

Research on “4D” Evaluation System Construction for Information Interaction Design

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Abstract. This paper focuses on the information construction of 4D evaluation system of Information interaction design (IID). The paper provides a specific and effective evaluation criterion for complicated procedures of IID including information processing, interactive logic, and behavior perception, and systemizes it by virtue of application verification, with a view to ensuring that the goal of IID can be achieved. The 4D evaluation system of IID is constructed by designing the evaluation system of IID comprehensively in four dimensions, namely “environment”, “user”, “technology” and “product”. Multiple values of IID (e.g. culture, aesthetics, user, ease of use, popularization of science, and dissemination) are unified in the model of the evaluation system. By constructing the 4D evaluation system of IID and the general process that integrates it with information interaction design, it is intended to find the paths that combines design theory and design practice more closely. Meanwhile, based on the application of information technology in information interaction design, a new way of information interaction that is oriented to the future, stands to reason and meets the demand of users will be also envisaged.

Keywords: Information interaction design · Evaluation model · Four dimensions

1 Introduction

The revolution of information technology brings tremendous transformation power for human society, and directly boosts the innovation of design-related areas on the whole, such as production mode, propagation path, user experience, and business model. Information interaction design (IID), as a reflection of human civilization in contemporary society supported by information technology, not only changes the way that people interact with social information, but also mirrors users’ eagerness for overall improvement of interactive experience in an era of information.

Research subject of this paper, “Information interaction design” is actually a systematic cognitive design fields, composed of the three design direction: information design, interaction design, perception design. As early as 1999, Shedroff published papers pointed out that should the information design and interaction design considerations together, treat it as a unified field of design theory. Shedroff argued that the information interaction design is integrated consisting of “information design”, “interaction design” and “perception design”, Shedroff call it “Information Interaction Design”. Information Interaction Design should be designed to standardize and facilitate information-oriented

mode of human interactions with the theoretical prototype, the focus should be to build more rational human information interaction and corresponding conduct under the information society background.

In the last decades, IID-related studies have attracted more attention from the design world. Many companies designed a series of excellent IID products in recent years, which boast of high design level and high-tech feelings. All of them are well received by market and users. It can be seen from the evolution of companies like Apple, Amazon, Facebook, Twitter, and Uber that in the wake of the age of service economy, many companies have realized significant user value and commercial value involved in IID. The “design thinking” dominated by IID is reforming conventional process and management methods of organizations, systems, and even product design, while the user experience strategy has been a core element of IID.

IID drives social innovation in terms of product design. As propelled by the development of design, the behavior relation between human and object, the group relation between human and human, and the cultural relation between human and society are all redefined. In general, international academe has studied many aspects of IID thoroughly, such as: ① human-computer interaction, ② interface design, ③ industrial design, ④ user research, ⑤ information architecture, ⑥ experience design, ⑦ content of text and voice, and ⑧ information visualization. Relevant studies are systematic, wide-ranging, highly recognizable, forward-looking and instructive. They support a virtuous circle of IID studies and practice. However, the studies still have their shortcomings. For example, the existing IID studies focus on the investigation and analysis of users and situations at the earlier stage as well as the research and development of mid-term design and technology, while the evaluation method system at the later stage is rarely reported. Compared with general design, IID is not unidirectional. Instead, it is a dynamic process with iterative repetition and mutual effect. Therefore, it is necessary to creatively reform the evaluation system of IID, so as to further improve the design principle and methodology of IID in modern times.

2 Concept of “4D” Evaluation Model of IID

Information interaction design (IID) is an creative integration research direction of design disciplines and humanities, information engineering disciplines, and human-centered design. Information interaction design based on In information science, organizational behavior, interdisciplinary research physiology, kinematics, automatic control theory makes the user experience as the core, with the digitization of information collection analysis and statistical techniques as a reference, finally can expand the experimental studies on the information product interacts with the environment, explore human-machine sensors, interactive, human-computer interaction and other information interactive works. The status of information interaction design has an important and leading role for the survival and development of nowadays design. With the continuous development, the design theoretical study also presents new features, it is no longer confined to the words of pure design theory, but increasingly focuses on practical applications for design guidance and reflection. Information Interaction Design is one of the

most typical representative design direction, it embodies the direction of today's latest development and application of design.

