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The Analysis of Role of Behavioral Sciences in Design Process Based on Environmental Design

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Abstract

The objective of analyzing the role of Behavioral Sciences in Design is to find a solution in order to reach a design product responsible to user's needs, is to achieve a solution for an environmental design which its body corresponds with the users behavioral plans. The named are the objectives of behavioral science's paradigms. In this research after a comprehensive review of literature and analyzing and categorizing the effective patterns on design process the role of behavioral sciences in design process was defined. The research, conclusions showed that the role of behavioral sciences works in two modes: forming models and theories and research methods. Among the findings it was defined that the effectiveness of the decisions in initial phases of design process are highly more than the decisions in lateral phases. In addition it was defined that normative theories reveals the normative statements of designers and this defines their personal frameworks. The latter phase is just a scientific guess thus it defines the role of behavioral sciences in environmental design process.

Keywords: Behavioral sciences, Design process, Design Research, design Paradigms

Introduction

There are many definitions for the word "Design" and when it comes to Architectural Design many more parameters step in. Design has been always introduced as a creative act which its accurate scientific definition is not possible. Design Theories have a major role in defining the paradigms of architectural design process. Theories are affective in architectural and urban planning and at the end they try to reach a specific goal. Besides design Paradigms efforts is to affect the theories and patterns in order to realize paradigm's essences.

There are many ways to study the Architectural design process but what really matters is that the outcome of the efforts should lead to formation of a process that can be able to accomplish certain goals. There has been a discussion opened in 70's called Design research which its goal was to form such processes. (Pakzad & Bozorg, 2012) Many theorists had efforts in this field of study and proposed many discussions and paradigms for design in order to reach their objectives. What really defines these objectives is the concerns of each theorist. In their opinion the focal concern is preferred to the others. For many of them the preferred concern is to make balance between human needs and environment's design. These thinkers usually act in the boundaries of environmental psychology and often work in groups in order to achieve the suggested goals in design research.

Literature review

Design Theory

Researches regarding design theories are separated in three major fields: First approach is Normative. In this approach problems are solved with systematic methods. Some of the famous researchers of this approach are Asimov (1962), Simon (1969) , Jones (1970) and Cross,Nathan Walker (1981). These researchers regard design as a problem solving; Rational Models regarding design including Pena Parshall's problem seeking (2001) and Christopher Alexander's Pattern

Language (1997). The second approach towards design Process is experimental and implies that the designer rarely uses normative theories.

Design is one of the most important human activities and can be counted as one of the major pillars of changes in societies. Until today many researchers have studied the design process and the architectural design. As a matter of fact design process has a complex and indefinable nature and design is a creative act which happens because of existence of limitations and necessities caused by functions and needs (Premius, 2012, 412) in addition since more than two millenniums ago individuals like Vitruvius proposed many definitions for design (Table 1).

Table 1: Different disciplines of design characteristics of various authors (Lang, 1987).

Vitros	Wotton	Gropius	Norberg-schultz	Steel
Usefulness Beauty stability	Product Joy Consistency	Function Expression Technology	Role Form Technology	Usefulness Shelter & Security Social Interaction Symbolic Identity Joy Development

Design Process or problem solving as a rational process

In 1960's as an aftermath of technology development, Problem solving theories were widely studied. (Porteous, 1977) in this epoch design is considered as a rational process that follows a systematic strings of data collecting, analyzing, testing and choosing alternatives.(Morris, 2012, 397).in 1968 Herbert Simon introduced the most famous three phased model of intelligence in analyzing design as a generating ideas and choosing as evaluation and decision making.

