Critical Success Factors on E-Government Application - From the View of Government Workers in Guangdong

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Abstract

This study used a sample of 293 government workers from Guangdong Province of Peoples Republic of China. Based on Delone and McLean's IS success model, we constructed the measurement scale for evaluating E-Government Applications success. We also examined impacts of five critical success factors (i.e. internal organization and management, quality of product and technology of suppliers, external technical environment, the external policy environment, and coordination and supportive ability of information center) on E-Government Applications. Some government characteristics and personal backgrounds were also included and explored as control variables.

It was found that these five critical success factors are significantly related among themselves. It was also found from the Pearson correlation coefficients that all but external policy environment were statistically related with E-Government Application. The level of government (the City government level) and personal role as a top leader were also found to be important government and personal factors associating with E-Government Application success.

A multivariate regression analysis was conducted to test five factors and two control variables. It is found that the model was statistically significant. Since the correlation among independent variables, it was found that internal organization management, external policy environment, City level government (a dummy variable) and user as a top leader (a dummy variable) were final significant variables.

This was a paper originated from a doctoral dissertation. Time and resources were limited. Some potential areas for improvements and suggestions for further study were also presented.

Keywords: E-government, E-government application success, Critical Success Factors (CSFs) for E-government application, E-government in China

Introduction

With the global political and economic integration, government management and service functions become more electronic, automation, and paperless. E-government is rapidly developed in a number of countries especially in developed countries. Using the internet technology to improve government organization; reorganizing the public process and management; changing management functions of government agencies; improving work quality and efficiency had a profound impact in establishing an efficient, well-coordinated, and standardized administrative system [24]. E-government plays an important role in promoting national government reform, improving government efficiency, enhancing the effectiveness of the role of government work.

E-government in many developed countries has entered a relatively mature development period. In contrast, China is lagging behind in either progress or research. Though Chinese e-government has developed for 20 years with a wealth cumulating of experience, a lot of problems still arise. We can clearly see that the increasing investment in construction of e-government in many parts of China, but these projects did not produce a corresponding efficiency or effectiveness. Furthermore they brought more new problems. Over the years, people spent more time in building e-government projects and less attention to the research in application process. In fact, only the successful application of e-government can truly demonstrate the practical significance of e-government and its goals. Application is the last stage and, thus, will determine the success of e-governance and its progress.

This study was conducted on different government departments to assess success on e-government application process. Various influencing critical success factors were examined. Case studies, detailed field interviews, and questionnaire survey were applied to this research. We tried to explore the critical success factors model for e-government application. We hope our results can guide all levels of government departments to promote e-government and to provide practical guidance and recommendations to e-government practice. The study also hopes to provide to the government with e-government measures and policies that will serve as a basis to further develop and promote e-government application and practice.

Review of Literature

E-government can be defined as government

agencies using modern information and communication technology to integrate management and services through web technology to achieve optimization of the re-structure and re-organization of government work processes [14]. It is through the internet information technology, use of modern science and technology, to achieve the goals of government performance improvement: First, we must facilitate public participation and the government management, and keep government information open to the public; Secondly, to provide various types of high-quality government services and ensure citizens, social organizations and other institutions to get access to public information and services conveniently; Thirdly, to improve administrative efficiency and enhance the competitiveness of the government [25]. From the review, we can see that the most important focus of e-government application is to enhance government performance. This study was focusing on establishing an evaluation system for e-government.

Research on e-government applications, especially within different Chinese governments, has not yet been studied in a systematic way. It is rather difficult to find studies in this area. In comparison, it widely found the implementation and evaluation of the ERP projects for business world. They could be from the view of information technology applying to the resources, on processes and/or activities, or on cross-sectional integration. The entire application and process for business is actually consistent with the e-government applications. The difference between the government and enterprises is the ownership and institutional differences. The mechanism itself is similar and is information system applications. Thus this study is based on the critical success factors of ERP applications. With proper adjustments for governmental characteristics and situational factors, this study will examine its hypotheses and assessment.

In the field of evaluate application of information system the landmark work was done by American scholars DeLone and McLean. In 1992 they proposed a six-dimension information system success model: i.e. system quality, information quality, system use, user satisfaction, personal influence and organizational impact. Eleven years later, they further improved the model by adding a new dimension: i.e. service quality. They also combined personal influence and organizational influence and merged them into a single new dimension, net benefits. However, because China has a different political system, the concern of e-government applications was placed on

effectiveness instead of benefits.

