The Observation and Experiment of Field dependence/Field Independence Based on R&T Users' Behavioral of Information Searching

OBSERVATION ET EXPÉRIMENTATION DE LA DÉPENDANCE DE CHAMP/ INDÉPENDANCE DE CHAMP BASÉES SUR LE COMPORTEMENT DE RECHERCHE D'INFORMATION DES UTILISATEURS R&T

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Abstract: Analysis the R&T users' behavioral of information seeking based on the theory of field independence/field dependence and take experiments on the analysis. It is of great meaning to make research from the angle. Choose university students as example to take empirical datum analysis and.
Key words: R&T Users, field dependence/field independence, information seeking, cognitive style, experiment

Résumé: Le présent article vise à analyser, sur la base de la théorie de dépendance de champ/indépendance de champ, le comportement de recherche d'information des utilisateurs R&T et à faire l'expérimentation sur l'analyse. Il est de grande signification d'entreprendre les recherches sous cet angle. On choisit des étudiants universitaires comme exemples pour accomplir l'analyse des données empiriques.
Mots-Clés: utilisateurs R&T, dépendance de champ/indépendance de champ, recherche d'information, style cognitif, expérimentation

1. INTRODUCTION

In psychology, cognition refers to individual gain and the internal information processing of psychological activity. Its research area includes information choice, inputting, coding, storing as well as extraction and so on. The cognition process is a process in which an individual obtains, code, store, extract and use the information and also including a series of continual cognition operation according to certain procedure system.

The cognitive style refers to an individual's performance in the information processing that is the unique style kept by him. There are many kinds of views about how the cognition style should be classified. At present, three kinds of basic classification are proposed, that is from the cognition, the personality and the move to classify the cognitive style. In this paper, the field independence/field dependence classification we studied here was proposed by Witkin in 1964, who took the cognition as the central viewpoint and more concerned the characteristic of cognitive process style. The 'field' means the environment. It has great influence to human's consciousness. The cognitive style about field independence/field dependant firstly proposed for resolving the problem about individual difference, mainly referring to the consciousness of an individual whether it is referenced by the external field of vision or by body itself as the contrast.

During the entire information searching process, we may see the field independence and the field interdependence phenomenon anywhere. The independent user is good at utilizing each kind of method for finding the correct answer, while the field dependent user is short of this ability. In order to study the science and technology users' information searching

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behavior, from the field independence/field dependence angel is meaningful to the more widespread discussion about the problem.

This paper has mainly done the following work:

A. Introduced the field independence/field interdependence concept and the present application situations.

B. According to above theory foundation, analysis the field independence/field dependence phenomenon during users' information searching in the technical database.

C. Carry on the exploring experimental inspection to field independence/field dependence phenomenon.

2. ABOUT FIELD INDEPENDENCE/FIELD DEPENDENCE

2.1 Concept and application of field independence/field dependence

The difference between field independence and field dependence is caused by the different space reference location, and then causes different ways to gain information. The field independence refers to the individual locating the space intrinsic reference relying, and obtain the knowledge and information only by one's interesting. And the field independent person favors in changing individual internal reference according to the environment, and more interests in abstract and theory. The field dependency refers to the environment external reference which the individual relies on oneself locates, and considers knowledge and information according to the stimulation of the environment. And the field dependant person favors in using the popular reference system which the social environment established limiting his own manner, belief as well as the sentiment. Moreover they change their mind to accept the social suggestion easily, also they are sensitive to others sentiment and gain much communication skill from others.

The field independence/field dependency theory has been applied in many domains. For example, in studying discipline, researchers find the independence was partial with the natural sciences that having little relation between social. While the field interdependence person is not interested in the cognitive reorganization skill, is partial to the interpersonal relationship discipline. In studying method research, researchers find the field independence being good at independent thinking and analyzing each element from the whole. Also they are good at motive study, understanding, analysis and like studying the non-structure material, and they are hard to be influenced by outside. And the field dependency is good at grasping information from the whole and studying systematized. When discussing or carrying on study together with other people, they are welcomed by others. Also they are easily disturbed by the environment and controlled by motive. So their study owes initiative. When concerning the human communication ability, researchers find the field independence is only a little or not affected by environments. They like lonely and the situation which has nothing to do with others, so their society association ability are poor. Although the field dependence is easily controlled by environment and uses the external social reference to determine his own manner and behavior, they have got big interest in communicating with other people and are good at human relationship.