On the perspective of design disciplines, in the computer, Internet and other information tools has been more deeply universal applied today, research width and depth of information interaction design research has been greatly expanded. Information interaction design primarily study the way of human society and the transmission of information and get responding information, ultimately to establish contacts with the outside world. The 4D evaluation system of IID proposed in the paper provides a specific and effective evaluation criterion for complicated procedures of IID including information processing, interactive logic, and behavior perception, and systemizes it by virtue of application verification, with a view to ensuring that the goal of information interaction design can be achieved.

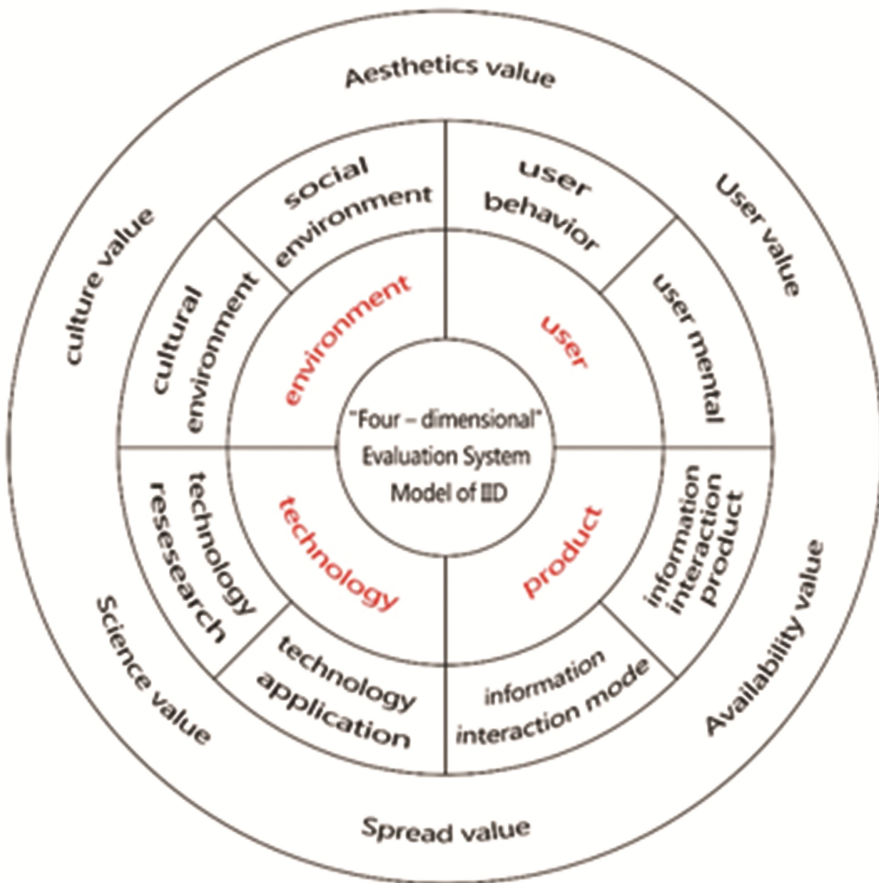


Fig. 1. "4D" evaluation model of IID

The 4D evaluation system of IID is constructed by designing the evaluation system of IID comprehensively in four dimensions, namely “environment”, “user”, “technology” and “product”. Multiple values of IID (e.g. culture, aesthetics, user, ease of use, popularization of science, and dissemination) are unified in the model of the evaluation system. On one hand, based on the rules and characteristics of IID, the relation of core elements of the 4D evaluation system of IID is defined, the principles, objects, methods, procedures and standards of the system are explored, and the weight ratio of specific evaluation indexes in the system is determined. On the other hand, the evaluation experiment and result analysis of IID are conducted both quantitatively and qualitatively by means of situational verification. The system’s rationality is improved in accordance with the results in application, so as to constantly iterate and optimize the system (Fig. 1).

2.1 Environment of “4D” Model

The first dimension element of evaluation system model is about the relationship between IID and environment, mainly refers to the relationship with the social environment. Phenomenological theory thought that the environment is not an abstract place, but by the specific things that the composition as a whole. Information interaction activities require different environments as a basis, in order to facilitate information interaction activities generate. We can say that environmental factors determine human behavior, determines the attributes of the information interaction design. Information interaction design activities and environmental linkages, provided its hold in the environment of the significance of a particular role. Through this research perspective, information interaction design activity embodies the value of user functionality in the social environment, which provide the information for the application, but also reflects the cultural values in the process of social development. In the system model, environmental products (dominant presence), user (intellectual existence) and culture (invisible presence) nicely connects together.

