Perceptive Construction-How the Body Cognition Shapes the Construction of Intelligent Creative Offices

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Abstract. Based on the cognitive behavior theory, this study introduces the construction of intelligent creative spaces and facilitates space context of workplaces by exploring the sensory perception from the perspective of the body cognition. By analyzing the body cognition process from Phenomenology of Body and narration of environmental consciousness, the study further analyzes the convergence between spatial behavior developed from perception and modern digital media, imagines our workplace environment anew, and tries to build up the workplace for public's reference that is context-aware, none technology-logic oriented, effectively creative and intelligent.

Keywords: Digital Media · Consciousness · Intelligent Space

1 Research Background and Purpose

With the high degree of institutionalization and development of digital media has the space construct thus gradually becomes the infrastructure of information platforms, and the Internet space and virtual environment gradually permeate and dominate the workplace, with the space governance increasingly independent of the actual environmental. In addition to collecting external information through visual, auditory, tactile and olfactory senses, the awareness of body consciousness can also affect the sensory perception of human body by changing the subtle atmosphere pervading the space [1]. This makes it a must for the spatial organization to make dynamic changes according to different forms such as environmental conditions and users' needs, while the workplace needs to be established to meet the requirements of having more connection, intervention and feedback between the human body and the workplace. However, the traditional workplace guided by the principles of formalization, class-differentiation, simplification and linearization cannot meet this demand. Therefore, the study attempts to establish the workplace for public's reference that is context-aware, none technology-logic oriented, effectively creative and intelligent.

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2 Theories and Methods

2.1 Literature Review and Discussion

Based on the cognitive-developmental theory and sensory perception development theory, this study probes into the entry of physical sense into perception space, and the entry of imagination space language into physical space language, with the correlation between environmental space and intelligent space discussed, so as to construct the theory of creative workplace.

Piaget argues in his cognitive-developmental theory that cognitive development refers to the changing process of the cognitive style of knowledge construction and the thinking ability to solve problems in the process of adapting to the environment after birth. Learner's store and organize miscellaneous materials learned before in memory, thus forming cognitive structure (Ernest R. Halgard, etc., 1981). The shape of space, however, should be based on the original cognition to guide the correction and reconstruction of a new space system. Moran (2005) argues from its origin that the body intention is in a world long before we have the conceptual experience about it. The body carries out cognitive activities with the space we are in in its unique ways, and interacts with the space through sensory perception, bringing us into the world of space [2]. Zhuojun Gong (2006) describes the spatial experience of body and vision. Through body's intentionality, perception itself facilitates a rhythm from physical experience [3]. The Phenomenology of Perception describes the life experience, or the past experience. This study focuses on the experience of contemporary video media, with a brand-new gestalt psychology revealed, illuminates the situation of science and technology media for human existence, and reviews the hidden experience of modern visual reading and post-modern video viewing. The new media is added to the both body and visual space experience, presenting a new cognitive behavior of body and space.

Ackerman (1993) suggests that perception defines the boundaries of consciousness and our perception binds us to the past [4]. Perception often resonates with new cognition through the accumulation of past experience. Bohan Huang (2002) analyzes the connotation of the space view by focusing on spatial problems, in accordance with the clues of perception and body [5]. Yishan Huang (2000) believes that the shaping elements of perception in space and form are based on the design elements from form development, while the setting of sensory space is inspired by the form development. It mainly interprets the needs of personal senses for space through space, and the needs and feelings of personal senses for the external environment in certain space [6]. Bachelard (2003) refers to truly entering the "inwardness", completely abandoning the outwardness of "Shi Xiang", and returning to the various body perceptions (sensation, perception, kinesthesis), with emphasis on the expansion of imagination in space through past physical experience [7]. Yizhang Huang (1999) believes that the context of development and concept of space refer to the space that permeates with the body and exists, which is true for both the existence of space and body, and also refer to space of phenomenology of perception, which is produced by the joint action between body perception and space. Based on the physical "being" and "Dasein", with essence in the meaning between the living body and the environment, and the characteristics of body perception makes the scenario space an overall presentation of inclusive absoluteness, self-enlightenment,

