

## **Risk Management Model for Telecom Enterprises Based on Variables (RM, SO, RC, SI) with Nature, Sense and Positive Psychology Hypothesis**

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### **Abstract**

As all know that in current era only the biggest asset is the personal information of any person, company, country, which have power to crash any country's economy. To prevent the information breach multiple risk management methods and techniques has been created. This information includes multiple complex factors including human nature, their psychology and sense. To understand and evaluate our proposed risk management model we take a telecom company as an empirical center for analysis our proposed hypothesis. We conclude that use of four variables RM, SO, RC, SI is the best way to improve the risk management and develop sense of information security among the employees and staff of the organization.

**Keywords:** Model; Risk Management; Telecom Enterprises; Information Security; Sense.

### **I. Introduction**

In the Internet Age, information security has become an important factor that affects the healthy development of enterprise. The existing literature mainly studies Information Security of enterprise from angle of technology prevention and control, but does not pay enough attention to how to strengthen Risk Management from angle of risk consciousness of person [1]. Risk Management, as a kind of modern enterprise management, plays an important role in Information Security. If an enterprise divides Information Security into aspects of "thing" and "person", by comparison, at present, the investment of enterprise in "thing" is far more than that of "person" [2], and Risk Management is the management of "people" in terms of fulfilling the ultimate mission of social responsibility [3]. If the enterprise lacks to "person", a factor of dynamic value, such an information security guarantee system is rigid and sluggish, not perfect. As far as MNC Industry is concerned, the current literature tends to focus on the physical of Risk Management as a technology tool, ignoring the active consciousness of organizations and their employees [4]. Taking MNC Industry as an example, this paper constructs a risk management evaluation index system based on Plan-Do-Check-Act Cycle, and constructs a driving model of Risk Management impacting Information Security by means of intermediary effect of Sense of Organizational Support and Risk Consciousness, to explore a driving mechanism of information security of

enterprise, to mobilize all staff to participate in risk management of information, as a decision-making reference for enterprise.

## **II. Relevant Literature And Theory of Conceptual Relationship**

### ***1. Information Security and Risk Management***

"Information Security" is usually defined as a systematic identification, control, policy and process of preventing information assets from being intentionally or accidentally leaked, altered, destroyed, or made unavailable. Information Security is a system concept, and not only refers to the security of information itself, but also covers information carrier, information environment and other aspects, usually divided into network security, information security and system security [8].

In 1956, Gallagher R. B. proposed the concept of "Risk Management", with emphasis on reducing the impact of expected adverse factors on functional economic entities. Information security management can not be separated from risk-based information management, that is, to build and constantly optimize the system of risk-based information management [9]. It is generally believed that the risk to enterprise source mainly exists in two aspects: external threat and internal hidden danger. Zeng Jianqiu et al [4]. Present that the information risk in MNC industry mainly exists in the internal hidden danger brought by the third party system and its participants, so we should strengthen the internal systematic structure and the internal organizational management. KNAPP K. J. et al [10] present that the development of information security strategy should focus on the dynamic optimization of information risk management. Professor Zhao Zhansheng [5] has made some improvements to PDRR Model, such as "warning" before "protection", which increases prevention and control of human factors. Wu Ying et al. [11] put forward an information risk management system from organization structure, rules and regulations, early warning mechanism and emergency response plan. Ye Erjiang et al. [12] have designed a management model of double-rule coupling mechanism with the idea of harmonious management theory, which emphasizes the initiative of "human" in risk management. Information Security and Risk Management are closely inseparable, so the following relationship hypothesis can be put forward.

