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Research Article

Evaluation in Food Security Supervision System Based on Cloud Computing

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Abstract: This study, based on the current status of China's food safety regulation and the experiences in developed nations and regions, using theoretical and empirical analysis methods, qualitative and quantitative analysis approaches, systematically explored the mechanism and patterns of and approaches for food safety supervision in accordance with the principles of systems engineering. Using theoretical analysis, qualitative analysis and quantitative analysis methods, in accordance with the systems engineering principles, based on the AHP evaluation system under cloud computing environment, the study of China's food safety monitoring system has great theoretical and practical significance.

Keywords: AHP evaluation, cloud computing, food safety supervision

INTRODUCTION

China's food safety has been considered as weakest link in social life. Food safety is not only crucial to the national economy and livelihood of the masses, but also an important indication of life quality of a nation and a state. Along with the rapid development of science and technology and the acceleration of globalization, food safety has growing impact on human society and tens of thousands of people every year have contracted infectious or non-infectious food-borne disease because they ate contaminated foods. These diseases are seriously affecting people's health and debasing the social welfare and production efficiency.

At present, Cloud computing is a hot spot in IT industry, almost every IT company is promoting this newly emerging business model and spending huge amounts of money researching Cloud Computing. With storage system becoming more and more cheap, internet bandwidth higher, processing unit faster, the old assumption that moving computing and storage into the" cloud" is becoming true. Food products have the features of credence goods. Being a kind of public goods, the externalities, information asymmetries in food supply, market failure is quite common. To address the market failure in food safety, the fundamental solution lies in the governmental regulation-the "visible hand", to offset the limitations of market mechanism. However, years of regulatory practices show that the effect of government regulation is not satisfactory; the malfunctioning of governmental regulation is still plaguing the whole society (Jin, 2012). Theoretically, the fundamental reason for government failure is that we still do not have a profound understanding of the food safety supervision mechanism, all these are the important issues concerning food safety and need to be clarified. The understanding to connotation and extension of food safety concept has not reached unanimity, the decision mechanism of food safety is not yet clear and have not the ways and means to construction cheap and efficient regulation mechanisms, especially on how to create conditions suited to China's regulatory system less. This study used the advanced information means to construct the food safety supervision framework, using APH evaluation model to evaluate and analysis the food safety, forming an efficient and convenient food safety supervision mechanism combined with cloud computing technology.

MATERIALS AND METHODS

Conception of cloud computing: Currently, cloud computing technology is one of the most concerned new computer technologies, often referred to as "cloud". It is an infrastructure of on-demand delivery resources and charge by using. It makes the goal of computing services clearer, at the same time promoting high efficiency and low cost of such services. Its openness has attracted many developers and researchers and recognized by the market (Wessells and Anderson, 1995).

Depending on the division of deployment model, cloud computing has three models: public cloud, private cloud and hybrid cloud, in which hybrid cloud is a special kind of model built up based on private cloud. NIST (National Institute of Standards and Technology) with some of the characteristics of a public cloud

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authoritative believes that cloud computing can be divided into three levels according to the service form: IaaS, Paas and SaaSo.

Food risk assessment model: Food risk assessment is based on the intake of certain pollutants in the crowd, food intake and intake of pollutants is equal to the population and the product of the content of pollutants in the food, now making the following assumptions:

- The crowd of the intake to food in a day is the random variable X, the distribution is tf_{ij}.
- In per unit mass of a pollutant content in the food to Y, the distribution is idf_i.
- The crowd to the intake of pollutants as a random variable Z, Vector space retrieval model can be described as I = (D, T, Q, F, R) Among them: D = $\{d_1, d_2,\ldots d_n\}$ As a collection of text, n text collection number; T = $\{t_1, t_2,\ldots t_n\}$ Set as a feature, m feature of all.

A text m feature indexing can be represented as a vector space $d_i = \{w_{i1}, w_{i2},\ldots w_{im}\}$, i = 1, 2,… n, w_{ij} is characteristic t_j for the text d_i of the weight, if the weight value w_{ij} is 0, indicating t_j that it is not appeared in d_i, $Q = \{q_1, q_2,\ldots q_m\}$ for the query set, a query q_r can be represented by vectors $q_r = \{q_{r1}, q_{r2},\ldots q_{rm}\}$, q_{rj} is a characteristic to t_j the query q_r weights, if the weight value q_r is 0, indicating that t_j is not appeared in q_r. Further definition: Frequency tf_{ij}: t_j is the feature for text d_i appear in the frequency; Inverse document frequency word idf_i (inverse document frequency): the word in the quantitative distribution of document collection, the calculation $\log(N/n_k + 0.5)$ is usually, where N is the total number of document centralized, n represents a number of documents containing K, called the document frequency of the term.

The normalization factor: In order to reduce the inhibitory effect of high frequency characteristics of individual word on other low-frequency feature words, the standardization of components.

