

정보 환경하에서 개인정보역량 측정모형 개발에 관한 연구

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요 약

본 연구는 정보환경에 있는 기업에서 근무하는 개인의 정보역량 측정을 위한 효율적인 측정모형을 개발하였다. 본 모형은 4 개의 측정영역과 12개의 측정요인 그리고 구체적인 측정항목을 포함한다. 개발된 모형의 타당성과 신뢰성은 SPSS software 를 적용한 Pilot Test 를 통한 Factor Analysis and Reliability Analysis 에 의해 검증되었고, 개인 정보역량을 효율적으로 측정할 수 있는 구체적인 측정항목들을 제시하였다. 개발된 측정모형의 실용성과 활용성을 검증하기 위해 실제 기업에서 근무하는 264 명의 인력에 대해 개인 정보역량을 측정하여 그 결과를 제시하였다. 본 측정모형은 산업현장에 있는 인력의 정보역량 향상에 기여할 것이다.

키워드 : 정보역량, 개인 정보역량, 측정영역 및 항목, 측정모형

Development of a Measurement Model of Personal Information Competency in Information Environment

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ABSTRACT

This study developed an efficient model for measuring personal information competency in an enterprise of the information environment. This model includes four measurement domains, twelve factors and feasible measurement items. This verified the validity and reliability of the developed model by factor analysis and reliability analysis through a pilot test with the application of SPSS software, and presented the concrete measurement items that can efficiently gauge personal information competency. The developed model was applied to the measurement of 264 workers in an enterprise in order to testify its practicability and utilization, and the measurement results were presented. This model will contribute to improving the information competency of human resources in industrial fields.

Key Words : Information Competency, Personal Information Competency, Measurement Domains and Items, Measurement Model

1. Introduction

In business environment, the need for the effective operation of enterprise resources has risen with the intensive competition facing among enterprises. For this reason, enterprises have implemented information systems to improve their competitiveness and performance, and to increase their productivity and business efficiency by using advanced IT (Information Technology). It is important for human resources working in information environments to have the capability to effectively execute given tasks by applying IT and information systems to their business [1-3].

Moreover, employees who have the ability to efficiently use IT and information systems are the most important factor in raising their business performance and the enterprise's

competitiveness. An individual in information environment needs the ability to efficiently perform their tasks by applying IT and information systems to his or her business, and this directly influences personal business performance and the competition edge of the organization.

Therefore, this study is to develop a measurement model that can effectively measure personal information competency with extracting the critical components of personal information competency through a research-based approach. This model will contribute to raising individual information competency in various industrial fields through the feedback of the measurement results.

2. Personal Information Competency Construct

2.1. Concepts of Information Competency

Generally, information can explain as "An organizational

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General Environment	Organizational Environment	Information Environment
General Competency Components	Competency Components in a Performance Perspective	Competency Components in an Information Perspective
Cog/Behavior skills	Skills, Activity	Capability of Information Application
Knowledge	Biz-Knowledge	Knowledge of Information Technology
Self-Concepts	Values, Attitudes, Reasoning, Judgment	Information Mindset
Traits	Development Abilities	Potential of Information Capability
Motives		

(Figure 1) Extraction Process of Components of Information Competency

set of data that can be efficiently used for a specific objective” [4].

And, the term “competency” was first introduced by David McClelland, a social psychology scholar [5], in the early 1970s and has since been variously defined by many researchers. Generally speaking, competency is the total set of knowledge, skills, and attitudes which function as the action characteristics of an organizational member that can do individual tasks outstandingly and efficiently in an organizational environment [6-8].

By analyzing the major components of competency obtained from the literature, we can extract five major components: Motives, Traits, Self-concepts, Knowledge, and Cognitive and Behavioral Skills [9].