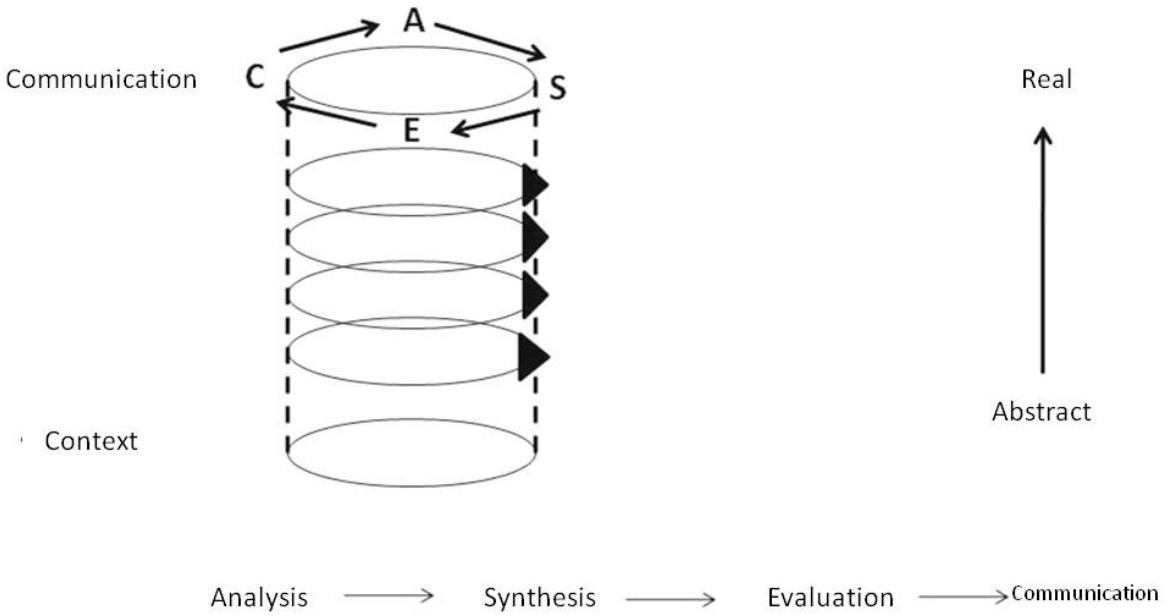

Figure 1: Design process of Asimov (Pranovich, 2004).

In 1999 Al Crossy introduced Simon's approach as an intelligence stage. A stage which problem is identified, data is collected and basic definitions are understood. Asimov studied Simon's three-phased model and its implications. Asimov believed that each engineering project can be modeled as a vertical string of actions.

He implied that inside each phase of vertical flowchart there is a horizontal string which organizes the process and repeats itself constantly. Asimov called this hierarchy "the Design Process" and describes it as "a cycle of activities which take place in time". (Rowe, 1992) He has assumed two vertical and horizontal axis for design process (Figure 1)

Horizontal line includes analysis, combination, evaluation and relation. Vertical line includes consecutive repletion of activities which starts in abstract domain and proceeds to concrete stages (Pranovich, 2004).

Methodology

This is a qualitative research using multiple references in order to reach a systematic analyze of the texts. (Content analysis method)

This research studied multiple generations of designers, different aspects and many proofs. In other words design processes, characteristics and proofs are brought to comparison and been analyzed.

Data analysis

Generations of design research

First generation of designers were based on analysis and combination. They followed scientific positivist methods in search of a transparent, logical, mathematical, repeatable and assessable. Different generations of design research and their characteristics are categorized in (Table 2).

Table 2: Categorizing different generations of design research Theories.

<table>
<tr><td>Design methods</td><td>Intuitive process, Un definable
Post WWII-
Late 50's, early 60's</td><td colspan="2">First generation
Analysis-combination method
Late 60's-Early 70's</td><td>Second generation
Participative methods
Early 70's-early 80's</td><td colspan="2">Third generation
concept & examination methods
Early 80's</td></tr>
<tr><td rowspan="4">Design process model</td><td rowspan="4">-</td><td>Rational models
Systematic design methods</td><td></td><td rowspan="4">Polemic process

Horst Rittel and Vladimir Bazjanac's model 1972</td><td rowspan="4">Design as a learning process</td><td rowspan="4">Design as a scheme of theory and examination
Bill Haley</td></tr>
<tr><td>Rational approach</td><td>Phase Approach</td></tr>
<tr><td>Alexander's model 1964</td><td rowspan="2">Archer's
Jones'
Six fields
AAA's,
Snowders model,
Behavior-probability model,
Archetypal model</td></tr>
<tr><td></td></tr>
</table>