The dependent variable of this study, the success of e-government system application, is based on the successful model developed by DeLone and McLean. The assessment system used six dimensions: system quality, information quality, individual impact, organizational impact, user satisfaction and system usage. Through the interview of 16 experts, we assign certain weights to every measurement.

For explaining factors, this study based on the implementation of critical success factors for ERP, with special consideration of specific patterns and factors applicable to the government sector. The use of critical success factors for e-government, from a global view, can be summarized as external factors and internal factors. The external environment includes four factors, the change of government, social development, laws and regulations, and economic progress. For internal environment, there are six major factors; the internal influence, the internal demand, technical capacity, standards, management methods, and information security. If these elements have commonality, it is the Chinese government management style. Chinese bureaucracy will be an additional special factor [16]. Among studies for the ERP application, Holland believed that the successful implementation of the ERP requires enterprises to process-oriented and that all departments must follow the same, unified process [5]. The real benefits of ERP can only be obtained from the organizational change. Therefore, the implementation of the ERP should be a business project rather than technology projects. Holland's ERP critical success factors for system implementation included tactical and strategic dimensions. The former one included senior management support, business vision, project schedule, legacy system, and ERP strategy. The later one included client consultation, personnel, client acceptance, trouble shooting, and configuration. Estsve argued that the high failure rate of ERP was due to the fact that project managers usually concerned about the technical and financial issues ignored non-technical issues. Therefore, Estsve used four dimensions to assess ERP system application: strategic, tactical, organizational and technical [4].

By reviewing researches of successful model in ERP implementation, e-commerce and e-government, this paper proposes a critical success factors model for e-government application. Please see Figure 1 for critical success factors for e-government applications.
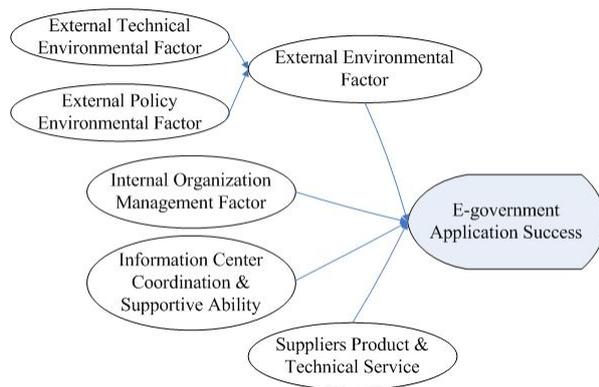
Figure 1 Critical Success Factors for e-Government Applications

The characteristics of companies could be another important factor [11] [1] [7]. So characteristics of different government units are not the same and will affect success of their applications of e-government projects. A description of the basic characteristics of government departments can be categorized into

(1) Situational factors include: the unit level, management style, the nature of the units, the location of the units, positions, and application roles;
(2) Personal factors include: time using application, gender, age, professional background, and academic qualifications.
These two areas have directly affected the degree of awareness of key success factors, so the actual impact of the various critical success factors will change accordingly. It is important to assess these variables and control for them.

Methodology

Pilot study was conducted in February and March of 2009. We interviewed some experts to assure validity of questions. After modifications of questions, we conducted the questionnaire survey from April to May of 2009.
Judgment sampling procedure was used to select appropriate units [15]. Random selection of staff was done in each unit. That is, the researchers according to their knowledge structure and research purposes subjectively determining sampled units. The provincial, city, district and other levels of government were all included to select a typical application of a certain unit. In Guangzhou city,5 provincial units, 15 city level units, and 15 district level units were selected. Furthermore, the samples covered approximately 25 municipal level units from Zhuhai City, Yunfu City, Dongguan City, Jiangmen City, and with a total of about 40 government departments. Questionnaires were sent in two ways, electronically via QQ or MSN and in paper by mail. About 800 questionnaires were sent to different level

government offices. We received 403 cases (about 50 percent respond rate.) Among them, 319 were from emails and 84 were from paper copies with response rate of 64% and 17% respectively. After carefully reviewing and examine them, we eliminate those incomplete, non-government end users, some duplicated copies, we were able to use 293 valid cases or about 70% of responded cases.

