



## **Evaluation and possibility of Virtualization for real spaces in architecture**

Case study: Virtual & real Incubators of science and technology parks

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### **Abstract**

Progress and technology and their results in transformation, In today's world is undeniable. This change in transforming of industry age to the age of communication and connection was so that today we can from where on the earth by using the technologies of electronic nets, communicate with the farthest place without any time and place limit .The results of this kind of communications are obvious in all aspects of human life, by quality and quantity effects Also, architecture as a tool for forming the spaces of human life, used this progress and technology. One of basic changes in this era is substitution of Virtual spaces in some Office centers and educational units ... instead of real spaces, which have been made by electronics net for communication.in another word, a kind of behavioral and relational patterns for limiting or deleting these spaces with all factual particulars have been used. This transforming in communication is rapidly changes the architecture of structures and organizations which for presenting objective and perceived spaces, represent most of their idea and behavioral and mental criteria .This paper by hopping to achieve a space with best quality wants to respond to all human needs both material and Spiritual.so this paper tried to evaluate and analysis both real and Virtual spaces, that both of these spaces have share goals like Values of stability and Optimal performance space built .this objective, performance and results of some Incubators of science & technology parks in Iran have been demonstrated.at the end with this demonstration that need to analysis their results, produced some Principles and basics which can be use in forming these two space this age.

**Key words:** Virtual Space, real space, science park, Incubators

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### **1. Introduction**

After the industrial revolution and the resulted changes from this event, the end of 20th century to the current time was accounted as a modern age in the history of humanity; which is being called Information or Informatics Age through the development in the communicative technology. Nowadays, all aspects of human life i.e. economy, education

and culture are influenced by the development of Information Networks in the global dimension; in the other words, the considerable development of this technology. In this respect, this advance has affected the architecture which is a kind of a means for forming the situation of human life; as by the emergence of these electronic and informatics communicative systems and establishing a network society, we are facing a change in the spatial concept of some features or performances of daily life such as work, buy, play (recreation), education, etc which in turn changed the features of architectural spaces and a new definition of space in the modern society of information. What is being represented as Cyber Space or Virtual Reality under the various titles is a reflection in the concept of space and place (Yousef Pur,96, 2006). This paper, in order to introducing a space which is being designed for satisfying the needs of human, tries to evaluate and analyze these two spaces; real space (architectural space) and virtual one which is the result of communicative systems' development and a change of architectural real space; in the other words, it is a replacement. In this research, the development centers of Technology and Science Parks were considered which is formed by two models of development center with a real space and a virtual one and also, in this paper, how to deliver the services is being studied. Defining the features of these two spaces and the factors which affected them and also their formation in the field of comparison and analysis is a method which is being used in this study for obtaining the optimum result. In accomplishing this research, the main purpose of this study is to explain the accurate meaning of keywords and this issue is a task of researcher to analysis these words which were used in this paper otherwise, it leads to an incomplete research. Often, words change in meaning, phonetics, etc over the time and these differences are obvious. In this paper, defining the concept of space is important which is being used in some fields such as physics, philosophy, sociology, architecture and the other fields, extensively. So, the meaning of space is not the same in all fields and studying this meaning (the meaning of space) must be done from various viewpoints; however, in this study, the researcher tries to study the meaning of space in these two fields; Architecture and Cyber.

## **2-Concept of Space in Architectural**

In clarifying the meaning of space, it is worthwhile to mention that organizing the space, from the view of scholars toward architecture, is important. The view of Edward T. Hall in explaining the coordinates of space on the concept of space by senses (hearing, seeing, smelling and touching) is that: "Sensing space through the senses is under the effect of issues as culture, language and traditions. But "Watsuji Tesuro", one of the Japanese Phenomenologist believed that: "Space focuses on the relationship of human with his environment and it is not abstract and absolute; not only it is an Euclidean geometry and was studied by the Scientifics, but also it depends on the subjective things and, more importantly, the existence of human's mind.( Erin Mc Carthy ,1,2001)Therefore, the meaning of space from his view is being determined by using the meanings of movement and developed transfer.(Sato yusukuni, 1,2001).What is important in this definition is that: "Architecture is a recreational process and space's organization by using the apparent factors appropriate to the materialistic and spiritual needs of human toward their perfection. Based on this definition, architecture is a process of organizing space for doing one or more tasks.(Noghreh kar, 160,2010) For this reason, architectural space, instead of assigning to an especial function, is being allocated to a set of practices and functions which are related to each other or there is a possibility for doing them in a space, potentially.(ibid,p,176) By considering this point, the architectural space is an effective space on the perceptions of addressees and users of space means human in which the

meanings of some words such as communication, meaning, place and time are being defined.