Designer's role	Mind is a black box who turns the given data into presentable outcomes through an unknown process	High stage of intellect is considered for designer, A design with believes is a better design	Challenging the role of designer as the key decision maker, Design-decision is a collective matter with participants, Designer as a technician who provides needed data for decision making	Horst Rittel and Vladimir Bazjanac's model 1972	An accurate forecast of architectural Design, organizations needed for design process, Evaluation process, based on designer's subjective structures
Form of process	Qualitative and positive	Linear and consecutive, With Normative characteristics	Consecutive but non-linear (Spiral)	Circular and positive (Non linear)	Non Linear positive
Phases and path of process	Intuition and revelation Review of experiments Closed and personal decision making	Experiment, analyze, combination and evaluation, emphasize on evaluation in each step,	Defining the behavioral system, the physical system ,defining the system of behavior-environment	Two actions: Diversify more and diversify less	Guess-Analyze (Forecast and evaluation)
Effecting factors	Designer and lived experiences	Design process effected by context and Worldview, Design influenced by designers content theory	Society participating in polemic	Design and past experiences	induction
Sum up & analysis	Based on individual decision making	Monotone and linear	Participative	inductive	Perceptional and qualitative

The main default of all above mentioned approaches is that the best way to systematize the design is to follow a rational and logical approach that naturally has a step by step and linear character. In fact this generation offer systematic and rational models of design and are separable into rational and phase.

Effective approaches on design process

As well as the philosophical and social thoughts are effective on formation of different art and architectural styles they also effect the design process. In other words every system of thinking can cause changes in different phases of design process. Each of the approaches have specific factors which can cause changes in details of design process. Methods, Patterns and effective factors on design process are summarized in (Table 3).

Table 3: Conclusions methods, design patterns and components that influence the design process from 1960 to 2002

<table>
<tr><td colspan="5">Methodological approaches and design process</td><td>Factors and parameters</td></tr>
<tr><td rowspan="4">Systematic design methods</td><td rowspan="3">Phasal approach</td><td>Jones Pattern 1960</td><td>3 Phases of analyze, combination & evaluation</td><td rowspan="4">Providing virtual Data with scientific methods, Breaking the problem into smaller ones, adding data into each step and finally synthesis of all solutions</td><td rowspan="4">Scientific knowledge
Designer’s ability to analyze</td></tr>
<tr><td>Archers’ Pattern 1960</td><td>Circular pattern which added inter-phases into jones’ model</td></tr>
<tr><td>AAA*</td><td>6 phased AAA model</td></tr>
<tr><td>Logical approach</td><td>Alexander’s Model</td><td>Separated steps so that starting every step needs finishing the previous</td></tr>
<tr><td>Context based methods</td><td colspan="2">Broadbent, G. pattern 1973</td><td colspan="2">Based on four ways of generating forms : functional, conventional, normative and deductive
Intervention of experiment and ration between analyze and synthesis based on environmental feedbacks</td><td>Influenced by economical, Cultural and Environmental factors</td></tr>
<tr><td></td><td colspan="2">John Lang’s theory
A scientific approach to environment’s design</td><td colspan="2">Step by step activities including: Planning, designing, choosing, execution and evaluation which are done linear but not necessarily without overlap</td><td>Physical Environment, Social System, cultural environment, traditions, Cultural norms</td></tr>
<tr><td rowspan="2">Interactive patterns (Perceptional)</td><td colspan="2">Dana dork’s model 1993</td><td colspan="2">Maximizing the knowledge to design, A practical ontology to a scientific method for architectural design. The purpose is reaching to a concrete accurate and repeatable objectives, that the outcomes can be verified by a theory</td><td>An appropriate question
Organization and interpretation of data</td></tr>
<tr><td colspan="2">Lawson’s Model 1997
Generator, guess, analysis</td><td colspan="2">Design Process in mind, Design as a learnable ability, design three principles : generator, function and domain</td><td>Psychological Motivation of Designer, psychological aspects of design</td></tr>
<tr><td rowspan="2">Design as a research</td><td colspan="2">Gisele 1981</td><td colspan="2">Design as an exploration and a form of research, research for the relation of environment-behavior</td><td>Research and exploration</td></tr>
<tr><td colspan="2">Groat 2002</td><td colspan="2">The role of architect as a cultivator</td><td>Realizing a successful environment regarding the socio-cultural aspects</td></tr>
</table>

* American Association of Architecture

The role of behavioral sciences

Many of anthropologists, sociologist and psychologists studied the profession of designers and the problems considered by architects. (McKechnie, 1974) More than that an increasing number

of industrial designers, architecture, landscape artists and urban designers execute systematic researches using technics of behavioral sciences (Lang,2009)

Both groups realized that behavioral sciences can develop content theories, models and concepts that helps us reaching a clear understanding of design process and a definition of the environment-behavior relation. Both groups admit that theories are enriched with research. The main goal is to elevate the abilities of designers in order to design better interiors, buildings, complexes, environment and landscapes.