2.2 User of “4D” Model

The second dimension element of evaluation system model is about the relationship between IID and user, mainly refers to users of user-oriented design. In a sense, Information interaction design is based on users’ creative process, and its purpose is to help users solve problems, improving the user experience, and then realize the target audience emotional resonance. From this perspective, this relationship includes applications of sensory experiences (how to use visual, auditory, tactile, olfactory, gustatory perception meet user needs), the user’s mental model and user behavior. Information interaction design From the “Design for others” to “Collaborative others for Design” is the is most unusual place with other design, to some extents, users can determine even the direction of design. Future users will be involved in the design, become collaborators, eventually decision-makers. Therefore, from the study of “usability”, “ease of user” extends to how to play to users’ “initiative”, “creative”, will be key to the future development of Information interaction design.

2.3 Technology of “4D” Model

The third dimension element of evaluation system model is about the relationship between IID and technology, mainly refers to the relationship between design activities and information technology. The traditional design perspective, often makes “technology” and “objects” as a whole, which leads to neglecting the real technology. Technology itself does not seem only simple tools, information technology for the design often have a decisive significance and effect. Kevin Kelly even claimed that “technology is the seventh existence of life. Technology is an extension of life, rather than something separate and life beyond.” In fact, every technology innovation will make technical elements improved, bring new opportunities and new changes and diversity final design mode. IT will be a key factor in promoting the progress of information interaction design, makes predicting the future development trend of information interaction design possible.

2.4 Product of “4D” Model

The fourth dimension element of evaluation system model is about the relationship between IID and product, mainly refers to the intrinsic relationship between the specific interaction information to convert the design process and results, and its essence is an internal agreement of contact. The development of information technology has given the diversity of forms of objects (material and non-material), but from the perspective of artificial fact is concerned, the matter is still mentioned belong to “artifact” category, which determines the type of objects. Information interaction design reflect features mostly achieved through the “objects” as the carrier. Thus, many of the traditional design for the “objects” rule, characteristics, cognitive attributes in the information interaction design still have in common.

In the previous design research study, most design emphasize while ignoring the inherent design factors associated even with the history, culture and other factors discussed in the background, showing the limitations and the lack of a more overall systematic theoretical research ideas. Therefore, from the perspective of the design system model presented in this paper to think about the information interaction design, will make a broader, more holistic, more accurately grasp the development context and the law of information interaction design activities, then carry out exploration and innovation of information interaction design in future.

3 Research Paths of “4D” Evaluation Model

IID is an iterative process, and its evaluation is to ensure the design quality, so it is also a very important part. A relatively objective evaluation system built for IID products can be used to evaluate the quality of product design, optimize the management process of design practice, analyze the existing problems in the design and provide a relevant basis to the design practice management department for planning (Fig. 2).