### **3. Cyber space or Virtual one**

For the first time, this word was used by William Gibson, the Canadian writer of scientific –fictional novels in 1984. From his view, this space is an imaginary real one which formed from the communication of computers that linked all humans, machines and information sources to each other in the world.( Vrooman,1,2002). Approximately, this meaning is the same as the meaning that we know. The view of Kinza about this space is:“For example, the virtual space is an environment from the invisible information that can be in different forms”. For increasing the understanding of us toward this definition, he defined the components of this space through Internet. In this space, there is a type of communication between human, commuter and network. In meaning, Cyber Space refers to “a set of communication among humans” through computer and network without considering time and place. (Oftadeh,2010)

### **4. Virtual space properties**

Some of the main properties of virtual space are as the following:

-interactional: interval interactional power between sender and receiver is one of the main properties of virtual space to the physical space.-Break of place and time logic: in the virtual space and time of place ,a phenomenon is a little of importance because you can access to it in each place&time.-Multimedia:The property shows the concept in the way of textual, picture, lingual, related to videos and etc, are parts of other properties in virtual space.-All trend and interaction are being done through network structure.-virtual space is intangible, but it is imaginary space in which phenomenon are being seen such as internet. (Oftadeh,2010)

What is common in concept of these two spaces(real & virtual)its space and formation element. and in this study, it has been tried to study the objective models of these two space in the incubators.

### **5. Definition Of Science Park& Incubator**

(IASP): International Association of Science Park:

A Science Park is an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions.

(IASP) : International Association of Science Park

A Technology incubator is an organization designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.( <http://www.iasp.ws>)

Delivering the back / support services are presented as the following:

-Espesial technical services, Espesial learning services, Management – legal services, Marketing and projecting services, Settlement services, Public services, Information services,  
Credit – financial services.

The other points which are the subsets of the above mentioned are defined in the below:

-Office services (type, publication, secretary, etc),Conference and meeting services, Storekeeping services, Permanent exhibition, Audio and visual services, Financial management services, Legal counseling services, Workshop services, Technical

counseling services, Laboratory services, Seminar holding services, Project control services, Marketing services, and controlling the trend of scientific activities and practices of located units in the incubator for increasing the success level of these units.(Aaghajani&Talebnejad,33,2009)

## **6. Definition Of Virtual Incubator**

The center of virtual incubators is a virtual organization which depends on a web that provides some services of the real incubators to the customers such as counseling, introducing the financing methods, information services and ... via Internet without considering the spatial and temporal boundaries.( Baldwin County Business Incubator)

## **7. Communication & Space**

In this way, the purpose is the spatial evaluation that must satisfy the needs of human with the optimum quality. This point tries to remind us that the purpose of this study is not to destroy a space with considering its positive features and advantages but also it tries to introduce the abovementioned properties with optimum productivity (by considering the factors which are forming these two spaces and also the common aims which exists in its top or in the other words, it is a factor on its success "satisfying the needs of human"). In describing the architectural and virtual space, all points were mentioned. What is common in these two expressions is the word of "space" and the meaning of "communication" is one of the effective factors in the formation of these two spaces because it is one of the most important concepts toward the human and other creatures which plays a role in the formation of vital needs in different degrees. Human who is a component in the world is in a permanent relation with the other components. In the world, there are different types of communication and in the gradation of the quality of communication / relation with human, after his relation with God which is being explained in the religious and philosophical texts, the highest degree of communication or relations is human with human relationship. In the simple way, human communications are being divided into several groups; human with human (person with person, group and collective), human with machine and human with animal. There are various viewpoints about this issue. Charles Horton Cooley believes that communication is a mechanism by which the human relationships happens and all thought's signs, transfer or communication tools and maintaining them in time and place will develop (based on it). Communication includes the face, behavior, movements, sound's echo, words, writings, print, railway, telegraph, telephone and all tools which were made in the way of humans' conquer on time and place. In original, the view of Charles Horton Cooley is correct. (Schramm,43,2002).In the traditional world, there is a close relationship between us and the architectural space. Architecture as a social art in organizing the tasks, functions and also a relationship between practices plays an important role In the other words,(Yousef Pur,98, 2006)the created space by architecture or the same architectural space is a scene for showing the behavior and patterns of especial practices. This trend in the current time was encountered considerable changes as the way of humans' communications which are accounted as a stimulus in creating an architectural space and a behavioral place in a pattern of activity satisfy our needs with the aid of development in its communicative technologies by creating a virtual space which stimulated the patterns of activities or practices and communications and also they are a factor on the formation of a pattern from the activity. During the development of this communicative process, architectural space faced considerable changes as the other aspects of human life and the telecommunication systems are the substitute of mobile systems and also the usual patterns of configuration are being replaced with the virtual space. Throughout the change of this communicative