The model that caught the attention of many tutors and architects because of its ability to evaluate every step and was introduced as an ideal model is Raymond Studer's. This model helps the definition of potential participation of behavioral sciences in theory and practice in environment design. The mail steps of this model is as shown below:

Defining an applicable behavioral system

- Defining a proper physical system
- Understanding and analyzing of physical system
- Explaining the acquired environment-behavior system (Figure 2).

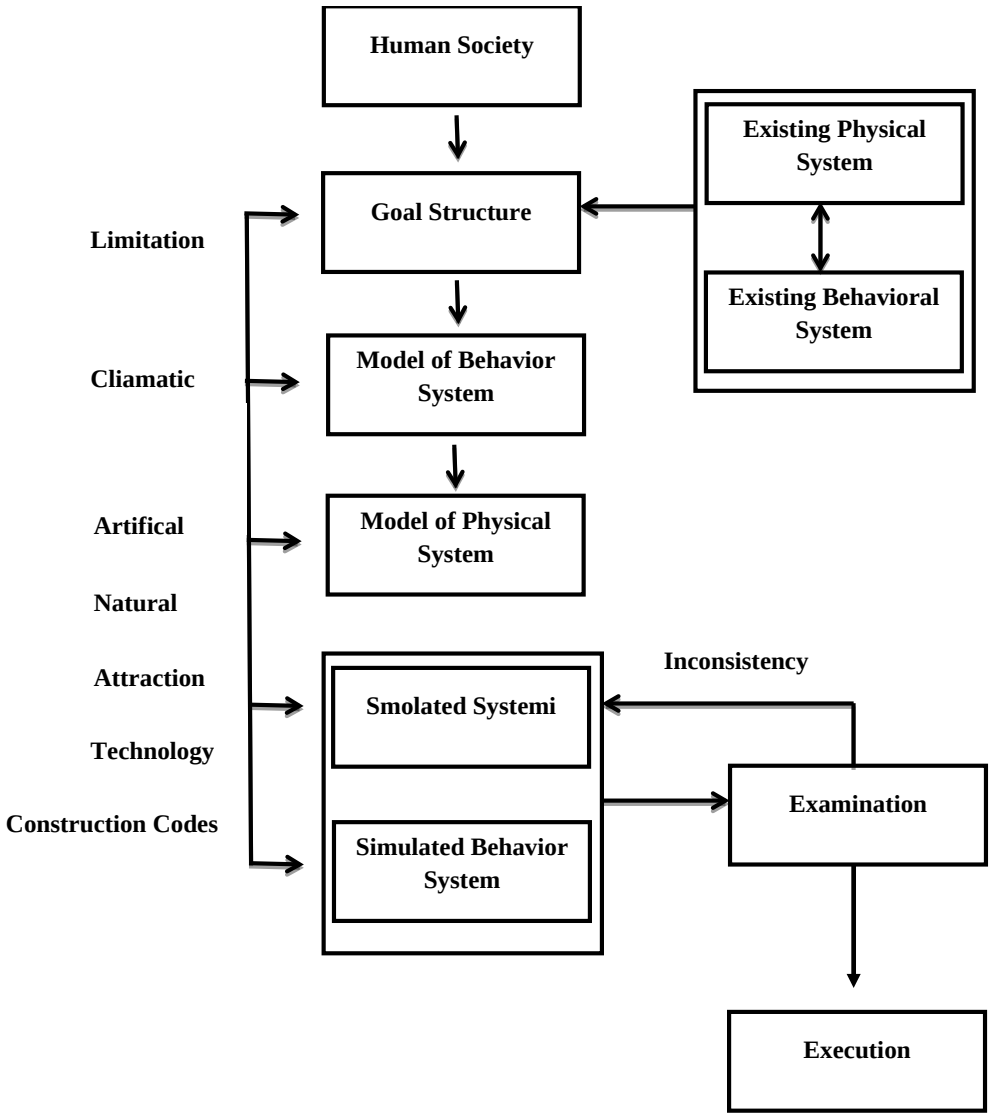

Figure 2: Behavior-probability model of the design process (Stauder 1969).