**Theory 1:** There is a positive correlation between Risk Management and Information Security.

### ***2. Sense of Organizational Support***

Sense of Organizational Support, first proposed by Eisenberger, a social psychologist, expresses an employees' general perception and belief of organizational support, which is reflected in employees' daily work [13]. However, more and more scholars regard the sense of organizational support as a construct of organization after personification, which endows organization behavior with new connotation [14]. As a kind of "complete personality", organization is endowed with a certain kinetic energy, from perspective of organizational personality, which scholars such as Mischel W. et al. [15] have analyzed. It is believed that organization has a dynamic drive to the internal system and the enablement function to the "complete personality". McMillin's work complements EISENBERGER's. Without the basic instrumental support, such as information, resources, tools, equipment, training, etc. needed to carry out the work, the process and quality of work will undoubtedly be adversely affected [16]. To maintain employees' positive perceptions and beliefs about organizational support, organizations should provide continuous instrumental support. If organization is regarded as a kind of relatively independent system, from view of the external- provided energy and the internal kinetic energy of system, on the one hand, the specific concept of "Sense of Organizational Support" describes the degree to which employees can feel support from the recognition or evaluation of their contributions by organization, thus showing the overall perception of importance of employees in organization [17]. On the other hand, from the organization's systematic input, the leader's or organization's supporter has given the system strong leadership or safeguard, causing the system interior to obtain prompt effective satisfaction. In theory, Sense of Organizational Support effectively indicates that there is a transparent relationship between external leadership or organizational support and internal needs, and that there is agreement between top and bottom intentions, and the goal of organizational support is internalized into work support, interest concern and value identification among all departments of system. According to relationships between organizational empowerment and organizational activism, risk management under influence of organizational empowerment can have an organizational activism effect on the information security management of enterprise [16]. So the following relationship hypothesis can be put forward.

**Theory 2:** There is a positive correlation between Sense of Organizational Support and Information Security.

**Theory 3:** There is a positive correlation between Sense of Organizational Support and Risk Management.

### 3. Risk Consciousness

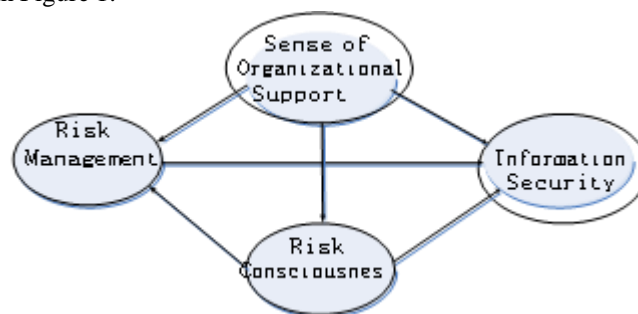
Risk Consciousness refers to the perception of risk, which is still in the perceptual stage and has not made subjective judgment on risk, as a premise of risk perception. [18]. Risk attitude is "a state of mind chosen on basis of positive or negative uncertainty that has an effect on the goal". Risk preference is defined as "risk tendency", that is, "the amount and type of risk that one is willing to pursue or retain is a quantitative expression of a risk attitude". Skriabikova, Nabiha et al. [19] divide risk management into three main links: risk perception, risk identification and risk aversion. Although they do not regard Risk Consciousness as a specific link of risk management, they all emphasize that Risk Consciousness exists objectively throughout the whole process or links of risk management, can not be simply abstracted into a single process or step. Baum J. R. et al. hold that Risk Consciousness shows different levels, the lower is generally perceptual, the higher is generally rational. The higher the level of Risk Consciousness is, the more inclined to rational cognition, so Risk Consciousness and risk cognition are closely related [20]. Risk Consciousness has an important moderating effect on Risk Management, from which the following relational hypotheses can be proposed.