quality, the resulted pattern was changed and also affected the required performance. But we face this question; whether the above and new space will satisfy the needs of human (as materialistic and spiritual ones) by these changes which their result is the omission of architectural space and the replacement of virtual space in which time and place were integrated or not? And whether the above mentioned space, virtual space, has the ability of replacement in the architectural space with determined purpose or not? For answering these questions, the samples of incubators of Science and Technological Parks are being studied in these two spaces; virtual and real (physical) ones. Then, a comparative approach is being used for analyzing and evaluating the optimum space. If the architectural space is being considered as a manifestation of relationships among the concepts of place, time, relationship and meaning, therefore, the difference of this space with the Cyber Space will be the result of incorporation of place and time in this field.(Fig1)

There are various points about the difference in these two spaces; however, this difference is related to the nature and the quality of these two spaces. In this study, not only we try to explain the positive and negative advantages and disadvantages but also we try to define a space which is able to satisfy the needs of target practice. Based on these definitions, there is a common point in these two spaces; means there is a communication and interaction between them but with a different quality. In the real architectural space, the way of physical communication, face to face and ... has a combination of materialistic and spiritual features and this communication in the virtual space, due to the limitation in using the different senses of human, is low. In the other words, space becomes free from several effective senses in the communication and this reason, reduces the quality of communication. In addition to the difference in quality, the speed and the range of interaction in these two ways of communication are different and each of them (these communicative features) is effective in the efficiency of a pattern of practices.(Fig2)

Communications in a series of these practices is being established via a flow of information without need to a behavioral place. The important feature which increases the quality of services is the speed and the range of communication. And these practices with the same features are being done via virtual spaces. In this study, a series of activities are designed for achieving this purpose which is the establishment of effective communications and in this field, the element of quality on speed of communication has a high value. The quality of these activities with effective interactions and communications which is being determined through methods such as creativities of architectures in organizing the architectural space and establishing the behavioral spaces which are in appropriate with creating the architectural space is changeable or variable. In this respect, using of some terms such as behavior setting or behavior place is a prerequisite for explaining their functional concept by an author. So by a brief summary of them, the purpose of the author will be determined.