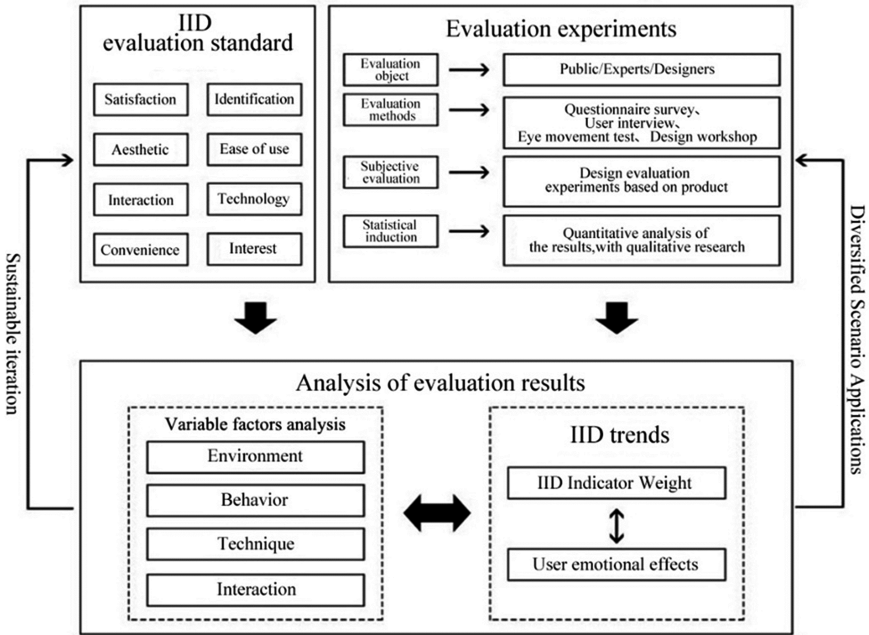


Fig. 2. Research paths of 4D evaluation model

3.1 Evaluation Criteria

First of all, this article needs to explore and establish IID evaluation criteria to help continuous iteration and optimization in the design phase so as to improve the quality of the completion of IID. Based on the ten usability principles proposed by Nielsen, and considering the achievement of the given functional goals, this article further optimizes the usability, and proposes eight reference indicators for information interaction design: satisfaction, aesthetics, interaction, convenience, recognition, usability, technology maturity, and interest. These eight factors have important internal links, but different emphases.

The eight reference indicators are a dynamic development concept. The content of the evaluation indicators should be diversified and dynamic. More public participation can be introduced to improve the content of evaluation indicators so as to provide the basis for the scientific evaluation criteria from the authoritative, professional and public point of view. The evaluation content should be highly operable and oriented, including whether the data samples are easy to acquire, whether the subsequent quantitative research can produce accurate results, whether the content can be compared with the development of the complete information interaction design, and whether it can embody the direction and trend of information interaction design.

3.2 Evaluation Subjects

The subjects of the evaluation model constructed in this article show the characteristics of pluralism and openness. The public, technical experts, designers and ordinary users can evaluate the information interaction design. This open evaluation model is no longer limited to the previous experts and management departments, but contains self-evaluation from the public and creative community, and even the evaluation of the whole society.

There are a number of reasons for the diversity of evaluation subjects. On one hand, the application of information technology plays an important role in the construction of information interaction design. The evaluation of its technical and system maturity requires the participation of technical experts. On the other hand, the goal of information interaction design is to serve the public. Therefore, the evaluation from users and the public plays a more important role, and will play a guiding role in the development of information interaction design.

3.3 Evaluation Methods

The IID evaluation methods discussed in this article include questionnaire, user interview, eye tracker experiment, workshop, etc.

User-based observation and test help to more accurately determine the state of the information interaction design and can also be used to evaluate the prototype. The user's behavior can be observed by notes, audio, video and interactive logs. It should be noted that the process of observation should not interfere with the user, or the results will have greater deviation. The basic purpose of test is to compare the impact of different design scenarios by measuring the user's performance of the task. As mentioned earlier, usability test is completed by typical users to perform typical tasks. The data collected can be used to analyze the user's action efficiency, time, error rate and operational steps. The results of the test will include mean and standard deviation.

Questionnaire is a commonly used method to collect statistical data and user experience. Questionnaire design can be open or closed, however it should be noted that the design of questions must be specific, with clear wording and directivity. Through a similar structured interview, the questionnaire is designed with more careful logic to collect a large number of users' opinions so as to find the general one. It is convenient, intuitive and fast. In addition, with the popularity of smart devices and mobile APP, many forms of questionnaire have been separated from the traditional paper, showing cross-media and cross-time zone characteristics, which further expand its applicability.

Similar to the questionnaire, the user interview is also a general technique widely used in sociology, psychology and marketing, suitable for rapid evaluation, usability test and field research. Different from the questionnaire, the form of user interview is more vivid and more acceptable to the user, which is usually a dialogue process with clear goals, and the results need to be sorted and analyzed from the perspective of context. In order to ensure the quality of the interview, the host should avoid too long questions and the words that may mislead the interviewees, and regularly transit from

the simple question to the complex question to make a pleasant interview with the interviewee as far as possible.

Design workshop is a new carrier for IID evaluation. In the design process of past products, the most common is a relatively extensive model to implement product features, supplemented by a shaping ‘shell’ that is pushed to the user. As to whether the product is reasonable to meet the needs of users and create good product experience, the actual results are often unsatisfactory. Designers are accustomed to follow the existing design experience, and the so-called ‘user research’ more still remains on the surface and does not really reflect the design pain points. This design pattern has encountered more and more problems, and the essential reason is that the user group the product design faces is not merely an imaginary user model or a simple network ID code, but they are real vivid individuals. The characteristics, attributes and needs of user groups are becoming more diversified and individualized than the past.