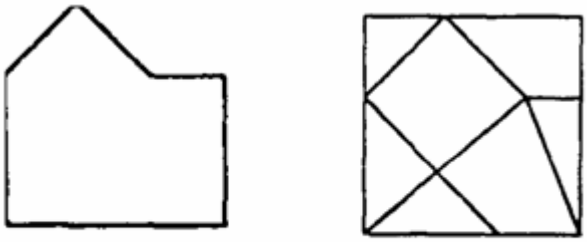
In information field, there are some experts taking research on the field independence/field dependence. Through experiment, Durfresne, Ford, Chen and some other scholars proposed that, in the hypermedia system free choice way, the field independent learner has the ability to establish study way in the non-linear procedure himself, while the field dependant learner is willing to choose the fixed hypermedia study procedure. In different navigation strategy choices, field dependant learner has many difficulties when reorganization information. Facing the same situation, the field independent learner is more willing to choose analysis method to complete the study task by himself. And in order to achieve the goal, he cannot only accept the information organizational structures which the system provides, but also has the ability to skip freely among pages to reconstruct the information structure. In about the influence of cognition type and experience about information searching behavior researching, Kim and Palmquist found the field interdependence lost easily in the Internet and field independent user more directly input address in homepage URL. In brief, the field independent person can clear off the question in the complex environment, and he takes initiative role to achieve the innermost feelings about the predetermined goal. And the field dependant person adopts a kind of passive observation role, and in complex environment he can easily disperse attention by some other quite obvious clues.

2.2 the determinations of Field independence/field interdependence cognition style

There are many ways to distinguish a person belonging to the field independence or the field dependant cognition style, for example, frame examination, bodily accommodation examination, extension room examination, inclined hut incline chair examination, mosaic graph examination, and so on. Because hut examinations and the body complied with the examination both needing complex installment, the good frame examination and the mosaic graph examination are widely used. Compares with the good frame examination, the mosaic graph examination is

suitable in association examines. Then we choose the mosaic graph test procedure in the experiment. Firstly, we introduce the method here.

The mosaic graph examination is a consciousness examination, which asks players to discover the simple graph hidden among a more complex graph. Namely first let players take a look at a group of simple graphs, and then after exchanging a group of complex graphs, ask them to identify simple graphs they have saw before. However, the simple graphs are hard to observe, because they have merged in the complex graph. Taking Figure 1 as example, ask players to identify the simple graph from the right complex graph.



simple graph　　complex graph

Figure 1

This duty needs players to try to break originally organized field, reorganize the cognition of stimulates and new consciousness unit, separate a project from an organized field. The ability also called the victory covert ability. The examination score will reflect the players' spatial reorganization ability. The research indicates ,in this aspect, the differences between players are not only related with consciousness ability, but also related with the highest level psychological difference --cognition way. The researcher proposed the field independence/dependant theory, the field independence favor in considering some part of the field being independent the environment. Then they can easily disentangle from the complex graph and find the simple one. But the field dependency is hard to accomplish the duty.

3. FIELD INDEPENDENCE/FIELD DEPENDENCE PHENOMENON DURING R&T USER INFORMATION SEARCHING

In face, during the whole information searching process, we can see many kinds of independence/field interdependence phenomenon. Field independent user is more rational, can be clear about the effective search mode. He is good at using all kinds of reconnaissance methods and changing the retrieval words to satisfy his own information request. The rational degree is low for field dependant user. He is short of the self-exploration ability, favors in using default retrieval ways and default retrieval strategy. And he seeks more help from other people than field independent one. The comparisons between the two kinds of users' see Figure 2.

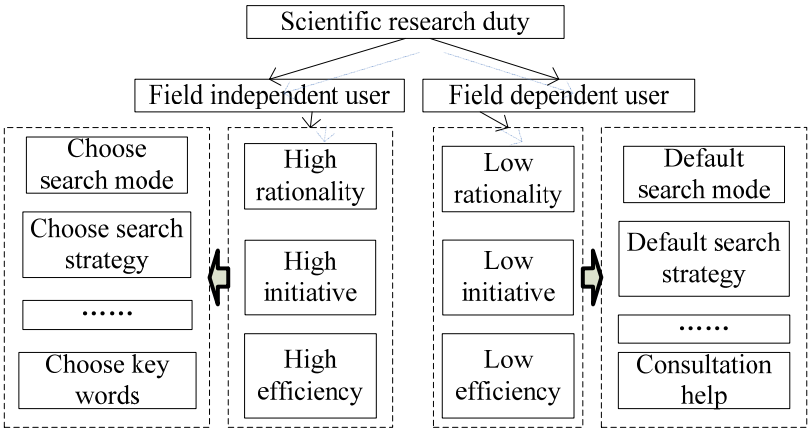


Figure 2　Comparisons between field independent and field dependent users

In Figure 2, we mark about the R&T users' field independence/field interdependence behavior process with the dashed line frame, which indicated specifically that the field independent users' characteristics are high rationality, high initiative, high efficiency. This kind of users can attempt choosing as many kinds of strategy, mode, key words as possible, namely in order to achieve goal he tries to attempt each kind of function, rationally