Behavioral sciences take part in principles and theories of design in many different ways. These approaches which are previously shown in Figure 3, consist of:

- Theories and models which enables the understanding of design process and defines the relation of users and Physical Environment
- Research Methods

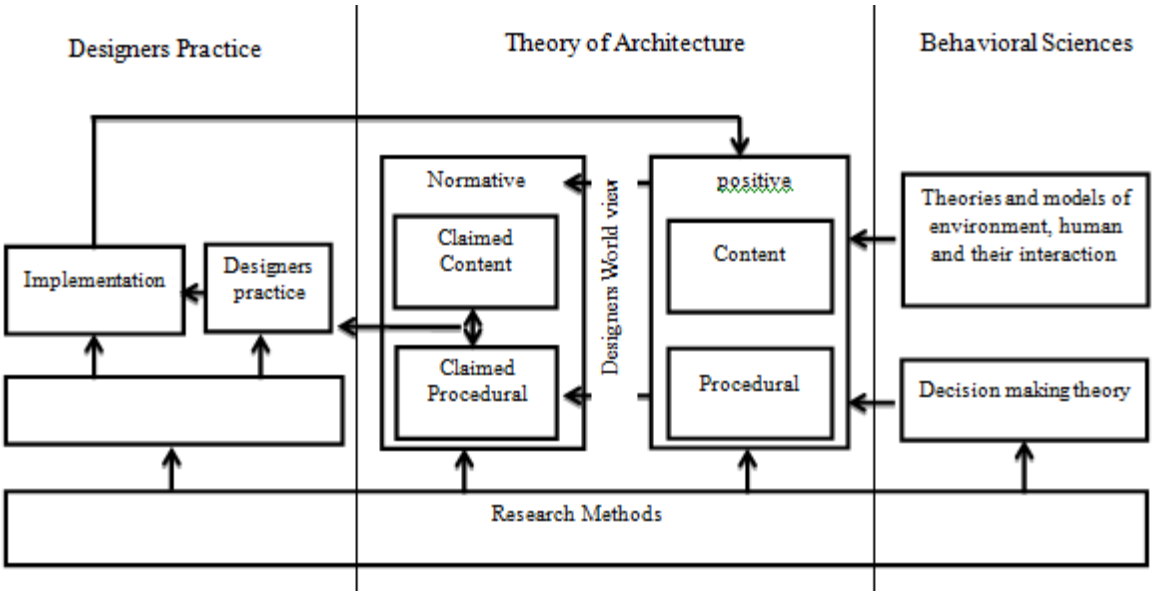

Figure 3: Behavioral sciences and theoretical principles of environmental design (Lang, 1987).

At first, designers of environment in order to form a more general model of decision making sought the opinions of Cognitive Psychologists and other Practical Sciences like John Dewey, Herbert Simon, Churchman and others.

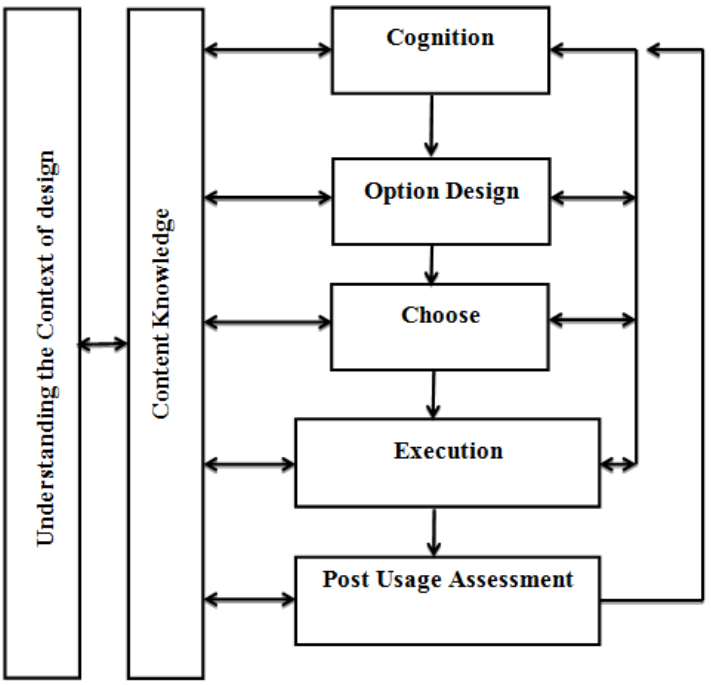

Figure 4: General model of phases of environmental design (Lang, 1987).