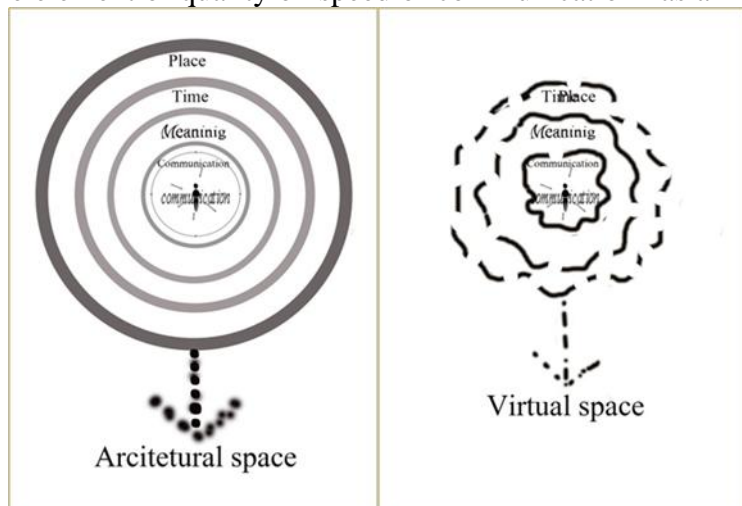


Fig 1:conceptual structure of virtual&art architectural spaces  
Source:Author

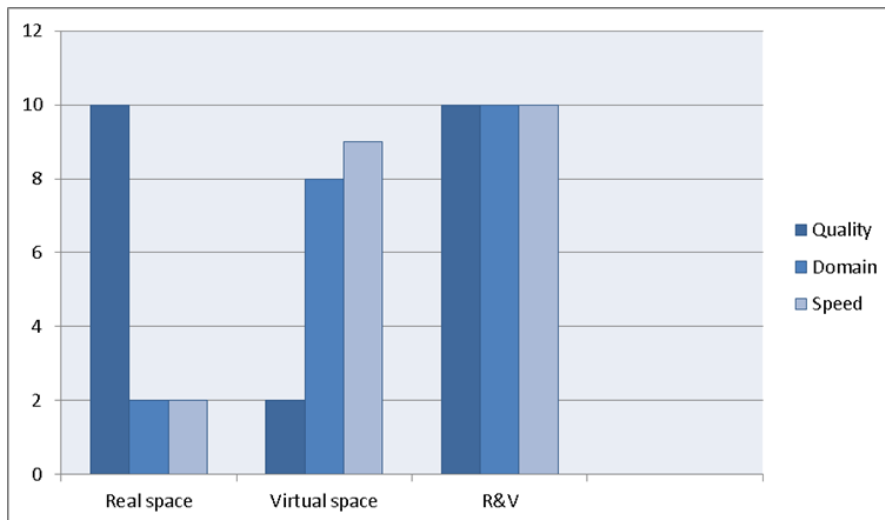


Fig 2 Compare (quality, scope, speed) real space, virtual, consolidated  
Source: Author

## 8. Definition of Behavior Setting

Behavior setting or “behavior – place” is an analyzable element or is for analyzing the environment which is being used for explaining the main functions of architectural spaces and designing city. Behavior setting is a concept which was used by Barker, R.G et al., in searching the “Growth Psychology” for analyzing the social environment and physical psychology of children. (Barker,1968;Wicker,1979)And the relationship of behavior setting with designing by architectures and designers of city was developed, gradually. (Gump,1971;LeCompte,1974;Bechtel,1977;Rapoport,1977;Motalebi,1998) A behavior setting is a small social unit which is being resulted from the stable incorporation of an activity and a place for satisfying the required performances of that behavior setting in a regular process. The elements of behavior setting (based on the view of Barker, R.G et al) (Barker,1968) are as the following: 1-Stable and continuous practices or activities in a place or the stable pattern of a behavior,2-Tridimensional array of an environment of a place – behavior,3-The environment structure of a place – behavior which is the result of coexistence between elements no. 1 and 2 and based on his view, it is synomorphy; it means that without a structural relationship between a domain and human’s behavior, there is not the possibility of forming a stable behavior –place. 4-A time course. The other learners named Wicker, 1979, presented the other factors. Among these factors, two of them means the plan of a behavior setting and person or its controlling factor are important as the 5th or 6th factors. (Motalebi,58,2001)

For example, a incubator place or an administrative place is a behavior setting or a place – behavior which consists of a continuous activity for a determined time. This activity consists of functions that a incubator or an administrative place are doing them for achieving their aims such as educational or learning function or counseling and the performance of an office.This place – behavior has a domain which is the result of definite elements such as column, walls, ceiling, floor, doors, windows, furniture, etc. These elements could regularize the behavior of users from the space of incubator as we can distinguish the space of a incubator from the other behavior settings in a coexisting between the behaviors of incubator’s individuals or administrative places. This point is a factor on the behavioral difference of various spaces which is related to the difference of place – behavior plan in order to the physical or skeletal array.