judge all kinds of effect about different retrieval effect, then he can complete the task with fewer retrievals steps and high efficiency. Compared with field independent user, field dependent users' characteristics are lower rationality, lower initiative, and lower efficiency. This kind of users needs more trial-error time to complete task, so they lack the independent exploration request. They will use default searching mode, searching strategy and turn for help, consultation, thus their searching efficiency are low.

4. EXPERIMENTAL STUDY ABOUT FIELD INDEPENDENCE/FIELD DEPENDENCE PHENOMENON DURING R&T USER INFORMATION SEARCHING

In order to carry the experimental study about field independence/field dependence phenomenon during R&T user information searching, we designed a simple experiment to try to classify the field independent and the field dependent users, and through the experimental video withdrawing the observation point to inspect whether the field independency has got higher rationality, high initiative, higher search efficiency than the field dependency.

4.1 Experiment designs

4.1.1 Experimental mentality

This experiment divides into two parts:

A. Use mosaic graph meter to determine science and technology user's cognition style. Recruits voluntarily as the cognition style determination objects, and choose each kind of 10 users based on mosaic graph examination(In the experiment, the cognition style determination experiment uses the determination method in "Operation And Demonstration in Psychology Tests "written by Li Shou joyful, Chief Editor Li Chuanyin).

B. Observes whether there are differences in the cognitive style between the two kinds of users when they are assigned the duty in the information retrieval in WP database. Through the observation of the information recording, extract variables and state the supposition examination about the two kind of user s ' information searching performance.

The basic flow sees Figure 3

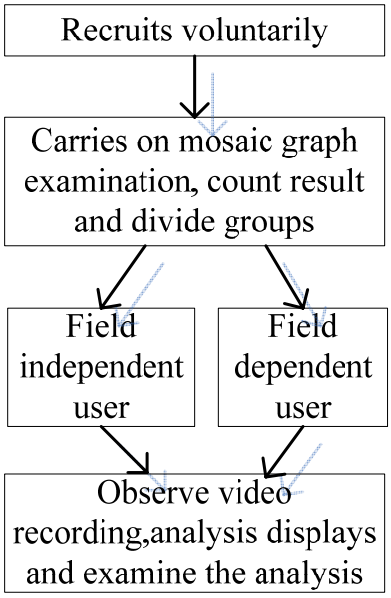


Figure 3 Cognition style determination experiment flow chart

4.1.2 Data origination

Participates in the experiment are elected from this fund topic-based group organized the study migration experiment in Nanjing University of Science and Technology Library Electron Reading room during mid-May 2006. The study migration experiment chose the Economy Management Institute non-information management/electronic commerce management the third year students as technical user's representative to attend the experiment. They not only are unfamiliar electronic commerce, but also not frequently use technical database. They are novice both in this domain knowledge and the database searching; meanwhile they have got the quite same primary cognition level to the electronic commerce subject. Palmquist and Kim's research indicated that the cognition difference influence the novices' network experience obviously, while the ones who has the same on-line retrieval experience have got similar retrieval efficiency, no matter what kind of cognition style they are. Then it is reasonable to choose 38 students as the cognition style determination objects, and then select 20 field independent/field dependant users(each group including 10 people) based on mosaic graph examination.

4.1.3 Design the test of observation point

Designing variables is an important part in the experiment, which guarantees the experiment being scientific. The distinguish of the field independence and field dependence can be weighted by the participators' rational level, efficiency of finding targets, initiative. Therefore, we designed the statistical variables: search strategy and its floor observation target's efficiency level.

4.1.3.1 design Search strategy efficiency level

A. The number of used reconnaissance methods

Observe the number of used reconnaissance methods when each participator completes the duty. The more methods they use, the bigger searching blindness they are, namely the searching efficiency is low, and the rational degree is low.

B. Times of using reconnaissance method

Observe the times of used reconnaissance methods when each participator complete the duty. The rational one is able to grasp the efficient way to complete the task, so fewer times one use, the higher searching level he gains.

C. Significance difference among used times of retrieval way's

Observe the number of used retrieval ways, including fast retrieval, high-level retrieval, classified retrieval, periodical navigation, two retrievals, when each participator completes the duty. Consider the field independent attempting each kind of function to achieve the searching goal, the number of times among each searching mode would not have got significant difference. While the field interdependence favors in using default retrieval way and retrieval strategy, the number of times might be significant different between default retrieval way and other ways.