form and circulation [8]. The "event concept" proposed by Tingxiang Zhao (1993) is actually a kind of interaction between body and space. The body cannot exist independently from the existential space. Under the theoretical framework of ontology, the formation of space happens because of the body existence [9]. Zhaoren Zheng (2004) regards vision as the most direct medium through which people feel space, and human's visual phenomena can most directly affect people's perception of space. Under the theory of sensory perception, vision is a kind of activity that is both open and hidden, while through the tactile senses, the physical sense shown can distinguish the nature of reality and the nature of matter [10].

Lawson (2003) argues that space is the most basic and common form for communication. Perception is actually a proactive process of perceiving the world around us. Through contact with the body, sensory perception bridges the spatial language that constructs the special atmosphere [11]. Rapoport (2004) stressed the multiplicity of environmental information and considered perception as the integration of various senses, arguing that perception is not a single existence, but instead interrelated and compatible with the environment [12].

The intervention of digital media can overturn the body perception which is once limited, with the discussion of the idea of intelligent space, and show the relationship between physical space and virtual space. Maolin Qiu (2015) mentioned that architectural space consists of diverse environment, which can be seen the environment for social communication, as well as the environment composed by users and functional components [13]. Yujun Huang (2005) regards that people are a part of the space. With the development of digital technology, to facilitate closer relationship between people and space, an environment in which people can perceive each other in physical space is constructed through the research and development of pervasive computing [14]. The traditional pure relationship between human and space is joined by digital media to form space, activity and interface. Through the application of smart solutions, which incorporate smart materials and information and communication technologies, users in this space are context-aware and therefore able to interact with their surroundings for capturing context-sensitive information to improve their living experience. The connotation of the so-called intelligent space is a symbol boasting many active mechanisms to participate in the creation of the environment, which can constantly track, sense and detect people and objects in the physical space, and give timely feedback and help.

The tactile sense plays a localized role in the space. Only with the tactile and pain senses can people locate in space. Once the tactile sense is removed, the perception of the body in space will be ineffective. Zhuangting Zhang (2005) argues that tactile sense can assist human to convey emotions, and such perceptual mechanism facilitates people's perception of the substantiality. From the aspects of "physiology" and "cognitive psychology", the significance and phenomenon of tactile sense are discussed in conception development [15]. The creative design of digital offices by Akihiro Kishimoto/Ryusuke Naka (2007) not only enables the remote work from multiple cities or countries, but also meets the requirements as follows: being personalized, with more recognition for work; being wireless, with efficiency in using space to create effectiveness; being emotional, with offices turned into another "home"; being differentiated, with senior staff's needs and requirements from both genders well catered to [16].

2.2 Research Methods

By means of literature analysis and theoretical discussion, and by adopting the evaluation indicators of questionnaire-based Semantic Differential (SD), this study, through on-the-spot investigation, tries to find out the perceptual-construct-related workplace, and finally, with the embedded digital media applications, establish intelligent creative workplace.

3 Research Process and Results

3.1 Theoretical Discussion of Body Cognitive Process

"Cognition" is external information received by our perceptual senses, then recoded, classified, and stored in our memory. The establishment of perception is such that when perceiving certain information is in need, it is taken out and used. However, people's perceptual response is not just a simple stimulus response. People will extract data from memory and choose what they need from the environment, through the feedback of thinking and experience. This study applies the framework of literature analysis to explore the interaction, appearance and perception relationship between perception and space in the cognitive process of the body.