System of activity: An environment is being formed via a hierarchy of behavior settings which creates the systems of activities in relation with each other.(Lang,130,2002)

Based on the definitions of IASP about the incubator and also some of the models of the technological centers in Asia and Europe, it is evident that the incubators are varied in their purposes and their missions. Therefore, the most important general purposes of these centers are;-Providing jobs and related opportunities,-Encouraging the economical activities with establishing companies,-Profits of transfer and commercializing technologies,-Developing the deprived areas,-Diversify the industries, -Development of especial activities,-Development of especial population groups, -Encouraging, supporting and creating the entrepreneurship spirit and finally,-The competition. The incubators in accomplishing these purposes must deliver a series of services in the form of especial systems. Based on this and the study of available sources, these services are being divided into 3 groups such as main, post – education and external ones (services)(Aaghajani,33,2002). In this case, the main services of incubator are the services that this center delivers them to its customers and they are the same among these centers and this issue led us to study these services of these centers from the view of activity system. Therefore, for clarifying this point, these questions must be answered; in which form of communicative patterns, the main services and its especial activity system are being formed and in which spaces and places, have an optimum productivity? These services are being studied in three categories. A summary of these services in the 1st group consists of laboratory and workshop spaces, conference and library. Each of these spaces are being studied in the form of two concepts; real and virtual and the results of these experiences and evaluating their productivity is one of the effective factors in the possibility of the usage of this concept.

### **9.Laboratory Spaces**

The activity of this system depends on the fixed equipment with various types. In the other word a type of human communications in these spaces is more than human communication with the objects; however, this communication is one of the effective communications in this space. Physical space: what was said in describing the above mentioned system is a required factor in the existence of space which will be provided by creating an architectural space. As in the architectural space through the appropriate array of architectural elements, main and guideline communications and a behavior pattern which is a necessary component for the target system will be created or made. Virtual space: The existence of information and communication flows with high range and speed is one of the success's factors in comparing of especial cases. It can be come to a conclusion that creating a suitable space for the performance of five senses, thought and intellect is one of the main factors of developing activity or its survival and this success requires the formation of architectural space and creating a behavior setting for each of these senses. Certainly, creating a virtual space in this case increases the success of formed environment. But replacing these two spaces instead of each other is not possible. Suggested model: by considering the results of t above analysis, the suggested model for this space is a combination of these two spaces as the virtual space which acts as a vein from the life of whole space is hidden in the real architectural space.

### **10.Conference spaces**

One of the most important services and activities of incubators is the establishment of these places. And the importance of this place due to the interactions and communications through fundamental guides of these centers (incubators) for accomplishing the above

purposes is obvious. The basis of this activity in this domain or space is to create an interaction which forms on a discourse that is a complex notion or concept (Pritchard & Jaworski, 4, 2005) which is not possible to define it only in one or more sentences. Therefore, how to use it is only mentioned and it is possible to study it in two general methods in the virtual or real spaces.

In the current time, various seminars are being held in the virtual spaces and some of their advantages are the low cost, more attendants, etc.

Communications in this space is predictable but due to the presence of small numbers of senses, it has low quality and without the place sensing. Conference in the physical architectural spaces: The communications in this space are face to face and due to the interventions of all senses, they have high quality. This space must be in the place and time. In this space, in order to a series of predictable communications, there is possibility for creating unpredictable communications in different levels of knowledge and wisdom and these communications provide a field and factor in creating the events in space, time and place that is influenced by architectural space and is effective in the made space. Architecture has an important role in creating these communications and increasing the capability of this space in creating the event such as placing furniture and the sitting places in the conference halls are important or effective in the quality of this communication. In the other example, designing an especial type of step or stair could be a good example in representing the behavior and also providing a field for creating an especial event in determined time and place which is effective in making communication and interaction in the space. (Hall, 72, 1966) By looking into the features of conferences in the real and virtual spaces, this question arises whether holding seminars and conferences in the virtual spaces satisfy the needs or purposes of incubators?, whether this space is able to replace the real architectural space in the incubators? For answering this question, in order to the mentioned qualities or features, the results of some of these conferences and seminars show the success of these spaces in creating communications which provide a motivation in creating a face to face communication.

The suggested model for the conference places of incubators is physical space that its architectural approaches are effective in making the required communications and guideline interactions. Within this domain, creating a virtual space which is being formed by communicative systems is an important factor in the success of designed physical space.