**Theory 4:** There is a positive correlation between Risk Consciousness and Risk Management.

**Theory 5:** There is a positive correlation between Risk Consciousness and Information Security.

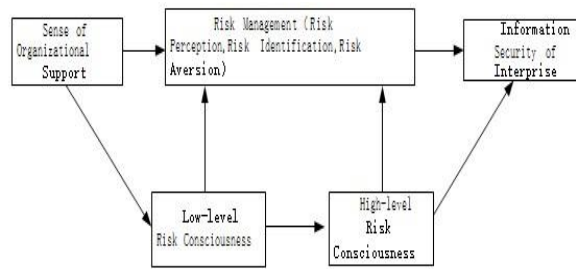
### III. Conceptual Modeling

Assuming that the information risk management of enterprise exists as a system, Sense of Organizational Support influenced by external circumstances can be regarded as a kind of kinetic energy generated by the external empowerment of system, and can be seen as a result influenced by policy support, environmental incentives, organizational publicity, leadership attention or other external driving effect [21,22]. Based on the above description of the relationship between Risk Management, Sense of Organizational Support, Risk Consciousness and Information Security, combined with the above literature review and the theory of conceptual relationships, this paper holds that Risk Management has an important driving effect on Information Security, and is influenced directly and indirectly by the mediating effect of Sense of Organizational Support and Risk Consciousness, because Sense of Organizational Support and Risk Consciousness both have a moderating effect on Risk Management, the following conceptual model of enterprise information security driven by Risk Management can be formed, as shown in Figure 1.



**Fig. 1:** Conceptual Model of Enterprise Information Security

In Figure 1 of the conceptual model shown, Information Security can be considered as a result variable, and Risk Management, Risk Consciousness, and Sense of Organizational Support can be considered as antecedents, and it will be helpful to understand how Risk Management affects Information Security of enterprise under regulation of Organizational Support and Risk Consciousness, further to understand the related risk management decisions. Thus, a theoretical hypothesis model including Information Security (SI), Risk Consciousness (RC), Sense of Organizational Support (SO) and Risk Management (RM) is constructed to study the driving mechanism of Information Security, a driving model of risk management constraints and information security of enterprise is shown in Figure 2.



**Fig. 2:** Driving Model of Risk Management Constraints and Information Security of Enterprise

#### IV. Research Design

##### 1. Scale Design and Pre-investigation

If there are multiple mediating effects between Sense of Organizational Support and Risk Consciousness between Risk Management and Information Security, we can do some relevant experimental analysis. Information risk management of enterprise is expressed as a project management, and PDCA-Cycle can be well embedded into the project management of information risk of the telecom-operating enterprises. As a management concept, PDCA-Cycle is often used to evaluate the level of risk management of mnc enterprises. Based on the links of risk management, that is, corresponding to the three stages of before, during and after the risk event, this paper refers to Dr. Yang Hongmin's [3] risk management system based on PDCA-Cycle to do the decomposition of structural variables. "Management, enabling, and transmission" is revised, corresponding to "risk perception, risk identification, risk aversion". Risk Management of enterprise information can be observed and evaluated through nine topics, as shown in TABLE1, and Cronbach's Coefficient is 0.902.

**Table 1.** Risk Management Scale for Telecom Enterprises Based on PDCA Cycle

<b>Risk Perception</b>	Information Content Security of Conventions of Management
	Information Content Security of Management Plan
	Information Content Security of Tracking and Monitoring
	Staff Participation in Organizational Management
	Integrated Information Content Security of Management
<b>Risk Identification</b>	Information Content Security Event of Management
	Information Content Security of Technical Assurance
<b>Risk Aversion</b>	Information Content Security of Quality Management
	Information Content Security of Training Plan and Management

As a system concept, Information Security (SI) is divided into network security, information security and system security according to the connotation interpreted by scholars such as Cheng Jin et al. [23,24]. In this paper, 10 items of information, information carrier and information environment are used to develop the scale and measure it. CRONBACH's Coefficient is 0.896.

Based on the design of Jacoby and Kaplan's (1972) Risk Consciousness (RC) scale, the risk dimension partition method of Stone and Gronhaug (1993) is combined with the order difference view of Baum J.R.'s risk perception. In the end, 10 items are selected to measure Risk Consciousness, including potential awareness of risk, prediction awareness of risk consequence, and active awareness of risk control, and the scale system shows the perceptual risk consciousness and the rational risk consciousness, corresponding to the low-order risk

consciousness and the high-order risk consciousness [25-27]. CRONBACH's Coefficient is 0.902.

Sense of Organizational Support (SO) measures job support, interest concern and value identity through 14 items, on basis of the scale developed by Ling Wenwei [13] and Chen Weimin[16] in China as reference. CRONBACH's Coefficient is 0.836.