Perceptual Constancy and the Construction of Interactive Space. Perception is object-based, which is the whole reflection of objective things from the human brain to each sense. Specific organizational characteristics are implied in the perceptual activities. The object is first recognized through visual perception, with image and background as the main components. Perception actively facilitates best interpretation of sensory information. Perception separates the image from the background, namely, only the sensory stimulus is noticed, and the invisible stimulus is temporarily stored in the nervous system. Factors that influence our attention to a stimulus include intensity, size, contrast, the physical nature of the movement, personal habits and temporary interests. Nevertheless, perception is not isolated, but integrated. In perception, people do not reflect individual characteristics and attributes of stimuli in isolation, but the organic synthesis of multiple individual attributes, reflecting the integrity and relationship of things. People's perceptual system establishes an outline property from recognizable objects, which is affected by environmental changes like color, shape, size and position. But the perceptual system maintains its stability to a considerable extent, arguing that objects are unfailing, namely the perceptual constancy. Perceptual constancy is of great significance to one's normal life and work. If one's perception varies with the changes of objective conditions, it is impossible to obtain any definite knowledge.

But vision is not the only element to construct perception. Perception is resulted from the synergy of all senses. Besides vision, we still have many other senses to feel the relationship between image and background. For example, we can identify the relative position of an object's existence by touching it, with body's participation making it easier to adapt to the new environment. The construction of creative offices needs perceptual constancy serving as the schema of spatial partition, which must facilitate the interaction between the body and the environment, so that the space is constructed by the human body rather than things.

Perceptual Space with Unique Mobility. Events are composed of space and time, with melody being the organization of time, and geometry being the configuration of space. When perceptual motor is facilitated, the human body is able to sense movements in different time and space. For space users, when a new type of space is generated, the interaction between human body perception and space will also occur, especially the resonance between motion perception. The configuration of a new type of space also means that people must change their working habits accordingly. Since perception is selective and does not respond in the same way to all surrounding stimuli, with focuses only on a few stimuli. Furthermore, what an individual perceives and how much he or she perceives is shaped by his internal needs, values, expectations and past experiences. Therefore, the construction rules of mobile perception space should be dependent on human body, and the shape and appearance of space constructed by digital media should also be redefined [17].

The Context of Perception – the Awareness of Intelligent Space. Body perception always maintains the imagination activity of "ontological perception" beyond the fact level, which needs to be implemented by body perception (Zhuojun Gong, 2006). Different from tactile sense, the color in vision will not produce the feeling of objectification on body parts like tactile sense dose. External objects can be analogized through visual perception to form the locating relationship with body space. However, the mobility and use state of the tactile sense is not outlined by sensory graph. Since the body and the external objects must both possess the nature of objects, in order to touch each other. In the process of mutual contact, the perceptual function of the body makes it transcend the state of objects, but the body still has the nature of objects, so it can indeed compare the physical existence state of external objects or others to form the perceptual judgment of the outside world (Zhuojun Gong, 2006). Like objects in space, the motion perceived by our five senses is an obvious sign. The inner continuity that consciousness perceives is nothing but the convergence of conscious states and our self-growth.

The construction of intelligent space showcases that users' activities and space can be perceived, namely, intelligent interface starts the perceptual interface developed from body perception. Space and intelligent elements can be combined, and intelligent environment should be an environment of perceptual interaction, or even the continuation of consciousness. The construction of digital media should be regarded as a spatial expression that fits the body perception and is reasonably defined.

3.2 The Discussion of Environmental Consciousness

Based on the above literature analysis, this study compares the construction of intelligent perceptual space with the physical environment through field investigation, by means of questionnaire survey and data analysis, in an attempt to establish the principle that applies for the construction of intelligent creative offices.