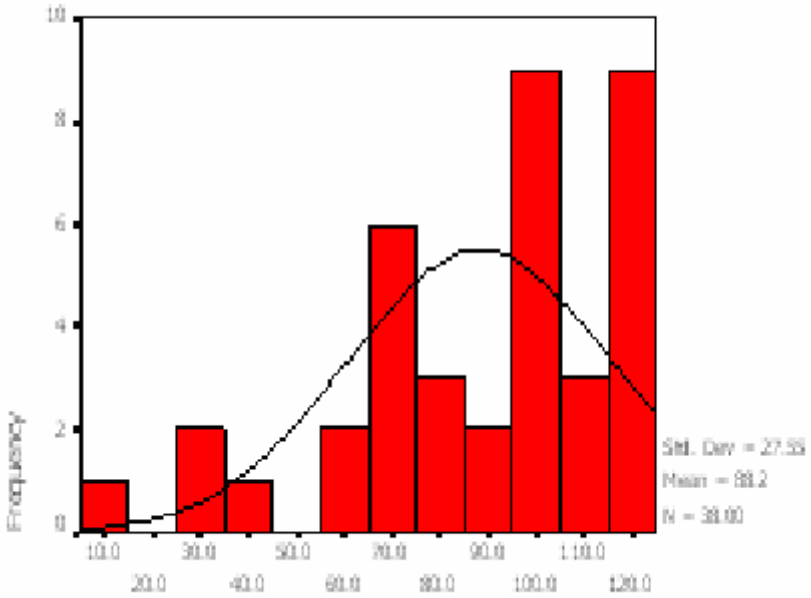


Figure 4 The distribution of mosaic graph experiment result

4.2 The distinguish of each observation target see table 1. The experimental result analysis

4.2.1 Cognition style classification

There are 38 recruits. According to mosaic graph survey meter grading, the highest is 122 minutes, the lowest is 14, the mean is 96, and the average is 88. The distribution of examination result see chart 4. It is a negative skew normal distribution graph, namely there are more high scores than low, more field independent student.

This is consistent with the examination results in reference 8. According to field independence/field dependent theory conception, in the mosaic graph examination, the high score owner is considered as the field independence, and the lower is considered as the field dependence. According to the theory, we select 10 participants from the highest ones as field independence and 10 from the lowest ones as field dependence.

4.2.2 Comparative analysis of the searching behavior between field independence and field dependence.

Extract empirical datum using statistics software SAS9.0.

4.2.2.1 Comparative analysis about numbers and times of used reconnaissance methods

The result is complied in Table 2. We may see from the table: ① Normality examination: the normality examination about the times of used reconnaissance methods of the field independence is 0.905, and its corresponding probability is 0.236>0.05, which means the group of data obeys normality distribution. The data of field dependence also obeys normality distribution, so we may carry on T-test. ②Compare the average values of the two independence group. F value is 1.55

and its corresponding probability is 0.522>0.05, which means two overall variances do not have significant difference. Then we may use precise T-test to carry on the examination equally of average values about the two groups. T value is -2.794 and its corresponding distribution is 0.012<0.05, which means there is significant difference between the two group and the field independence used less reconnaissance methods.

Similar with the analysis about the numbers of used reconnaissance methods, from the examination result, we can see there also is significant difference between the two groups and the field independence used less number of times.

4.2.2.2 Analysis of the choice times of retrieval ways

Table 3 is compiled results among five kinds of retrieval ways of the field dependency. From the table, we can see that there is significant difference between fast retrieval and other four retrieval ways and no significant difference between any two ways among the four.

Table 4 is compiled results among five kinds of retrieval ways of the field independency. From the table, we can see that there is not significant difference between any two retrieval ways among the five.

4.2.3 the compiles of result analysis

4.2.3.1 Significant difference about numbers and times of used reconnaissance methods of the two group

The performance of the field independence is better, because their degree of rationality is higher than the field dependence. They can analysis the efficient of all the methods and make a clear judgment about the best one. Therefore reflected in the statistics result is that the field independence use less numbers and times of reconnaissance methods to complete the duty. As for the field dependence, their degree of rationality is lower and they lack self-exploration ability, so they need more opportunity to try the best one. Then reflected in the statistics result is that the field dependence uses more numbers and times of reconnaissance methods to complete the duty.