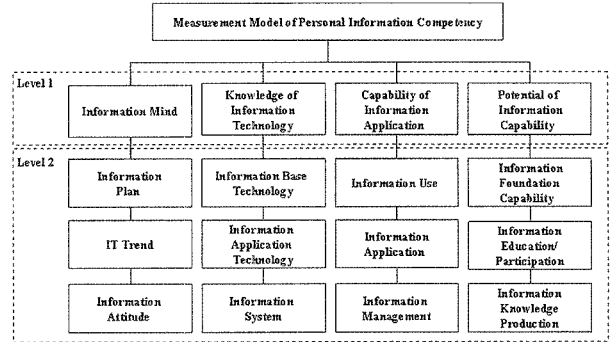
In general competency, individual characteristics such as motives, traits, self-concepts and knowledge lead to skills, and the action of a person with skills has an effect on the performance of individual business from an information perspective. In other words, information competency is able to transform general competency into a type of competency based on an information perspective.

Hence, personal information competency can be defined as a total set of information knowledge, technology, skills and attitudes which function as action characteristics of an organizational member who can do individual tasks outstandingly and efficiently in an information environment.

(Figure 1) indicates the extraction process of the components of the information competency from the components of the general competency and how the extracted components of information competency are utilized as the major components of the model in developing a measurement model of personal information competency.

2.2. Personal Information Competency Construct

The previous major studies on competency measurement or evaluation are as follows. Munro et al (1997) presented the measurement model with the three components such as computer self-efficacy, demographics, and usage in terms of EUC competence [10]. McCoy (2001) indicated the measurement model of computer competency with the



(Figure 2) Structure of developed Measurement Model

five components such as hardware, software, programming, integration, and general knowledge [11]. Torkzadeh & Lee (2002) researched the measurement model of end-user computing skills with the four components such as technical ability, business knowledge, educational background, and computing experience [12].

The previous studies into personal competency measurement have used fragmentary perspectives based on the knowledge and skills of personal competency, and have not conducted from the total perspective of personal competency. Therefore, the aim of this study is to develop a model that can totally measure personal information capability in an information environment with focusing on the components of information competency produced by prior studies in this area.

The measurement model developed in this study consists of these four measurement domains as level 1 of (Figure 2), and each measurement domain has 3 measurement factors as level 2 of (Figure 2).

These measurement items and factors were extracted in studies and discussions by about 30 experts in information departments, such as postdoctoral researchers, professors and senior developers in information research centers, and the previous literature on an end-user computing [12-18].

First, the measurement domain of the information mindset, shown in <Table 1>, is the domain where measures acknowledgement, attitude, a sense of value, and adaptability on information are measured by factors that consist of an information plan, IT trends, and an attitude towards information. The information plan is the entire plan that an enterprise wants to perform in information department. So, individuals have to know it to effectively execute their business in corresponding with the information strategy plan and implement plan of the enterprise. The information plan consists of the information strategy plan and information implement plan as the measurement items. Information technology (IT) trend represents the acceptance and diffusion of new IT. It is important to

<Table 1> Measurement Items for Information Mindset

Domain	Factors	Measurement Items	Extracted Measurement Items
Information Mindset	Information Plan	Information Strategy Plan	-V1: Understanding of information objectives and strategy -V2: Understanding of implementation plans for each information department -V5: Applying information plans to business department
		Information Implement Plan	-V3: Understanding of implementation plans for information projects -V4: Understanding of implementation status for information projects
	IT Trend	Acceptance of New IT	-V8: Number of subscriptions to IT magazines -V15: Understanding of IT progress trends in IT leading countries -V16: Understanding of national or international IT industries
		Diffusion of New IT	-V10: Presentation of IT knowledge on an organization Homepage -V11: Publishing on IT knowledge in IT magazines -V12: Lectures and education on IT within organizations -V13: Lectures and education on IT outside of organizations
	Information Attitude	Information Aptitude	-V23: Recognition of a company information knowledge -V24: Recognition of information security -V25: Recognition of personal information security
		Information Ethics	-V20: Ethics consciousness in an information society -V21: Understanding of laws and institutions dealing with information security -V22: Etiquette of information telecommunication and internet use