Questionnaire included a total of 6 parts with a total of 60 Questions. The survey took about 15-20 Minutes to complete. The first part of the questions is the basic characteristics of the respondents, including respondents situational factors such as unit level, management style, where the office is, positions and application roles. Personal factors including gender, age, educational level, professional and relevant work experience were also included in this part.

Second and third part is the main body of questionnaire, including "the success of e-government applications", measurements of total 6 questions [9], and the measurement of key success factors. Measurement of critical success factors which are divided into part four with 43 questions. They were the measurement of external environmental factors [22]; the measurement of internal organization and management [6] [10]; measurements of business understanding, organization and coordination, and supporting capacity of IS department [12] [10], and the measurement of level of vendor and its technological level [20]. Most of questions were designed by using Likert scale with five choices.

Reliability tests were conducted. Measurement items of all reliability testing Cronbacha á Coefficient 0.950; Each side of a research structure Cronbach's á Coefficients was larger than 0.8. This signified a very good internal consistency reliability. The success of e-government applications has a Cronbach's á Coefficient of 0.780 that is within the acceptable range [8]. This study had a total of 43 items, all samples KMO Value is 0.910, Bartlett'S Test of sphericity chi-square value of 8223.147, It reached a very significant level, indicating that the sample data suitable for factor analysis.

For construct building, we used principal component analysis on 43 items, we were able to extraction six main factors. Orthogonal rotation was conducted to 43 items and identified five factors. Table 1 shows the final results of critical success factors. Five factors were extracted with the cumulative explained variance 66%. Among them, five Alpha Coefficients were examined. Specifically, 0.890 for internal organization and management; 0.915 for the supplier's level, the impact of external technology environment; 0.792 for external information technology; 0.849 for supporting ability of IT department; and 0.777 for

external policy and regulations were found.

Results

From Table 2, we can find that relationships between the dependent variable and four success factors are statistically important. Only the relationship with external policy environment was not statistically important to the dependent variable. However, it was found that external policy environment variable is highly correlated with internal organization and management variable and IT support ability. The relationships among five independent variables are all statistically significant. It implies that independent variables cannot be co-existed in the multiple regression analysis even most of them are statistically correlated with the dependent variables.

Internal organization and management dimension has a statistically significant relationship with the success of e-government application. To assure the success of e-government, it is required that government officers must first have "consciousness", especially, the leaders, including department heads and various business leaders should put this in priority [16]. Top government level should mandate a dedicated department to promote e-government applications and provide adequate funding and resources. End users at all levels of government should truly utilize the application programs. CIO's and IT offices have good administrative and resource coordination capabilities. Internally, a sound management and consistent policy on e-government should be one crucial success factors.

External provider (product, technical level and application) is also found to be significant with the correlation coefficient of 0.21. From the point of view of external technology, it is clear that software flexibility, easy to adjust for process and new features, and etc. are important. It is also important that the e-government should be easy to achieve subsystems integration, good performance and high security. From the development and application point of view, the supplier must have a high level of technology and the project manager must have extensive experience in project management and communication as well as coordination capabilities.

External technological environment is also found to be statistically significant with the dependent variable with a correlation coefficient of 0.15. The popularity of e-commerce will push the government to use the e-government system. Willingness and readiness of people and business have a positive impact on the application. People and business may also demand government to improve its efficiency and effectiveness. Thus, it is found that external technological environment, including people and business, will have a positive relationship with e-government success.

IT departments and its effectiveness related measures have an important impact on the success level of e-government with a correlation coefficient of 0.22. It is also found that characteristics and effectiveness of IT is highly correlated with other independent variables. IT department is the primary factor that connects the internal management that includes the senior managers, end users and different units of the government sectors. It also coordinates and communicates with external providers. The services that IT offices provide and the abilities to solve problems will also significantly contribute to the success of e-government applications.

The direct relationship between external policy environment factors and the success of the system is relatively low with a correlation coefficient of only 0.04. However, its significant relationships with other independent variables are found. This implies that indirect relationship on the dependent variables via other independent variables may exist.

In order to compare five Critical success factors simultaneously and with situational factors (organizational level and individual lever), a stepwise multiple regression was conducted. In addition to five critical success factors, we also included eleven different situational factors, i.e. the level of the units, management style, the nature of the units, the location of the units, positions, application roles, time using application, gender, age, professional background, and academic background.