## **11. Educational Spaces**

A brief summary of main services in the 2nd category is in the range of educational and counseling services. There are several experiences toward the feasibility of services such as counseling and education or learning ones in the virtual spaces in which the most current one is establishing the virtual universities. Virtual learning means the usage of developed computerized methods for transferring the lessons or syllabus to the students.

Virtual learning means delivering or presetting the educational points or syllabus by using a space simulation or by creating the possibility of interaction between learner and syllabus and the omission of physical space between teacher or professor and learner and also the establishment of a relationship between them for learning. The speed in this space is more than the real one and the learning is so dense. And learning in this situation is so quick in contrast to the delay of a professor in the real place. (A group of authors Academic, 2006) But there are some questions such as; whether this place provides the required quality of education? In the other words, whether a created or formed interactive relationship has ability of omitting the physical space by the omission of physical communication between learner and teacher or instructor? Or whether the virtual



space has the ability of replacing with architectural spaces? Based on the recent results, these experiences were not useful and promising. In accordance with the published statistics, 70% of the institutes of virtual learning in U.S.A were faced with failure or the virtual university of English, in contrast to millions pounds, did not success. Also the slowness and the reluctance to changing the system of universities and the valid center all the world is evidence to this fact. Certainly, this method of learning accomplished its purposes and desires. Purposes such as the repeatability of lessons, cost – effectiveness of learning, accessibility in each time and place, etc were considered but what is not important in its success is promoting or increasing the quality of learning.( Sadegh pour,2,2009) The quality of learning which is being done in the real space is promotable from various ways such as architectural creativity in creating or establishing a space or a behavior setting appropriate to the educational practice.

In other words, the quality in the physical space depends on the type of formed communications in this space and in some cases, sensory and unpredictable interactions and communications increases the quality of educational or learning space; however, these communications are not possible in the virtual world. This method of education has the capacity of creating changes in the educational and learning systems but if it is being used as an independent method, it will play a role as an educational facilitator. Nowadays, the best approach of virtual learning is an approach consists of two learning methods; traditional and electronic ones.( Sadegh pour,2,2009) By considering the results of virtual and real earning centers, the suggested model of incubators is a combing model from physical and virtual space as the intervention of the above mentioned spaces is not a causative factor. In the other words, the virtual space does not try to remove or decrease the physical model but it is an intervener factor in the success of the above mentioned space.

## **12. Office spaces**

A summary of the main delivered services in the 3rd group are; networking and financial provision. And the reacted activities are; bank – relations, creating the relations through technological and commercial financial network, access to the investors, direct investing, information transfer between entrepreneurs, initial capitals, operational budget, state loans, tax aids, etc.(Aaghajani,34,2002).

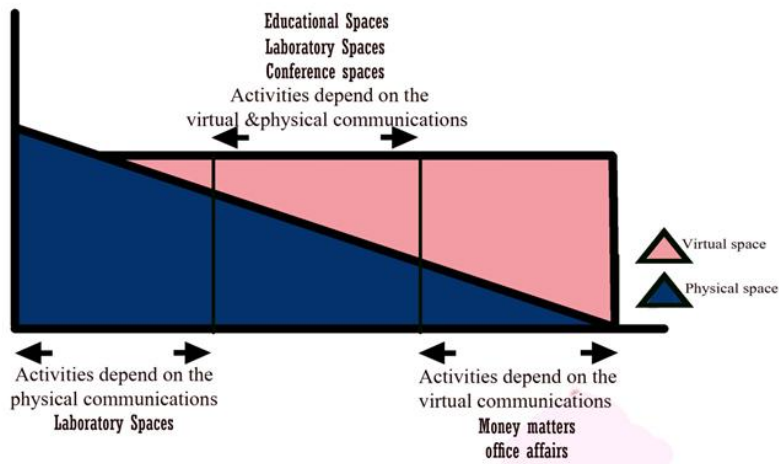
The activity system of this group of services depends on a flow of information which creates the formal relations in the physical architectural space and is predictable. What accomplishes the considered target within the delivered services is speed and accuracy in doing these activities.