<Table 2> Measurement Items for Knowledge of Information Technology

Domain	Factors	Items	Extracted Measurement Items
Knowledge of Information Technology	Information Base Technology	H/W & S/W	-V26: Possession of H/W knowledge related to information -V27: Possession of S/W knowledge related to information -V28: Possession of knowledge related to computer O/S system -V31: Possession of knowledge related to programming languages
		N/W & D/B	-V29: Possession of N/W knowledge related to information -V30: Possession of knowledge related to D/B
	Information Application Technology	Solution	-V35: Possession of solution knowledge related to ERP, SCM, KMS, CRM, PDM, HRM and so on
		Business Implementation	-V37: Possession of technology knowledge related to e-commerce -V38: Possession of technology knowledge related to System collaboration technology
	Information System	Operation System	-V42: Possession of knowledge related to H/W of operation system (O/S) -V43: Possession of knowledge related to S/W of O/S -V44: Possession of knowledge related to N/W of O/S -V45: Possession of knowledge related to D/B of O/S
		Related Institution/ Regulation	-V47: Possession of knowledge related to O/S institution and regulation -V48: Possession of knowledge related to O/S information security measures

accept and disseminate IT to create business in information environment.

Information attitude identifies the understanding of aptitude and ethical consciousness related to information in performing individual tasks in an information environment.

Therefore, the information mindset is the direction and foundation for advances in personal information competency; it is like the head of the entire body.

Second, the measurement domain of the knowledge of

information technology, described in <Table 2>, indicates the knowledge that individuals in an enterprise information environment need to efficiently apply information to their business. The knowledge of information base technology consists of basic technology knowledge such as hardware, software, network and database related to information. Information application technology includes solutions and business implementation knowledge related to information. Solution knowledge represents technology knowledge related

to business solutions such as ERP, SCM, KMS, HRM, CRM, PDM, and so on. Business implementation knowledge indicates the technology knowledge related to e-commerce, operation systems, and system collaboration. Knowledge of information systems is knowledge of the operation and technology of the information systems operating in an enterprise, and the institutions and regulations related to the operation systems.

In order for individual to efficiently carry out his or her works in an enterprise, he or she has to know the enterprise's information system very well.

Third, the measurement domain of the capability of

information application, as shown in <Table 3>, is the domain designed to measure the capability that individual has to effectively apply information knowledge and systems to his or her business. Information use capability represents the capabilities required in business tasks such as spreadsheet, presentation, word processing, and the ability to search for and use information on Internet and Intranet. Information application capability indicates the capability to use the solutions and information systems related to individual business. Solution application refers to the ability to apply business solutions (ERP, SCM, CRM, KMS, DW, etc.) to the enterprise's operations, and the capability of

<Table 3> Measurement Items for Capability of Information Application

Measurement Domain	Measurement Factors	Measurement Items	Extracted Measurement Items
Capability of Information Application	Information Use Capability	OA	-V52: Ability to use Word processing -V53: Ability to use Spreadsheets -V54: Ability to use Presentation
		Internet	-V51: Ability to search information on the internet
	Information Application Capability	Solution Application	-V59: Ability to use ERP, SCM, CRM, KMS, DW and so on -V60: Ability to apply Solutions to Business
		Information System Application	-V61: Ability to use H/W, S/W, N/W, D/B of Information Systems -V62: Ability to apply Information Systems to Business (B to E, B to B, B to C)
	Information Management Capability	Utility	-V71: Ability to apply utility (Data processing, compaction/compaction release, recovery of system errors, prevention and treatment of computer virus) -V72: Possession of security establishment and management capability
		Storage/ Management	-V69: Ability to apply DBMS to Business -V70: Ability to apply DW to Business

<Table 4> Measurement Items for Potential of Information Capability

Domain	Factors	Items	Extracted Measurement Items
Potential of Information Capability	Information Foundation Capability	Degree/ Certificate	-V74: Possession of an M.A. or PhD. degree from an information departments -V75: Possession of an M.A. or PhD. degree from other departments -V87: Possession of certificates related to information departments
		Experience	-V76: Possession of job experience in an information department -V77: Number of working years in an information department -V78: Possession of work or management experience in an information department
	Information Education/ Certificate	Information Education	-V82: Completion of internal education related to information -V83: Completion of external education related to information
		Participation	-V81: Completion of overseas training related to information -V84: Participation in conferences related to information
	Information Knowledge Production	Publication	-V89: Achievements publishing books related to information -V92: Achievements publishing articles in IT magazines -V94: Achievements publishing papers and articles related to information in international journals -V95: Achievements publishing papers and articles related to information in national journals
			Lecture/ Announcement

information systems application is the ability to efficiently apply information systems to their works such as e-business of the form B to E, B to B, and B to C. Information management capability represents the skills related to the application of information storage and utility (material treatment, compaction/release, system error recovery, and virus prevention/treatment etc.), and D/B management. This is a very important department that can significantly influence the performance of individual works since it involves the application of all of personal capabilities, viz. his or her mind, technology, knowledge, and skills to individual business tasks in an enterprise.