When all five critical success factors and situational factors are considered together, it is found the model is statistical significant at 0.000 level. Furthermore, it is found that the model explained 11.1% of the variance of the success of e-government applications. Please see the Table 3 for the results.

From the parameter test, shown in the Table 3 we found that four variable are statistically important to the dependent variables. Internal organization and management and external policy environment variables along with City level, and top leader were found statistically important. Internal organization and management including end users, top management, and CIO's and project managers abilities had a relatively higher correlation (see Table 2) with the dependent variables and shows a significant contribution in the multiple regression analysis. The external policy environment was not statistically significant with the dependent variable according to the bivariate analysis. However, when we ran multivariate analysis, it was statistically significant. As discussed previously, this variable is correlated with other independent variables. Thus, it is possible that external policy environment, though did not have a direct, have an indirect affect on the success of e-government via other critical success factors. As a matter of fact, the external policy factor is associated with policies and e-government structure that relate to the legitimacy

and necessity of the e-government system. A sound policy will also provide a guideline for e-government system and assure security, safety and other aspect of the e-government. Thus, it is one of the important factors to the success of e-government application. Further exploration should be done to answer the effect of external policy environment.

Two situational factors were found to be important in the final regression model. One is the

City level with a significant level of 0.024. It means that level of government has different impacts on the success of e-government system. Specially, the City level units are more likely to contribute to the success of the e-government. Because, most of the systems are development at the City level government and may provide better communication and services to the end

Table 1 Factor Analysis of Five Critical Success Factors

Constructs	Dimensions	Items	Component				
			1	2	3	4	5
External environmental factors	Policies and regulations	X11					0.563
		X12					0.573
	Applied Technology Environment	X16			0.684		
		X17			0.840		
		X18			0.787		
Internal organization and management factors	End-users intention: first in command attention	X21	0.644				
		X22	0.644				
		X23	0.773				
		X24	0.660				
	End-user's intended use	X25	0.770				
		X26	0.735				
		X27	0.738				
		X28	0.684				
Information technology departments of business understanding, organization and coordination and support services capacity	CIOResource coordination	X32	0.565				
	Department of information technology project manager capacity	X34	0.510				
	Information technology sector to support service capabilities	X38				0.715	
		X39				0.696	
The level of product technology vendor	Technological level of suppliers	X42		0.752			
	Supplier Project Manager Competency	X43		0.714			
		X44		0.663			
	Degree of product operations for compliance with	X46		0.719			
	Chief Information Resource Integration	X47		0.819			
		X48		0.788			
		X49		0.823			
Total Variance Explained	Rotation Sums of Squared	Total	5.902	4.980	2.143	1.519	1.365
		Of Variance	24.592	20.751	8.929	6.329	5.686

	Loadings	Cumulative%	24.592	45.344	54.273	60.602	66.288
Cronbach's Alpha			0.890	0.915	0.792	0.849	0.777

Table 2. Means, Standard Deviations, and Pearson Correlation Coefficients of Variables (n=293)

		Successfully applied	Internal organization and management	Supplier standards	The external technical environment	Information technology sector capacity	External policy environment	Municipal Units	Top leader
n		293	293	293	293	293	293	293	293
Mean		3.62	3.86	3.97	3.45	3.75	3.64	0.43	0.09
Std. Deviation		0.52	0.63	0.69	0.76	0.60	0.80	0.50	0.28
Internal organization and management	Pearson	**_0.25_**							
	Sig.	**_0.00_**							
Supplier standards	Pearson	**_0.21_**	0.59						
	Sig.	**_0.00_**	0.00						
The external technical environment	Pearson	**_0.15_**	0.46	0.27					
	Sig.	**_0.01_**	0.00	0.00					
Information technology sector capacity	Pearson	**_0.22_**	0.79	0.66	0.40				
	Sig.	**_0.00_**	0.00	0.00	0.00				
External policy environment	Pearson	0.04	0.58	0.34	0.39	0.45			
	Sig.	0.45	0.00	0.00	0.00	0.00			
City Level	Pearson	**_0.16_**	0.16	0.16	-0.04	0.12	0.03		
	Sig.	**_0.01_**	0.01	0.01	0.55	0.03	0.61		
Top Leader	Pearson	-0.07	0.10	0.06	0.05	0.11	0.06	0.13	
	Sig.	0.21	0.10	0.28	0.40	0.07	0.30	0.03	