IID-oriented design workshops focus on the process of ‘inspiration, integration, insight, and creativity’ in product design, with more emphasis on early-stage research and discussion of product design rather than direct finish product. Each workshop participant plays the dual role of ‘common user’ and ‘product designer’. Compared to the systematic product design process, it lacks of ‘practice’ and ‘evaluation’ to find and capture the creativity best reflecting the pain point of design through the design team communication and collaboration and use design tools to polish the design details. The design workshop aims to explore the fusion paradigm of creativity, technology and culture, which will be a microcosm of product design from past closed self-research model to cross-border open collaborative model. It should be noted that, in addition to the product design at commercial level, design workshops also contain part of the public responsibility to guide social innovation. How to disseminate advanced design thinking and methods based on the workshops and improve the inclusive, diversified and open properties of design workshops as well as sustainable information sharing between the creative groups and targeted creativity sharing needs more practice cases to explore and summarize.

3.4 Evaluation Experiments

From the degree of completeness of information interaction design, there are two categories of evaluation experiments: one is stage evaluation, the evaluation in the design process, and the other is summarizing evaluation, the final evaluation after the completion of information interaction design. On the basis of the flexible use of the method, specific evaluation experiments are designed scientifically and rationally.

As argued in this article in combination with the effective experience of psychology, sociology and anthropology, the subjective evaluation of information interaction design can obtain the conversion results from the design prototype to the design results through the following methods: (1) Heuristic evaluation: subjective evaluation by expert guidance; (2) Usability test: analysis and test based on user experience quality; (3) Guidelines: self-evaluation in the construction process by the designer through certain design requirements; (4) Cognitive walkthrough: the targeted users’ cognitive level of information interaction design. Through detailed analysis of the characteristics of information

interaction design products, the evaluation experiment is designed scientifically and rationally, with quantitative analysis of experimental results as well as qualitative conclusion of the strengths and weaknesses of information interaction design products.

It should be emphasized that in the analysis of the evaluation results, attention must be first paid to the analysis of variables, including specific environmental characteristics, behavioral psychology, technical attributes, and interactive methods in order to ensure the analysis and accurate treatment of specific situations. Secondly, according to the ‘user-centered’ design idea, specific user emotional effect is analyzed, and weights of evaluation indicators of specific information interaction design are adjusted. Through the quantitative accumulation and the result analysis of multiple evaluation experiments, the evaluation criterion of information interaction design is iterated sustainably, and the application range of subjective evaluation experiment is expanded.

By constructing the 4D evaluation system of IID and the general process that integrates it with information interaction design, it is intended to find the model/path that combines design theory and design practice more closely. Meanwhile, based on the application of information technology in information interaction design, a new way of information interaction that is oriented to the future, stands to reason and meets the demand of users will be also envisaged. Additionally, in a technological context characterized by informatization and intelligence, setting up the 4D evaluation system of IID is also conducive to exploring how to achieve the effective intersection and integration of different disciplines and guide the innovation of IID language and aesthetic ideas that suit with the characteristics of the information age.

4 Evaluation Case Study: Taking “CM Browser” as Evaluate Subject

This paper selects the old and new version of CM browser as the evaluation case of IID four-dimensional evaluation model discussed in this paper, and tries to discuss it from four perspectives. In the experimental sample, 20 people were selected for telephone interviews and 8 interviews were conducted (Fig. 3).



Fig. 3. New version of CM browser design

Different from the old version, the new version of the CM browser highlights are “features of the toolbar”, “folding animation”, “video playback record”, “search and

browsing records combined” and other functions. In the design of the navigation page, the home page is a combination of nine palace grid and list navigation, focus within the collection and Kingsoft navigation. In the form of navigation, and with “collection of history” on the first tab in the Palace, Kingsoft URL navigation on the middle position to highlight the two labels. The list URL navigation is expanded with shadows to enhance the area separation, thus the hierarchical relationship is clear. This navigation design path in compared with the old version, more suitable for users in different environments which have a higher level of flexibility and quality of user experience (Fig. 4).