Fourth, the measurement domain of the potential of information capability, shown in <Table 4>, contains various measurement factors that comprise the information foundation capability, information education and participation, and information knowledge production. This refers to the potential development probability of personal information competency, such as individual education and job experience related to information, and the achievements of information knowledge production.

This is an important domain for the development of information knowledge and capability, and the extension of information competency in terms of the breadth and depth of information. But, generally, human resources working in an enterprise don't make sufficient effort to produce information knowledge. It is difficult to produce information knowledge, so it is a weak point among the various information capabilities required by human resources working in an enterprise of information environment.

By studying personal information competency based on these measurement domains and factors, we can develop a model that efficiently measures personal information competency as shown in <Table 1, 2, 3, 4> and (Figure 2).

3. Methods

In this section, we verify the validity and reliability of the developed model construct, and present the measurement items that adequately comprise each measurement domain construct. Many researchers have studied the methods to verify the validity of the model construct. Kerlinger (1978) presented two methods of construct validation: (1) correlations between total scores and item scores, and (2) factor analysis [13]. Doll & Torkzadeh (1988) [14], Mirani & King (1994) [15], and Etezadi-Amoli & Farhoodmand (1996) [16] used factor analysis to verify the validity of the measurement instrument construct. Palvia (1996) [17], Torkzadeh & Doll (1999) [18], Torkzadeh

& Lee (2002) [12] used correlation analysis to verify the validity of the measurement instrument construct. This study is designed to verify the validity and reliability of the model construct by confirming the validity and reliability for the measurement items through factor analysis and reliability analysis for the measurement items in each domain. The measurement questionnaire used a five-point Likert-type scale; where, 1: not at all; 2: a little; 3: moderate; 4: good; 5: very good.

3.1. Sample Characteristics

A sample of 152 usable responses was obtained from a variety of industries and business departments, and from management levels with considerable experience. The industries represented in the sample were manufacturing and processing (4.9%), construction (1.2%), finance, banking and insurance (2.4%), transportation, communication and services (24.4%), and information consulting and system implementation services (67.1%). The respondents in terms of business departments were identified as strategy planning (17.1%), development/ maintenance (51.2%), business application (13.4%), and consulting/ education (18.3%). The respondents identified themselves as top manager (3.7%), middle manager (62.2%), and worker (34.1%). The respondent had on average of 11.5 years of experience (S.D. =1.075) in their field, their average age was 35.5 years old (S.D.=6.611), and their sex, male (81.7%) and female (18.3%).

3.2. Survey Method

The survey method used in this measurement questionnaire was based on two kinds of collection methods: direct collection and by e-mail.

3.3. Analysis and Discussion

The optimal measurement items by executing factor and reliability analysis with SPSS ver.11.0 software were remained, while the others were deleted. The correlations with the corrected item-total were significant at $p < 0.001$ and similar to those used by others in previous researches.

<Table 5, 6, 7, 8> show the values of factor loadings, corrected item-total correlation and coefficients alpha obtained from factor analysis and reliability analysis of the measurement items of the proposed model. The factor loading and Cronbach's alpha values of the extracted items in each measurement domain were generally analyzed as factor loading > 0.620 and Cronbach's alpha > 0.640 .

Therefore, the validity and reliability of the extracted measurement items were corroborated by two kinds of analysis.