In these disciplines the process of decision making is divided to many phases which are:
Cognition: which its purpose is to understand the Point of all activities.
Design: in this phase the proposed solutions are being evaluated.
Execution: decision is made in this phase

And, probably the Post-occupancy evaluation which its conclusions are brought to the phase of cognition. The consecutive phase of Process are shown in Figure 4. (Figure 4) Since this a general framework covering both the positive and normative models, it is considered as an Ideal model for decision making.

Conclusion

The role of behavioral sciences in the process of architectural design has two modes which are formation of theories and models of design and research methods. Having these in mind with more attention to former we can find a model for the process of architectural design which its main concern is to respond the existing necessities in environmental psychology's paradigm. According to John Lang, design theories are divided to positive and normative models. Mainly design theories are normative. On the other hand the normative statements of every designer is derived from their worldview and their perception of a desirable world. In first pages of this research it was indicated that designers decisions in initial phases are more effective than the latter phases of process which puts emphasize on the initials. The Initial phases according to Jane Darke Model is dedicated to assumptions. Beside the assumption phase is simultaneous to normative statements of designer.

In figure 5 a primitive model based on this research's conclusions consists of general approaches to design process on the basis of behavioral sciences. (Figure 5) in this model the position of behavioral sciences in design process is located in the initial phase which is proposed Jane Darke in assumption phase. Preferences of an environment designer on the basis of environmental psychology's paradigm is to achieve the Ideas which this paradigm has set in order to respond to users' needs.

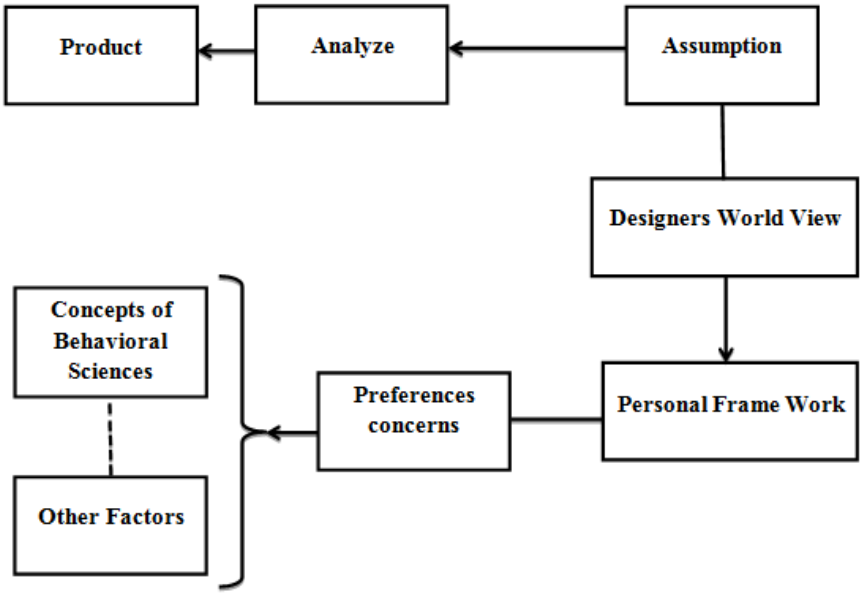

Figure 5: The primary environmental design process based on concepts of behavioral science.

In environment design there are always emerging new problems which diversify more through time. Thus it seems that there should be a prior phase to the "assumption" in order to make "emerging new problems force stable. With changes in lifestyle, norms and social values there come

the new problems for design, previously unidentified, which necessarily need new criteria and factors. Thus the existence of a prior phase called "Understanding the problem of design" is inevitable.

Another important notion in design process on the basis of behavioral sciences is "Post-Accommodation evaluation" which was a generating principle of forming the paradigm of environmental psychology. It is also a data gathering technical about the environment the behavioral sciences. This evaluation defines the degree of design's success. After the inhabitation of users the degree of designers understanding of the behavioral plan is assessed by this method. In this way possible behavior changes or possible physical changes in designed environment are observed and registered. Thus it will be revealed that the process of environment design has succeeded to respond to users' needs or not. Sometimes the obvious results show that users needed to change the physical environment because not only it was appropriate for their needs but also it impaired their behavior plan. Thus one of the important phases of Architectural design on the basis of behavioral sciences is "post occupancy evaluation" which enables the completion of the process (Figure 6).