4.2.3.2 Difference service condition

There is not significant difference between any two retrieval ways as to the field independence. Because in order to achieve the goal, this kind of persons would attempt each kind of function the database provided, so the choice situation is quite dispersible and do not exist the centralism choice phenomena. As for the field dependence, there is significant difference between fast retrieval and other four retrieval ways. Because fast retrieval is the system default retrieval way, this kind of person lacks the independent exploration request, then he would favor the default modes which the database provided. So there are significant difference between the fast retrieval and any other retrieval.

5. CONCLUSION

We confirm that the field independence/field dependence phenomena exist when R&T user searching information through this experiment. And we also have got certain perceptual knowledge of the two kinds of users. It is an attempt to research the behavior of R&T users form the field independence/field dependence angle. It is accumulated precious experience for further researching. Also there are many inadequate places, including:

A. The manifestation of the field independence/field dependence need further discussion.

B. In this experiment, there are only 20 samples in two experimental groups. In order to enhance the persuasive power, we need enlarge sample capacity in next experiment.

C. Experimental planning is of great important in the whole experiment. The planner need to consider every detail, otherwise, any small problem would lead to unsatisfied results.

Table 1 Observation variable qualitative appraisal table

	Number of used reconnaissance method		Number of times of used reconnaissance method		significance difference among each retrieval way	
number of strategy target	More	Less	More	Less	Exist	Not exist
appraisal of search strategy	Low	High	Low	High	Passive	Negative

Table 2 Statistics result about numbers and times of used reconnaissance methods

Examination variable	Experimental group	Average	Normality examination		Two sample F-test		Two sample T-test	
			value	Probability	Value	Probability	Value	Probability
Number of used reconnaissance methods	Field independence	3.5	0.905	0.236	1.55	0.522	-2.794	0.012
	Field dependence	4.7	0.847	0.052				
times of used reconnaissance methods	Field independence	19.8	0.910	0.271	2.43	0.202	2.244	0.038
	Field dependence	28.4	0.945	0.598				

Table 3 Significance analysis of the choice times of retrieval ways about the field dependency

	Fast retrieval	High-level retrieval	Classified retrieval	Periodical navigation	second retrieval
Fast retrieval	——	2.613*	3.051*	3.216*	3.18*
High-level retrieval	——	——	0.646	0.582	1.299
Classified retrieval	——	——	——	0.000	0.518
Periodical navigation	——	——	——	——	0.536
second retrieval	——	——	——	——	——

Note: *: $p<0.05$

Table 4 Significance analysis of the choice times of retrieval ways about the field independency

	Fast retrieval	High-level retrieval	Classified retrieval	Periodical navigation	second retrieval
Fast retrieval	——	-0.245	0.958	1.947	0.807
High-level retrieval	——	——	1.260	2.584	1.202
Classified retrieval	——	——	——	2.752	0.000
Periodical navigation	——	——	——	——	-2.228
second retrieval	——	——	——	——	——

REFERENCES

Barbara Niedźwiedzka. A proposed general model of information behavior. *Information Research*, 2003 (10)

Carol Collier Kuhlthau. Accommodating the User's Information Search Process: Challenges for Information Retrieval System Designers. http://www.asis.org/Bulletin/Feb-99/kuhlthau.html.［2005-05-12］

Chun Wei Choo. Closing the Cognitive Gaps: How People Process Information. Financial Times of London, *Information Management Series*, March 22, 1999.

Donham, J., Kuhlthau, C. C. , Bishop, K. and Oberg, D.. *Inquiry-based Learning：Lessons from Library Power*. Linworth Publishing, 2001

Kim, K. S.. Individual differences and information retrieval: implications on Web design. Proceedings of the 6th Conference on Content-Based Multimedia Information Access RIAO 2000, Paris, France, 2000

Kuhlthau's Model of the Stages of the Information Process.

http：//library．humboldt．edu/~ccm/fingertips/kuhlthau．html．［2005-05-12］

Palmquist, R. A. & Kim, K. S.. Cognitive style and online database search experience as predictor of web search performance. *Journal of the American Society for Information Science*, 2000, 51(6)

Saracevic, T.. The stratified model of information retrieval interaction：Extension and applications. *Proceedings of the American Society for Information Science*, 2003（34）

T. D. Wilson. Human Information Behavior. *Information science*, 2000 (2)

Whitmire, E.. Epistemological beliefs and the information-seeking behavior of undergraduates. *Library & Information Science Research*, 2003, 25(2)

Witkin. H. A. and J. W. Berry. Psychological differentiation in cross-cultural perspective. *Journal of cross-Cultural Psychology*, 1975(6)

Witkin. H. A, C. A. Moore, D. R. Goodenough and P. W. Cox. Field-independent cognitive styles and their Educational implications and interpersonal behavior. *Psychological Bulletetin*, 1977 (84)

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