Table 3 Multiple Regression Analysis of Five Critical Success Factors and Situational Factors

	Â Coefficients	T	Sig.
(Constant)	2.733	13.203	0.000
Internal organization	0.184	2.191	**_0.029_**

and management			
Supplier standards	0.060	1.051	0.294
The external technical environment	0.061	1.394	0.164
Information technology sector capacity	0.012	0.138	0.891
External policy environment	-0.098	-2.182	***0.030***
*Municipal Units	0.136	2.267	***0.024***
*Top leader	-0.208	-1.994	***0.047***
R^2	0.111	F = 5.074	0.000

*Variables when measured using the qualitative scales, Dummy Variables were used

users in the government. Further analysis is recommended. Another important personal factor is the top leader. If the end user has a role as the top leader of the unit, it is more likely that the success of e-government will be higher. Top level commitment is one of the critical factors to the success of many different information systems including e-government in this study.

Suggestion

This research was designed to study the e-government success and critical success factors associated with it. It is from a government workers' perspective. We did not cover the public or companies who may use the e-government system. We examined 43 items and found five dimensions who may contribute to the success of e-government. There five factors are correlated among themselves. Therefore, in the final multivariate analysis, only two of them are found to be statistically significant. We also found that the level of the government unit, i.e. the City level and top leader of a unit will contribute to the success of the e-government system in Guangdong province of China. This research was originally coming from a doctoral dissertation. Due to limited time and resources, some improvements may be done in the future studies.

This research is focusing on the government workers. It does not cover other potential users from the public or business. It may be more complete in the future to include some external users.

We used the same set of questionnaires for end users who work for the government. It is arguable that some parts of the survey may have validity problems. For instant, it is rather difficult to ask government workers about their perceptions or evaluation of external providers. It will be ideal to develop some different questions to measure some external and internal factors by investigating these issues from other ways.

The independent variables are highly correlated among themselves. Multiple regression analysis may not be the best approach to test the multivariate model. A linear structural relational model or other techniques should be considered in the future.

In the situational factors, unit-level and application roles were found to be significant. Personal characteristic variable, especially the "number one" in the unit has a negative relationship with the success of e-government application. It looks like the top leader may use more "harsh" way to evaluate the performance and assigning lower ratings for success e-government application. Therefore, it is recommended that top support will be an important issue for future research.

Another situational variable, the level or type of government, is found to be also significant. In this research, it is found that the end user from the City level is more likely to give good evaluation to the system. Apparently, in the future, it is important to further explore this variable.

References

[1] Bergeron and Raymond. 1992. The Advantages of Electronic Data Interchange. Database, Fall, pp.19-31

[2] DeLone WH, McLean ER 2003. The DeLone and McLean Model of Information Sueeess: A Ten-Year Update. Journal of Management lnformation Systems, 19 (4),pp.9-30

[3] DeLone, WH, and McLean, ER 1992. Information System Success: The Quest for the Dependent Variables. Information Systems Research [J] (3: l),pp.60-95

[4] Esteves, J., Pastor, J., "Towards the unification of critical success factors for ERP implementation" [C]. 2000. Proceedings of the 10th Annual Business Technology (BIIT) Conferenc, Manchester.

[5] Holland,C.,Light,B.,Gibson,N., 1999. "A Critical Success Factors Model of Enterprise Resoucre Planning Implementation ". 7th European Conference on Information Systems ECIS,Copenhagen,Denmark

[6] Javenppa, SL, Ives, B. 1991. Executive Involvement and Participation in the Management of Information Technology. MIS Quarterly, 15-2, pp. 205-227.

[7] McGrown, M. and Madey, G. 1998. The Influence of Organization Structure and Organizational Learning Factors on the Extent of EDI Implementation in US Firms. Information Resource Management Jounal, Vol. 11, No.3, pp.17-27

[8] NuallyJ. 1978. Psychometric Theory. Second Edition. McGRAW-HILL

[9] Raymond L 1985. Organizational Characteristics and MIS Success in the Context of Small Business. MIS Quarterly, 9 (l), pp.37-52

[10] Reimers Kai. 2002. Implementing ERP Systems in China [C]. 35th Hawaii International Conference on System Seience.