<Table 5> Factor loadings, corrected item-total correlation and coefficients alpha of information mind

Variable	Factor Loading						Corrected Item-Total Correlation	Coefficients Alpha
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6		
V1	0.705						0.496	
V2	0.709						0.639	0.796
V5	0.645						0.459	
V3		0.751					0.600	0.796
V4		0.811					0.710	
V15			0.820				0.588	
V16			0.851				0.530	0.666
V10				0.752			0.548	
V11				0.742			0.526	
V12				0.699			0.661	0.786
V13				0.689			0.647	
V23					0.640		0.457	
V24					0.698		0.658	0.755
V25					0.787		0.643	
V20						0.823	0.682	
V21						0.686	0.559	0.765
V22						0.665	0.559	

<Table 6> Factor loadings, corrected item-total correlation and coefficients alpha of knowledge of information technology

Variable	Factor Loading						Corrected Item-Total Correlation	Coefficients Alpha
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6		
V26	0.716						0.702	
V27	0.780						0.753	0.880
V28	0.755						0.713	
V31	0.621						0.600	
V29		0.683					0.720	0.879
V30		0.717					0.677	
V35			0.784				0.605	0.754
V37				0.738			0.566	0.753
V38				0.689			0.612	
V42					0.780		0.760	
V43					0.742		0.774	0.904
V44					0.809		0.825	
V45					0.811		0.801	
V47						0.671	0.520	0.716
V48						0.833	0.627	

<Table 7> Factor loadings, corrected item-total correlation and coefficients alpha of capability of information application

Variable	Factor Loading						Corrected Item-Total Correlation	Coefficients Alpha
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6		
V52	0.851						0.802	
V53	0.761						0.739	0.861
V54	0.626						0.643	
V51		0.807					0.648	0.860
V59			0.806				0.583	0.737
V60			0.820				0.584	
V61				0.784			0.471	0.640
V62				0.635			0.472	
V71					0.669		0.483	0.651
V72					0.728		0.484	
V69						0.662	0.612	0.755
V70						0.796	0.611	

After conducting the factor analysis, the number of measurement items in each domain was reduced as follows: the measurement items of information mindset: from 25

<Table 8> Factor loadings, corrected item-total correlation and coefficients alpha of potential of information capability

Variable	Factor Loading						Corrected Item-Total Correlation	Coefficients Alpha
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6		
V74	0.769						0.685	
V75	0.786						0.684	0.809
V87	0.649						0.559	
V76		0.843					0.693	
V77		0.873					0.732	0.839
V78		0.779					0.747	
V82			0.822				0.707	
V83			0.754				0.711	0.860
V81				0.719			0.559	0.839
V84				0.686			0.771	
V89					0.640		0.701	
V92					0.734		0.757	
V94					0.899		0.806	0.910
V95					0.898		0.830	
V96						0.760	0.740	0.909
V97						0.666	0.665	

items to 17 items; the measurement items for knowledge of information technology: from 25 items to 15 items; the measurement items for capability of information application: from 23 items to 12 items; the measurement items for potential of information capability: from 24 items to 16 items. In other words, 97 measurement items were reduced to 60 items, and 37 items were deleted from the measurement items presented at first.

In this way, the measurement items in each measurement domain consisted of the items holding superior validity and reliability.

4. Case Study and Application Alternatives

4.1. Sample Characteristics

This case study applied the developed measurement model to 264 persons working in "K" enterprise, by each business department such as strategy plan department (27%), development and maintenance department (21%), business application department (34%), and administration support department (18%). The business positions of respondents were identified as top managers (8%), middle managers (21%), and workers (71%). The respondents had on average 7.7 years of experience (SD = 0.597), and most respondents (86%) had college or university degrees.

4.2. Case Study and Analysis

The case study analyzes the measurement results obtained from those respondents working in the strategy plan department and each business department as the organizational level, and one person working in strategy plan department as an example, and explains the meaning of the measurement result from various points of view. We use a measurement index in the analysis results of

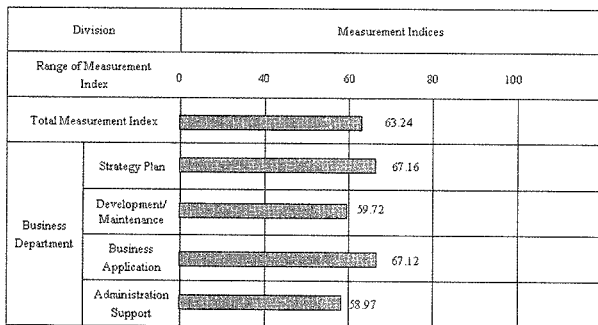
case studies, which is a total value applying the weight value to the measurement result that an end-user or an organization is examined by the measurement items in each measurement domain and factor of this tool.