After discussion and revision of senior managers, senior engineers in field of information security, management experts and scholars, the measurement table designed by this research has been gradually perfected and matured. After formation of the preliminary table, it has been revised and fine-tuned by more than 20 managers of 12 telecom operators, which is more suitable for the current situation of information risk management. All questionnaires are measured by Likert Five-point Scale [28].

After that, a small-scale pre-survey is conducted among some mnc operators in three cities. The results of pre-investigation are good. All questionnaires designed by SPSS21 show good reliability and validity. A total of 50 questionnaires are distributed and 48 are collected, with a recovery rate of 96.0%, 43 valid questionnaires, and the effective rate is 86.0%.

## **2. Formal Investigation**

The questionnaire survey is conducted among employees of mnc operators through multiple channels. In order to achieve a higher recovery rate and efficiency, the survey mainly takes the form of on-site distribution, firstly, by means of training on-site distribution for mnc operators, mainly consisting of customer managers. Secondly, during college students' summer vacation, students practice the survey, entering enterprises to distribute questionnaires to managers or employees in mnc enterprises (this part does not include the pre-survey questionnaire).

## **3. Descriptive Statistics**

The survey is conducted among employees of mnc operators. The selection of sample basically covers all types, covers a wide range, and is representative. The results of demographics variables of sample are as follows:

First, in terms of gender, women account for 56.3%. The age distribution is mainly in the post-80s, post-90s and post-70s, among which the post-80s and post-90s account for the most, 46.4% and 35.1%. According to the distribution of sex and age, the proportion of female employees is slightly higher than that of male employees, and most of them are young.

Second, in education, the overall situation is good. College degree account for the highest proportion, 45.7%. The proportion of technical secondary school or high school education or below is 17.6%. The proportion of bachelor degree or above is 23.9%. Master degree or above account for 12.8%. In position, management and non-management category of technical personnel account for a smaller gap, respectively, 16.4%, 11.8%. The proportion of grass-root, middle-level and top-level managers is 31.4%, 10.6% and 1.8%. It can be explained that the overall quality of personnel in telecom operators is high, and most of them with bachelor degree or above hold certain positions and engage in certain management.

Finally, according to the length of service, the staff mobility is high, the staff job-hopping and the new comers are frequent. According to the sample survey, the proportion of working 1~3 years and 3~5 years is 23.8%, 32.9%. The proportion of 6~10 years is 18.8%. The proportion of over 10 years is 15.7%.

## **4. Reliability and Validity Analysis**

After the formal investigation, SPSS21 is used to do reliability and validity analysis to confirm whether it can do Structural Equation Analysis. The data from this study has passed KMO and Bartlett Spherical Test. CRONBACH's  $\alpha$  of four main variables including Risk Management, Sense of Organizational Support, Risk Consciousness and Information Security is respectively 0.924, 0.901, 0.945, 0.787, which are all relatively higher. The KMO values are 0.916, 0.822, 0.880, 0.766.

**Table 2.** Reliability and Validity of Variables

Variable Name	Cronbach's	AVE	Explained Variance	Fitting Coefficient
Risk Management (RM)	0.924	0.928	0.797	$\chi^2 / df = 1.918$
Sense of Organizational Support (SO)	0.901	0.819	0.782	RMSEA=0.074
Risk Consciousness (RC)	0.945	0.827	0.806	RM=0.066
Information Security (SI)	0.787	0.896	0.811	NFI=0.886
				GFI=0.910

The four main variables are all significant at level 0.01. It can be concluded that the main variables designed in this study have good reliability and validity, and can be used for Structural Equation Analysis and related adjustment effect analysis, as shown in TABLE 2.

## V. Conclusion Data Analysis And Results

### 1. Analysis of Common Methodological Biases

In order to investigate problems of common method deviation, Harman Single-factor [27,28] Test is used in this paper. TABLE 3 shows the factor load of principal component analysis without rotation. The total of 14 initial eigenvalues of the principal component greater than 1 in TABLE 3 can explain 66.618% of variation. The variance of the first principal component is 25.014, which is less than 50% of the total variance. On the whole, it can be concluded that common methodological biases do not have a significant impact.