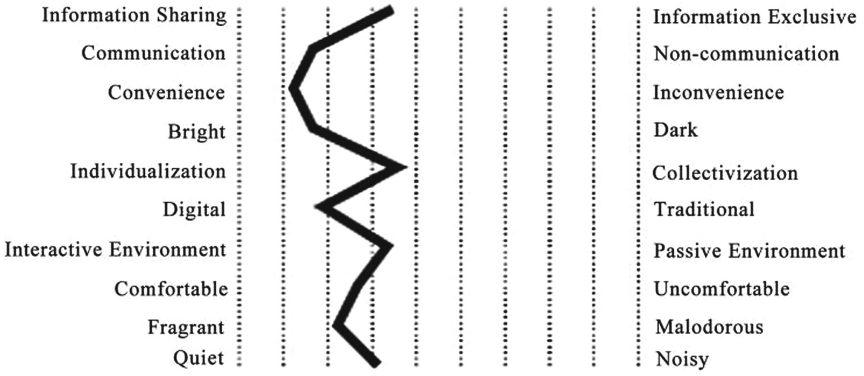
Questionnaire Survey and Analysis. In order to understand the relationship between current workplace usage and users' expectations, this study collected nearly 150 groups of qualitative vocabulary based on the above theoretical discussion, applying KJ method for preliminary screening, eliminated items with high overlap and difficult evaluation,

and obtained a total of 56 groups of situations and demands (Table 1). Through questionnaire survey and analysis, data was reduced and classified by Multi-Dimensional Scaling (MDS), and 10 representative samples from this group were collected. The Semantic Differential method (SD) was applied to make a 10-scale evaluation questionnaire (Table 2), with 20 people in each group. In each group, respondents conducting design-related and general clerical work were selected for classification. As for the features of communication, convenience and brightness, results are close to ideal, while when it comes to features of information sharing, personalization, quietness and interactive environments, the results saw the lack of them. This data shows that the configuration of body cognition in workplace focuses on the construction of visual perception while ignoring the shaping of auditory, olfactory and tactile senses, leaving some cognitive distance between users and the workplace, thus fails to create intelligent creative offices from the perspective of body cognition.

Table 1. 56 Sets of Context and Demand-Sensitive Vocabulary

1.Open 2.Independent 3.Mobile 4.Interactive 5.Closely-connected 6.Information Sharing 7.Clear hierarchy 8.buffer space 9.Visual Management 10.Communication 11.Gorgeous 12.Internet 13.Privacy 14.Appeal 15.Convenience 16.Bright 17.Knowledge Commons 18.Personalization 19.Status Symbol 20.Visualization 21.Tactility 22.Connectivity 23.homogeneity 24.Video Message 25.Digitization 26.Intelligent Furniture 27.Flexible Space 28.Smart Environment 29.Interactive Environment 30.Smart Space 31.Information Space 32.Static 33.Dynamic 34.Single 35.Multiple 36.Wireless Communication 37.Space-oriented 38.Users-oriented 39.High Touch 40.Comfortable Space 41.Spatial Elasticity 42.Space Consistency 43.Comfortable 44.Quiet 45.Lively 46.Fragrant 47.Electronic Secretary 48.Emotion Indicator 49.Automatic Conveyor 50.Dimension Door 51.Memory Chips 52.Spatial Transparent Shield 53.Sports Sensor 54.Automatic Dim Sum Machine 55.Pleasing Voice 56.Being Different

Table 2. 10 Pairs of Bipolar Adjectives Based on Semantic Differential (SD)



Field Observation Method. This study carries forward the results of the above questionnaire analysis, and directly verified the case of one lawyer's office as field observation case. In Fig. 1 and Fig. 2, same characteristics are shown for the feeling of current offices or the most desired equipment in the with reference from current usage and the questionnaire. The application of digital media fails to incorporate body perception, resulting in the following problems:

1. The division of office space, yet seemingly open, facilitates mutual interference and lacks of spatial communication.
2. The partition divides the domain, but the individual's space lacks personalization.
3. With only three requirements of convenience, brightness and personalization in the aforementioned research satisfied, the remaining demands like information sharing, communication of interactive environment, digitization, interactive environment, comfortable space, fragrance and quietness are not met.

