shape of adaptability, which show form weakest to strongest strategy in each project and overall case study. It can be taken in consideration in future design and existing buildings to solve the problem toward adaptability to fulfill users’ need.
c) The most problem faced in both groups during investigation of capability in adaptability of buildings for changes was the floor to floor height, lack of enough elevators, inadequate proportions of space, inadequate arrangements of socket points, lack of spaces in space program and its layout, shape of buildings, designed without take in concentration future needs, and problem in ventilations. The design of archive due to future grows demand of area and its protection was the most important spaces for all users.
d) The result for need of change over time due to type of adaptability for both groups (A&B) it was showed that during first five years need for changes was more than (6-10) years since during this time it show that which departments of organization grow rapidly for instance archive documentation need spaces, these types of spaces need to expand that’s why demand for each type of changes are increasing and nearly its percentage same in both groups but in group B since the offices are commercial with rapid development in income for the company they try to cope with technology in order to increase income of company. The order of changes according to types of adaptability as adjustable, versatile, refitable, convertible and scalable alternatively, which tested hypothesis.
e) The problems which faced in level of feasibility of most buildings are in layers’ space, space plan due to its layout in regards to circulations, and services, on the other hand social needs have high influence on the types of office to be either cellular or open office space.
f) It become clear that design for office building either open office or closed office depend on function and organization structure.

10. RECOMMENDATION
- For new buildings proposing that analyze space program layer and make a survey with users of building to anticipate the needs that they will face in future to take in consideration during design process.
- Recommending in new design buildings give archive space its importance and security since this space is the most important point for office.
• Municipalities should apply the metamodes in form of regulations to be confirmed by them upon new designed projects to get extra benefits on the user’s level economy.

• For the existing building it recommends that analyze the building due to building characteristics to show, which layers have more capability to change for solving problem in a logical way.

• The researcher suggests for architectural departments to shed light on the concept of adaptability and to be embedded within theoretical syllabuses

• Encourage young architects to build their capacity theoretically and practically about adaptability done by companies (Design and Construction) or universities. (Architectural departments).

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