**Table 3.** Common Method Deviation Tables

Com position	Total	Initial Eigenvalue	Accumulates %	Total	Extract Square Sum Load Variance %	Accumulates %	Total	Rotating Square Sum Loading Variance%	Accumulates %
1	16.074	25.014	25.014	16.074	25.014	25.014	16.074	25.014	25.014
2	7.163	9.237	34.250	7.163	9.237	34.250	7.163	9.237	34.250
3	4.175	5.062	43.475	4.175	5.062	43.487	4.175	5.062	43.487
4	2.338	3.425	46.908	2.338	3.425	46.908	2.338	3.425	46.908
5	1.896	2.839	49.712	1.896	2.839	49.712	1.896	2.839	49.712
6	1.418	2.419	52.104	1.418	2.419	52.104	1.418	2.419	52.104
7	1.401	2.373	54.465	1.401	2.373	54.465	1.401	2.373	54.465
8	1.357	2.240	56.690	1.357	2.240	56.690	1.357	2.240	56.690
9	1.249	1.948	58.614	1.249	1.948	58.614	1.249	1.948	58.614
10	1.186	1.757	60.316	1.186	1.757	60.316	1.186	1.757	60.316
11	1.146	1.705	62.076	1.146	1.705	62.076	1.146	1.705	62.076
12	1.091	1.607	63.683	1.091	1.607	63.683	1.091	1.607	63.683
13	1.032	1.529	65.105	1.032	1.529	65.105	1.032	1.529	65.105
14	0.901	1.428	66.618	0.901	1.428	66.618	0.901	1.428	66.618

### 2. Analysis of Variable Structure Fitting Index

In aspect of construct validity and discriminant validity of variables, AMOS21 Software is used to validate the validity by confirmatory factor analysis. Through analysis of fitting index, the fitting of the four-factor model of Risk Management, the three-factor model of Sense of Organizational Support, the two-factor model of Risk

Consciousness and the one-factor model of Information Security are all best, the structure validity of each variable is good, as shown in TABLE 4.

**Table 4.** Analysis Table of Variable Structure Fitting Index

Variable	$\chi^2 / df$	GIF	AGIF	CFI	NFI	TLI	RMSEA	SRMR
<b>Risk Management (RM)</b>	2.185	0.943	0.912	0.967	0.938	0.917	0.035	0.0312
<b>Sense of organizational support (SO)</b>	2.364	0.944	0.932	0.951	0.937	0.945	0.056	0.0369
<b>Risk Consciousness (RC)</b>	1.864	0.963	0.961	0.935	0.872	0.907	0.061	0.0418
<b>Information Security (SI)</b>	1.429	0.992	0.964	0.906	0.915	0.911	0.037	0.0372

In the test of discriminant validity, the item of each variable is evenly distributed to each dimension by using Item-packing Method, and then each dimension is analyzed as latent variable index. As shown in TABLE 5, the benchmark model has a better fitting effect and a better matching index than the other three models, the four variables: Risk Management, Sense of Organizational Support, Risk Consciousness, and Information Security have a high degree of differentiation.

**Table 5.** Confirmatory Factor Analysis Table

Model Type	Factor	$\chi^2 / df$	GIF	AGIF	CFI	NFI	TLI	RMSEA	SRMR
<b>Datum</b>	RM,SO,RC,SI	1.327	0.942	0.947	0.922	0.957	0.973	0.033	0.0263
<b>Triple Factor</b>	RM,SO+RC,SI	4.106	0.887	0.827	0.893	0.885	0.885	0.091	0.0443
<b>Difactor</b>	RM+S O+RC, SI	4.411	0.749	0.902	0.877	0.852	0.848	0.114	0.0512
<b>One Factor</b>	RM+S O+RC+ SI	5.342	0.814	0.818	0.797	0.875	0.850	0.106	0.0516

NOTE: RM stands for Risk Management; SO stands for Sense of Organizational Support; RC stands for Risk Consciousness; SI stands for Information Security; "+" stands for latent variable merging.