Based on the above three factors to term weighting formula (1):

$$w_{ik} = \frac{tf_{ik}\log(N/n_k + 0.5)}{\sqrt{\sum_{k=1}^{n}(tf_{ik})^2 \times [\log(N/n_k + 0.5)]^2}} \quad (1)$$

The similarity between the text and the query can be used to measure the distance between two vectors. There are many kinds of calculating method of similarity, commonly used methods of inner product, Dice coefficient, Jaccard coefficient and cosine coefficient, usually uses the cosine coefficient method, namely the cosine of the angle between two vectors to represent the similarity between the text and the query Sim (d_i, q_j), see Eq. (2). Cosine similarity calculation method is a normalization, the angle between the two vectors of the smaller, the greater the degree of correlation between documents, correspondence cos is higher. Two vector included angle cosine is equivalent to their standard vector inner product unit length, it reflects the similarity term component two vector of relative distribution:

Table 1: Judgment matrix and index weight of criterion layer

A	B1	B2	B3	a_i
B1	1	1	1	0.3333
B2	1	1	1	0.3333
B3	1	1	1	0.3333

B1: CR = 0.0548 and CR<0.1; B2: CR = 0.0944 and CR<0.1; B3: CR = 0.0940 and CR<0.1; They are by mean of the consistency check

$$Sim(d_i, q_j) = \cos\theta = \frac{\sum_{k=1}^{n} w_{ik} \times w_{jk}}{\sqrt{(\sum_{k=1}^{n} w_{ik}^{\ 2}) \times (\sum_{k=1}^{n} w_{jk}^{\ 2})}} \quad (2)$$

The evaluation results: In order to urge therelevant governmental departments to avoid the slackness of work, dereliction of duty,malfeasance and other issues, a set of supervision performance evaluation index was putforward. This index system adopted the general theories for governmental performanceassessment and the practices in different places, taking the practicality of our country intoconsideration, using AHP evaluation method to conduct analysis through SPSS software, a newperformance assessment index system including 20 indicators ranging within 6 areas ofperformance from 3 three dimensions was selected for local food safety supervisionperformance assessment, thus provide a powerful and scientific tool to strengthen thesupervision over the regulatory agencies (Zhang, 2003).

For the building index system, we can use AHP and entropy weight to determine the index weight of subjective and objective information respectively, comprehensive weights are obtained, in order to improve the accuracy and credibility of evaluation results.

The determination of index weight method: When determining our ecological system coordinated integrated evaluation system of the index weight j,we should comprehensively consider the results of subjective and objective weights way, that electricity ecological system coordinated weight value j of comprehensive is concluded (Annandale, 2000).

Application examples: Through the yearly information of related data, we select 2000-2011 statistical data in Wuhan as the original data in the research; it is shown in Table 1 weight method. Based on the AHP method.

According to the weights of the criterion layer and index layer, it conducts the total sort of levels of hierarchy and calculates the comprehensive weights, CR = 0.0815 and CR<0.1, via the consistency check. By using AHP method for food security electronic

Table 2: Judgment matrix and index weight of electricity subsystem

B1	C1	C2	C3	C4	C5	a_j
C1	1.0000	7.0000	1.0000	5.0000	5.0000	0.3838
C2	0.1429	1.0000	0.1429	1.0000	0.3333	0.0504
C3	1.0000	7.0000	1.0000	5.0000	7.0000	0.4106
C4	0.2000	1.0000	0.2000	1.0000	2.0000	0.0824
C5	0.2000	3.0000	0.1429	0.5000	1.0000	0.0728

Table 3: Judgment matrix and index weight of environment subsystem

B2	C6	C7	C8	C9	C10	C11	a_j
C6	1.0000	5.0000	7.0000	5.0000	3.0000	1.0000	0.3276
C7	0.2000	1.0000	3.0000	0.2000	0.2000	0.2000	0.0474
C8	0.1429	0.3333	1.0000	0.2000	0.2000	0.1111	0.0282
C9	0.2000	5.0000	5.0000	1.0000	3.0000	0.3333	0.1508
C10	0.3333	5.0000	5.0000	0.3333	1.0000	0.2000	0.1046
C11	1.0000	5.0000	9.0000	3.0000	5.0000	1.0000	0.3416

supervision system to coordinate the weight of comprehensive evaluation index system is as follows:

A = {0.1279, 0.0168, 0.1369, 0.0275, 0.0243, 0.1092, 0.0158, 0.0094, 0.0503, 0.0349, 0.1139, 0.1304, 0.1221, 0.0152, 0.0192, 0.0464}

Secondly, the layer weights for each indicator are defined. The judgment matrix and the index weight in subsystems of the Table 2 and 3.

Based on entropy weight: Making use of statistical data in Wuhan of the standardization, entropy value of each evaluation index is calculated as follows:

W = {0.0460, 0.0709, 0.0286, 0.0362, 0.0283, 0.0252, 0.0449, 0.0312, 0.0447, 0.1348, 0.1684, 0.0932, 0.1069}

The judgment matrix and weight of Rule layer are shown in Table 2 and 3 CR = 0.0000, judgment matrix in criterion layer is completely consistent for the consistency check.

RESULTS AND DISCUSSION

For food safety regulation, we should collect, enter food safety testing data through data collection, in the data management system, establishing a database based on cloud computing, using the established food evaluation model to analysis the data and using AHP evaluation system to evaluate, eventually finding food safety problems, determining the nature, scope and degree and proposed control scheme according to the problems .Effective food safety control is systematic project. To improve the effectiveness of food safety regulation, measures in the following six aspects should be taken. It is to establish and perfect institutional systems for food safety. First, further improve China's food safety regulation system of laws and regulations, The coordination within "Food Safety law" and the original already exists laws such as the "Product Quality Law," "Food Sanitation Law," "Consumer Protection Law" and "pigs slaughtered management Ordinance "are relatively poor. It is quite necessary to improve the legal and regulatory systems for China's food safety supervision system, to transform the departmental legislation into legislation at state level to achieve the unification of laws and regulations there are need to unify the various laws and regulations.

CONCLUSION

This study proposed food safety supervision based on cloud computing architecture, through the combination of cloud computing technology and food safety testing technology, using the AHP evaluation system to evaluate risk factors of food safety, in order to achieve the purpose of reducing the risk of food safety. Through the analysis of the structure, cloud computing architecture based on the food safety supervision with the use of the information is means to guarantee food safety, reducing the risk of food safety value.

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