Discussion on Intelligent Creative Offices. Possessing "perception", such as tactile, visual, olfactory and auditory senses, along with kinesthesis, is the basis of maintaining human health. Intelligent space is analogous to human function. "Smart environment" is a place designed for human beings. Through the application of intelligent methods, users in this space have the context-aware ability, so that they can interact with the surrounding environment, and capture context-sensitive information to improve their living experience (Qiu Maolin, 2015). The high degree of institutionalization of digital media frees

Fig. 1. The Internal Environment of one Lawyer's Office (Only meet the standards of Convenience, Brightness and Personification in Table 2 as for Planning and Design)

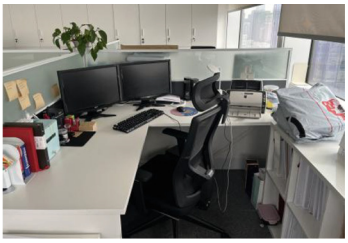


Fig. 2. The Internal Environment of one Lawyer's Office (In Accordance with Negative Area of Bipolar Adjectives in 10-Scale Table from SD)

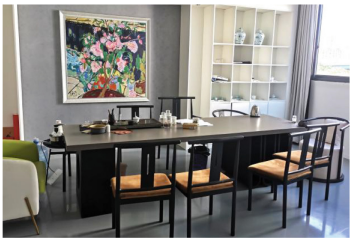


Fig. 3. Space Field with Communication, Convenience and Interactive Environment in the Weiner Digital Art Industrial Park (Picture taken by the author himself)

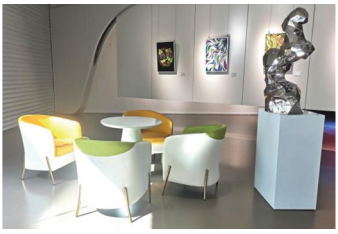


Fig. 4. Working Environment from an Urban Perspective in the Weiner Digital Art Industrial Park, with Interactive Space (Picture taken by the author himself)

Fig. 5. Relationship Graph Between Perception Construction and Workplace (Drawn from this Study)

workplace from space and time restrictions. The increasingly complex workplace makes the it presents the urban landscape. The application of the Internet and information space has brought about revolutionary changes in the workplace, and the environmental space is used by people ultimately. The involvement of virtual reality enables people to interact with the environment, but the space lacks the integration of personal experience, namely, the lack of construction of body perception. The construction of digital environment, as found in this study, is significantly different from the use of human-machine interface in the past, such as information-sharing versus information-exclusive; unobstructed versus obstructed; individuation versus collectivization; digital – traditional; interactive environment versus passive environment. Due to the amorphous nature of digital media,

which changes its interface according to the space and users, Qiu Maolin argues that architecture can be viewed as a combination of "event space". Therefore, Fig. 3 and Fig. 4 should be able to make dynamic changes based on different types. With reference from human, the cognitive process generated by human triggers the perceptual behavior pattern to guide the user behavior in the interactive space (Fig. 5).

4 Conclusions and Suggestions

When the application of digital media is gradually popularized in the workplace, the user interface interacts more frequently with users in the space, while many media transformation should be based on the expansion of human body experience. The study aims to have a primary exploration into the perceptual space through phenomenology theory, seeks for the relationship between perceptual construction and intelligent creative offices, and provides the spatial qualitative vocabulary and its corresponding mode for designers' reference:

1. Based on the construction of human perception, intelligent space should not develop towards complicated human-machine interface, yet instead with difference from the previous ways of workplace's spatial demands, and be adjusted towards the direction of humanity and adaptability in accordance with body perception.
2. A low-tech and high-touch way should be applied to deal with the relationship between digital media, virtual space and the construction of physical environment.
3. Space and self should be re-examined under the theory of phenomenology of perception, and virtual reality and human–machine interaction environment should be proposed through elastic design. Like a kind of habitable shell, the intelligent creative workplace should take the body perception interface as the baseline for the construction of digital media.

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