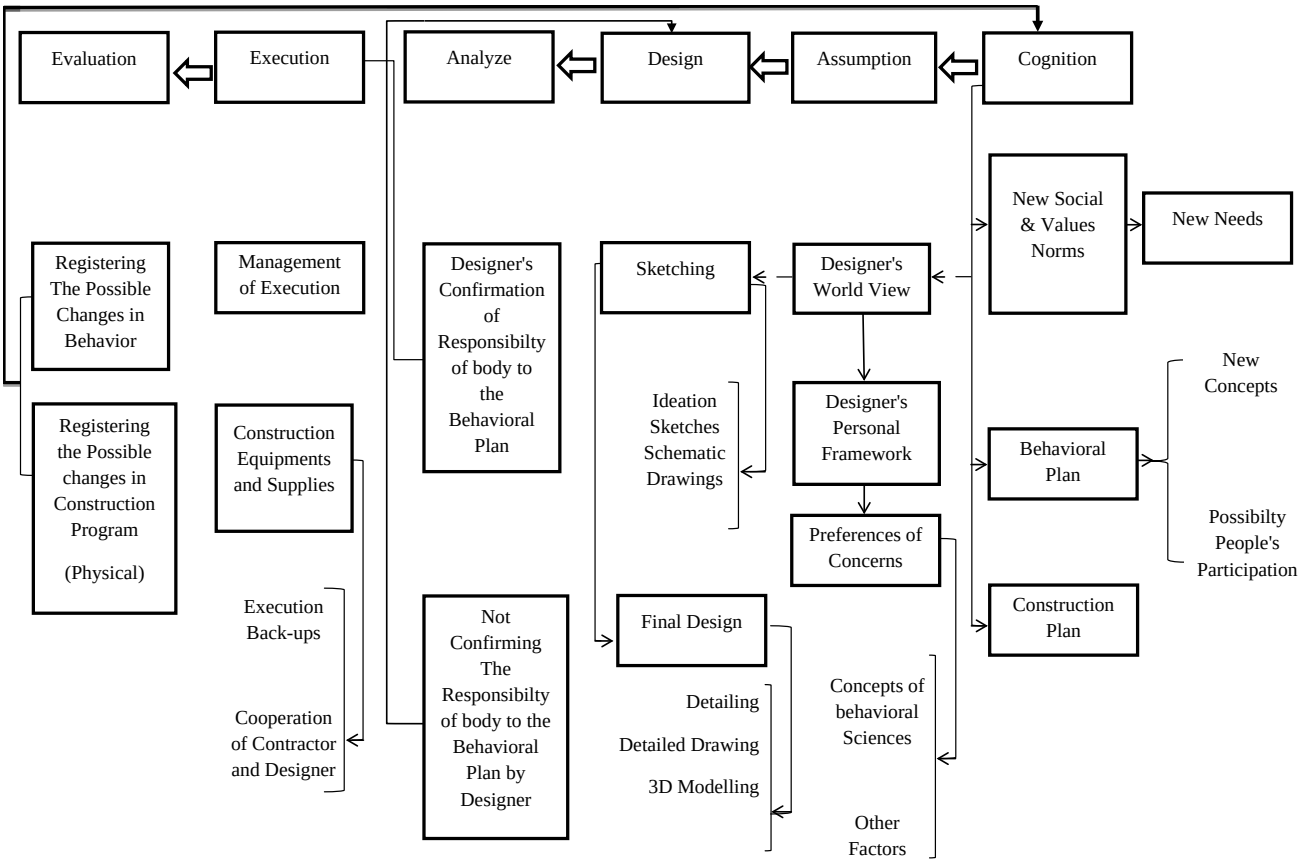

Figure 6: Role of Behavioral Sciences in Design Process based on Environmental Design.

Suggestions for further research

The conclusions of this research implies a general overview on the relation between behavioral sciences and environment design which is not applicable in all design matters. With changes trough time and place values and norms of designers are changed that suggests re-assessment of this research's conclusions. Numerous factors can cause the changes in details of design process. For example early sketches can be changed in the future and as an effect change the initial phases which are the matters of great importance.

Hopefully with the studies of design research the process of environment design will be more clarified and the path to realize the goals of Architectural paradigms are paved.

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