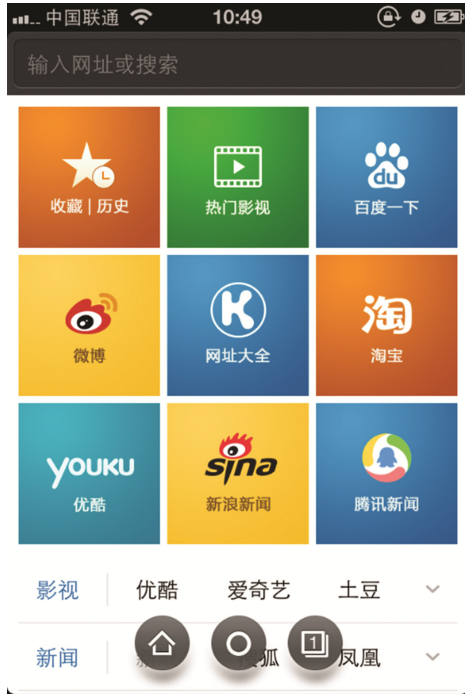


Fig. 4. Navigation design of new version

In the page display section, slide up into full-screen mode, slide back to normal page, increase the page display space and improve the reading experience, compared to the QQ browser from the menu bar into the full-screen mode more efficient, more ingenious form. The new version of the product design more emphasis on the application of dynamic technology, so that the whole effect becomes more beautiful.

In the search page part of the search page collection of history and favorites, so that users can easily access based on history and favorites. In the search page, the specific page can not be deleted; in the history page, only the full list can be clear, may affect the user experience effects. In the new version of the design, more embodies the “user-oriented” design concept, but the inadequacies also need to further iterations and optimization (Fig. 5).



Fig. 5. Search page design of new version

The new version of CM browser to compare with the old version, the new version reduce some features, such as account, share, scan two-dimensional code, no map mode, recent access and other functions are canceled; only keep the browser several basic functions such as Search, collection, history, night mode, the overall function is more concise, more prominent product focus. The new version attaches great importance to the user experience, a lot of operation reflects the “only when users need to appear,” the design principles, animation is stunning, the first use impressive. Overall, this is a visual appearance, the operation on a powerful, user-oriented experience, the function is relatively simple personality browser (Table 1).

Through the “environment”, “user”, “technology”, “product” four aspects of 4D evaluation system model, the new version than the old version has been more user support and welcome. Specific scores, the old score of 7.47 points, the new version score of 8.37 points. Overall, the new version of the product according to their product positioning, cut not commonly used functions, focusing on the basic functions; operation details of the user experience, a rich feedback through the operation of the user to deepen the identification of the function. Through appropriate animation guide user’s operating behavior; but are in the ordinary function to optimize the above, no too obvious and abrupt changes. Full respect for the priority of the information level, according to product positioning, the use of color, font size to highlight the main information, and filter some miscellaneous information. Overall, the evaluation of the model to obtain the basic scores can reflect the difference between the quality of the product itself. However, in

Table 1. Evaluation statics of CM browser

Levene's Test for Equality of Variances		t-test for Equality of Means							
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
							Lower	Upper	
.065	.799	-.569	2157	.570	-.39317	.69150	-1.74925	.96290	
		-.577	29.849	.568	-.39317	.68115	-1.78456	.99821	
.839	.360	.486	2157	.627	.83852	1.72458	-2.54351	4.22054	
		.820	31.460	.418	.83852	1.02221	-1.24506	2.92209	
1.811	.179	.995	2157	.320	.17656	.17740	-.17134	.52446	
		1.593	31.199	.121	.17656	.11084	-.04944	.40256	

the follow-up study, more cases are needed to test the reasonableness of the 4D evaluation model, and to continue the iteration and optimization.

5 Conclusion

The innovative points of the paper include: (1) the IID evaluation system focuses on standardizing and promoting the interactive behavior of user groups. It attaches particular importance to establish a more rational way of information interaction and corresponding codes of conduct for human beings in such an information age. (2) The goal of constructing the 4D evaluation system of IID is to evaluate the degree of target completion of information interaction in a rational way, and balance the restrictive relationship between the subject of information interaction and the environment. (3) The user-oriented design is the core idea of the 4D evaluation system of IID, while the “evaluation with public participation” is the top priority that guarantees the sustainable development of the evaluation system.

By constructing the 4D evaluation system of IID, the present study will be able to create more value from the emotional effects of users and culture creativity. Meanwhile, the rationality that the “design-evaluation-design” cycle can be considered as the general design process of IID will be also verified in practice. It should be noted that the evaluation object of the 4D evaluation system is not limited to common intelligence products. The information interaction of public service system like metro space is also the important research object of this evaluation system.

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