[11] Rockart J.F. 1979. Chief Executives Define their Own Data Needs [J]. Harvard Business Review,March-April, PP.81-93

[12] Slevin D., Pinto J. 1957. Balanceing strategy and tactics in project implementation, 33-4.(1957)

[13] 仲秋雁,閔慶飛,吳力文. 2004. 中國企業 ERP 實施關鍵成功因素的實證研究[J]. 中國軟科學, 2004 年第 2 期

[14] 宋皎.2003.試析當前我國電子政務發展制約因素[J].科技進步與對策，2003 年 10 月

[15] 李懷祖.2007.管理研究方法論（第 2 版）.西安：西安交通大學出版社，pp.143-149

[16] 汪玉凱，張勇進.2007.業務流程再造理論在政府管理中的應用—淺析政務流程再造[J].電子政務，2007(6)

[17] 周宏仁等.2008.信息化論[M].北京：人民出版社，pp.

[18] 林瓊.2003.當前中國人內隱領導理論研究——來自深圳、廣州、杭州的調查，博士論文，暨南大學，企業管理

[19] 張秀慧.2003. 企業引進 B2B 關鍵成功因素，說是論文，臺灣大學，資訊工程學研究所

[20] 郭琪.2008.政府資訊資源分享的障礙因素分析與對策研究[J].特區經濟，2008 年 03 期

[21] 閔慶飛. 2004. 中國企業 ERP 系統實施關鍵成功因素的實證研究，博士論文，大連理工大學，技術經濟與管理

[22] 馮耀明.2004.電子政務推進中的社會環境因素分析[J].山西省委黨校學報，2004 年 6 月，Vol.27 No.3

[23] 榮泰生.2002.企業研究方法.臺北：五南圖書出版股份有限公司，pp.123-339

[24] 劉泉寶.2001.網路資訊技術對政府工作的十大影響[J].資訊化建設，2001.12

[25] 蔡立輝.2005.當代中國電子政務：反思與走向[J].中山大學學報：社會科學版，2005 年第 3 期,第 45 卷

[26] 蔡立輝.2007a.電子政務研究應堅持多學科取向[J].資訊化建設，2007/11

Appendices

Table 4 Internal Organization Management

Internal Organization Management Factors	End-users intention: Top Leader Focus	**X21**	Unit authorized by the Government is responsible for e-government program
		X22	Sufficient funding is provided to ensure the implementation of e-government program
		X23	"Top leader" focuses on application, has provided adequate funding and resources
		X24	Top leader attends e-government program himself
	End-users' intention	**X25**	Units leaders attend e-government program theirselves
		X26	Staff uses actively
		X27	Staff supports e-government program
		X28	Staff works coordinating with each other
	CIO Resource Coordination ability	**X32**	CIO's administration and coordination ability
	Information Center's Project Manager's Ability	**X34**	Project manager's administrative operations and system requirement analysis ability

Table 5 Suppliers' Product & Technical Service

Suppliers' Product & Technical Service	Suppliers Technical Service	X42	A high level of technology suppliers
	Suppliers Project Manager's Ability	X43	Suppliers' project manager has extensive project experience
		X44	Suppliers' project manager communication and coordination ability
	Products Business Matching	X46	Software has high flexibility, can facilitate the adjustment process and develop new features
	Government Information Resources Integration	X47	System has high security
		X48	Subsystem enables multiple business information resource integration
		X49	System performance is good, fast and stable operation

Table 6 External Technical Environmental Factors

External Technical Environmental Factors	Application Technical Environment	X16	The level of development and application of e-commerce
		X17	Business of e-government public services and willingness to accept
		X18	Citizens of e-government public services and willingness to accept

Table 7 Information Center Coordination & Supportive Ability

Information Center Coordination & Supportive Ability	Information Center 's Supportive Ability	X38	Information center's engineers to provide on-call support services
		X39	Information canter's engineers are skilled, on-site problem-solving ability

Table 8 External Policy Environmental Factors

External Policy Environmental Factors(X0)	Policies, Regulations and System's Security System	X11	Sound policies and regulations or normative systems that use system
		X12	Administrative system in the vertical business systems and dependencies between the Government Management Platform named "Fragmentation"