(1) Case Study and Analysis of Organizational Application

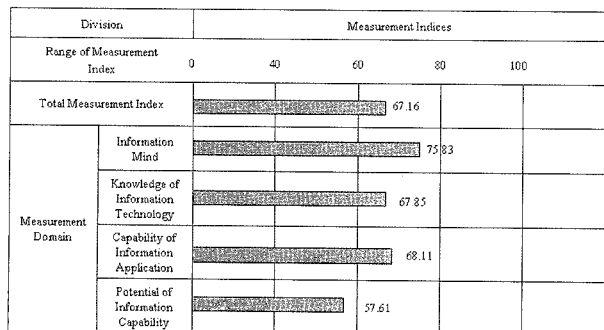
By applying the developed measurement model to the organizational level in this case study, we want to present the measurement results of each business department of the entire organization, and the measurement results of each measurement domain of the strategy plan department.

By (Figure 3) which explains the measurement results of each business department, it can be seen that the total measurement indices of the strategy plan department and business application department were higher than those of the other departments, because the measurement indices of information mind and potential of information capability of the strategy plan department were higher than those of the other departments, which is due to the capability of this department to effectively perform the management strategy planning, the establishment and execution of information program, and the control and performance analysis for the enterprise's operations.

(Figure 4) shows that the total measurement indices of



(Figure 3) Measurement indices of each business department and overall organization



(Figure 4) Measurement indices of each measurement domain of strategy plan department

the strategy plan department are quite high in the measurement domains of the information mind, knowledge of information technology, and the capability of information application, except for the potential of information capability.

Therefore, human resources of information plan department should make an effort to improve and develop the information department related to education and experience, certificates, and the product of information knowledge in order to effectively improve the organizational total information competency.

(2) Case Study and Analysis of Individual Application

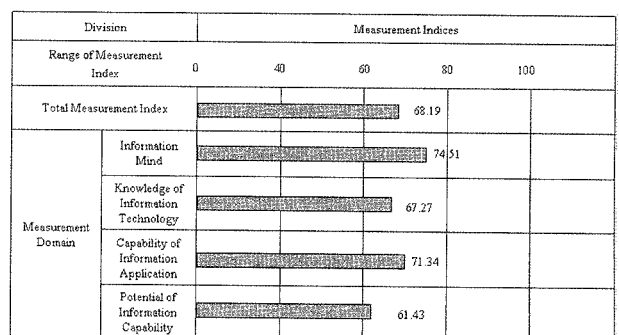
The measurement results of one person working in the strategy plan department are taken as an example. (Figure 5) shows that the total measurement index of his information competency is 68.19, the measurement indices of the information mind and the capability of information application were also quite high, and the measurement induces of knowledge of information technology and the potential of information capability were quite low. Therefore, this person should make an effort to complete information education program, acquire certificates, and produce information knowledge in order to effectively develop personal total information competency.

(3) Application Alternatives of the Developed Model

The developed model presents a methodology to measure personal information competency in an enterprise of information environment. The application alternatives of this model can be summarized as follows.

First, this model can be utilized for the efficient cultivation and policy development of human resources in an enterprise of information environment.

Second, this model can be utilized for the efficient education and development program of human resources in an information environment through the application of the measurement results.



(Figure 5) Measurement indices of each measurement domain of an individual in strategy plan department.

Third, it will contribute to efficiently improving personal information competency by identifying its problems and solving methods through reflecting individual measurement result.

5. Conclusion

The expectation performance and significance of this study can be explained as follows.

First, this study developed an original measurement model that can efficiently measure personal information capability in an enterprise of information environment. Therefore, the developed model opens up a new direction and possibility since it functions as a measurement method for totally measuring personal information competency.

Second, this study presents the concrete measurement items for each measurement domain of the developed model. They are the feasible measurement items that can efficiently examine personal information competency.

Third, this study increased the suitability and practicality of the measurement model by a factor and reliability analysis and through a case study.

In conclusion, this study presents a practical and original measurement model, and provides a foundation for the development and advancement of the measurement methodologies for personal information competency in an enterprise of information environment.

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