### 3. Descriptive Statistics of Variables

**Table 6.** Descriptive Statistical Tables of Variables

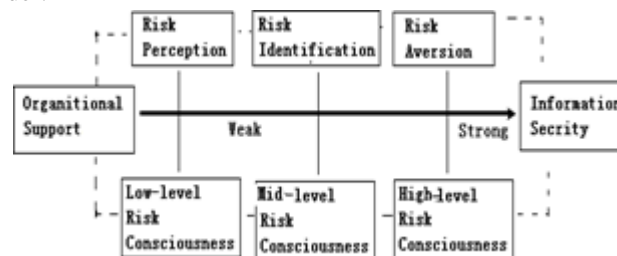
Variable	Sex	Age	Education	year	Position	Number	RM	OH	RR	SI					
Sex						1.000									
Age						0.021	1.000								
Education						0.041*	-0.021	1.000							
year						0.037	0.466*	-0.071**	1.000						
Position						-0.102*	0.075**	-0.241	-0.071**	1.000					
Number						0.024	0.023**	0.012**	0.041*	0.033*	1.000				
RM						0.010	0.053	0.057*	0.080**	-0.026	0.091*	1.000			
SO						0.063	0.030	0.113*	-0.008*	-0.053**	0.084	-0.061	1.000		
RC						0.015	0.036	-0.051**	0.011**	0.228*	0.072**	-0.062*	0.071*	1.000	
SI						0.029	0.051	0.080	-0.040	0.099**	0.066**	0.045**	0.075**	0.161*	1.000

NOTE: \*\* Indicates Significant Correlation at 0.01 level; \* Indicates Significant Correlation at 0.05 level.

Through the model construction and its related empirical tests, the hypotheses proposed in this paper have been effectively verified, and at the same time, the main conclusions are as follows:

1. Sense of Organizational Support and Risk Consciousness have significant mediating effect between Risk Management and Information Security of enterprise, and have significant impact on Information Security through Risk Management.
2. Among the multiple mediating effects of Risk Consciousness, Sense of Organizational Support plays a significant role in regulation of Risk Management and Information Security by driving Risk Consciousness.
3. As a kind of information management system of enterprise, Risk Consciousness runs through the process of Risk Management.

Therefore, the above research conclusions have positive significance to promotion of Risk Management of enterprise information. If governments, enterprises or relevant industry sectors are fully aware of the driving effect of Organizational Support on Risk Management and the reinforcement effect of Risk Consciousness from lower to higher levels. Therefore, it is significant to strengthen Sense of Organizational Support, mobilize the whole staff to participate and promote rationalization of the collective risk Consciousness [41-44]. As shown in FIGURE 5, the enhancement effect on Risk Management is a process from weak to strong as Risk Consciousness is transformed to higher-order.



**Fig. 5:** Driving Mechanism of Information Security of Enterprise

1. Actively mobilize all personnel of enterprise to participate in the risk management of information. Information Security is one of the important contents of Risk Management of enterprise. Risk Management has phases objectively, and each link's mistake of its may lead to information-risk event. That is to say, Enterprise Authority should pay attention to every link in process of Risk Management. The relevant departments should overcome two kinds of malpractices [29,30]: First, Risk Management of information is a matter only for some departments and some personnel; second, Risk Management of information emphasizes the information security guarantee of construction of physical conditions, ignoring or belittling the participating consciousness of all staff.
2. Give full play to mediating effects of Sense of Organizational Support. Sense of Organizational Support is a driving effect between Risk Management and Information Security, which is mainly manifested in the role of strengthening the awareness of risk, and which makes the action route of Risk Consciousness to Risk Management have stronger stability. In response, the corporate authorities should give full play to the intermediary effect of Sense of Organizational Support [31,32], using such means as policy and environmental incentive mechanism to mobilize internal and external resources to promote the internalization of information



security objectives into work support, interest and value recognition among departments.

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