In the physical spaces, delivering these services is associated with creating or making the formal behavior patterns or relationships. The intervention of senses and creating the human communications, behaviors and also the unpredictable events from the consequences of physical spaces mostly cause the disruption in speed and accuracy in the activity of an incubator. Professor,” Jon Lang”, believes that these formal institutes could be established by a flow of information instead of people .

In the virtual spaces, there is a possibility for creating a communicative flow for doing these services as by increasing the speed which is the result of suspension of time and place and also by decreasing the causative factors as human senses which is being formed by the developed systems of communications, the success of considered activities increase.

### 13. Presenting the suggested model

By considering the features or properties of two spaces, real and virtual ones, and also the situation of communications for the suggested model in this group of activities, creating the virtual space is important which is being formed on the root of real space. In the other words, real space will change into a virtual one by removing space, placing the behavior centers and behavior patterns and also avoids the unpredictable communications of real spaces. From the other viewpoint, the uncontrollable communications which are being formed by the senses in the physical spaces are a causative factor in the formation of



virtual space and the limitations of virtual spaces are the important factors for the success of target activity in this space. In the suggested model, the real space encounters a considerable decrease (the concept of place) but a complete remove does not occur. A brief summary and presenting a suggested general model on the

Fig 3: A brief summary and presenting a suggested general model on the incubator, by considering the available communications.  
source: inspired by: Izumi(1968)

incubator, by considering the available

communications

A series of presented activities by the incubators, by considering its especial target, depends on place and the physical communications. The other group of activities is in a space which is an integration of these two spaces and the other group does not depend on physical space or place and being formed only by a flow on communications. This issue in evaluating the feasibility of incubators provides a field for presenting an integrative model. And adjusting or reforming the architectural space and observing the stability principles will be an appropriate answer to the considered performance during the present time.(Fig3)

### 14. Conclusions

In the direction of evaluation and virtualization of real space in the architecture, studying the weak and strong or positive and negative points and the main factors in forming two spaces, real and virtual, is essential. In this respect, the concept of communication is analyzed within these two spaces and its result was an answer to the first question; whether the virtual spaces are able to be replaced with architectural spaces? The obtained results from these studies provide an answer to this question; by considering the target activity, the considered performance and also studying the features of an effective communications, the possibility of its virtualization will be determined. As in most studies of some activities of incubators in the technological and science parks, it was observed that the effective communications of some performances depend on the physical architectural spaces. And the other group depends on a flow of information in doing the target activity. In the other words, some activities need the uncontrollable and unpredictable communications (which are from the features of physical architectural

space) for accomplishing the considered target. The discussion of virtual space and replacing it with various spaces and different performances of architecture in the present day are being accounted as a modern event.

David Clark from M.I.T. University presented an Theory in the field of standards called “Elephants’ Meeting”. This theory shows the activities around a new subject. Sine a new topic discovered for the 1st time, a wave of searching activities around it will be formed such as discussion, article, etc. After a short time, this wave will become slow and after the industry showed its interest toward it, a wave in investments will be formed. The main point related to this theory is that; the junction point of these two points is an elephant (the wave of searching and investing). In this place (the junction point of these two elephants), standards will be defined, completely. If they are defined before a determined time (before finishing a research), it will be possible to misunderstand the subject and the standard won’t be good or appropriate. If they are written sooner than a determined time, after a beginning of an investing wave, the investment of more companies – from different directions – will be possible and perhaps, they will ignore them. If the distance between these two elephants is less, the crushing of standard writers will be possible.

This discussion is true in the replacement of virtual spaces as in a case of replacing these spaces (before enough studies and determining the required standards in its feasibility), we face the consequences and the inefficiency of emerging event as in the previous experiences, the lack of success of valid virtual learning centers in the entire world is an example of this theory means; when the distance between these two elephants is less and the related standards are not defined.( Tanenbaum.A.S,2002)

Haste or being hurry in doing activities (replacing the virtual space instead of real one in some learning centers) causes the crushing of standards and also unsuccessful (lack of success) of the considered space. However, replacing the virtual spaces with different spaces is continuing and these points or issues are motivations and the responsibilities of related experts who taking steps in studying and defining the required standards in replacing or integrating these two spaces.

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