STRATEGIC FLEXIBILITY, INFORMATION SYSTEM FLEXIBILITY AND ENTERPRISE PERFORMANCE MANAGEMENT

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Abstract: *Enterprise performance management (EPM) is to help organization to achieve its strategic goals by efficient use of its resources. The competitive business environment is putting tremendous pressure on organizations to improve and outperform. The strategic flexibility allows the firm to meet the uncertainties around its environment. The enterprise performance measurement and management system allows to monitor and control the performance to achieve strategic objectives of the organization. Information system (IS) flexibility in terms of flexibility to use, flexibility to access and flexibility to change the system helps organization to effectively monitor the performance. The paper is based on empirical study in Indian upstream oil industry to identify the effect of strategic flexibility and IS flexibility on enterprise performance measurement and management. Effect of macro and micro variables of strategic flexibility and IS flexibility on effectiveness of EPM in measuring and managing enterprise performance improvement has been studied using univariate and bivariate analysis such as descriptive statistics, correlation, and regression. The dimensions of EPM effectiveness identified based on literature review are: strategic alignment, strategic monitoring, and perspectives such as financial, customer, internal business process, and learning and growth. Macro and micro independent and dependent variables are found to be strongly correlated. It has emerged from the study that strategic flexibility and IS flexibility are contributing to EPM effectiveness. At micro level, government policies and control, global opportunities, global competition, competitive strategy, market forces, computerization, EPM system functionality, flexibility to access system, flexibility to change system, and minimal investment for change are predictors of EPM effectiveness. The results are encouraging and the study may be extended to other sectors.*

KeyWords: Strategic Performance Management, Performance Measurement System, Strategic Flexibility, Performance Measures, Performance Improvement, Key Performance Indicator, Business Excellence.

Type: Empirical

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Introduction

Enterprise Performance Management (**EPM**) is a set of processes that help enterprise to improve performance by efficient use of resources, system and infrastructure. It is, sometimes, also referred as performance management system (PMS). It describes all the processes, methodologies, metrics and systems needed to measure and manage performance of the organization. It is used as a strategic tool of learning, enabling to better understand what drives value creation in the enterprise. It helps organization to achieve their strategic goals. The objective of performance measurement has changed over the past few decades. Traditional performance measures based on financial performance or productivity are no longer appropriate in today's competitive global market. Alternative performance measurement systems have been developed incorporating variety of performance measures/key performance indicators (KPI) based on efficiency, effectiveness, productivity, quality, customer satisfaction, innovation, and employee satisfaction, etc., in addition to financial measures, to produce world-class enterprise performance. Alternative EPMS models such as economic value added (EVA), return on capital investment (ROI), activity based costing (ABC), total quality management (TQM), six sigma, etc., were proposed but they were having a particular perspective in focus and lacking in strategic perspective and comprehensiveness. Modern comprehensive EPM models such as Balanced Scorecard (Kaplan and Norton, 1992), EFQM Excellence Model (1991), and Performance Prism (Neely and Adams, 1998) have overcome the above shortcomings. The effectiveness of EPM have been studies in detail and found to be affected by various factors including flexibility.

Review of Literature

Enterprise performance management help the firm to make efficient use of system and resources to improve business results. According to Drucker (1964), two concepts that underlie organizational performance are efficiency (doing things right) and effectiveness (doing the right things). Initially, the focus of measurement was on financial aspects. Traditional systems concentrated more on financial or productivity aspects. Latest generation of performance management systems which came up in last 10-15 years, are multi-dimensional in nature and mainly focussing of strategic perspective. An enterprise performance management system (EPMS) is a system having set of performance measures or key performance indicators (KPIs) to quantify efficiency, productivity, quality, and effectiveness of actions undertaken by the enterprise so as to monitor, control, manage and perform the activities. The information generated by the system must be accurate, relevant,

timely and easily accessible for the persons who need them (Neely, 1995, Bourne et al., 2003).

Balanced scorecard (BSC) proposed by Kaplan and Norton (1992, 1996) to incorporate balanced set of leading and lagging, financial and non-financial performance measures/ indicators from four perspectives of financial, customer, internal business process, and learning and growth to drive performance improvement. Performance measures are to be derived from vision and strategy of the organization. Neely and Adams (1998) conceptualized a Performance Prism framework, which depicts the measurement as the process of gathering management intelligence. It is a three-dimensional model having five facets for delivering stakeholders value namely Stakeholders satisfaction, Strategies, Processes, Capabilities, and Stakeholders contribution. Business Excellence Model, developed by The European Foundation for Quality Management (EFQM) (1991), is a self-assessment framework for measuring the strengths and areas for improvement of an organization which consist of nine criteria. Five enablers are leadership, people, policy and strategy, partnership and resources, and processes. The four results criteria are people, customer, society, and key performance indicators.

According to Volberda (1996), “Flexibility is the degree to which an organization has a variety of managerial capabilities and the speed at which they can be activated, to increase the control capacity of management and improve the controllability of the organization”. Flexibility necessary to compensate for strategic changes that originate in indirect environment and reach via component of direct environment (Eppink,1978). It is the ability to precipitate intentional changes and adapt to environmental changes through continuous re-thinking of current strategies, asset deployment and investment strategies (Evans, 1991; Bahrami, 1992; Sanchez, 1995). Information system (IS) flexibility has several dimensions such as compatibility, functionality, data transparency, connectivity, technical and functional skill and technology management. It is positively correlated with mass customization, market position and innovativeness of the organization (Byrd and Turner, (2001)).

An empirical study of 175 Canadian SME manufacturing companies related to supply chain showed a direct effect of strategy on flexibility and flexibility on performance (Kamel et al., 2009). Healthcare PMS should have multi-perspectives such as efficiency, effectiveness and flexibility (Purbey et al., 2007). Chenhall (1996) studied the performance of

37 manufacturing firms and found a positive association of high degree of manufacturing flexibility, performance measurement and organizational performance. Deloitte and Touche (2001) suggested three pronged strategy to be adopted viz. adoption of strategic flexibility to deal best with uncertainty; creation of strategically flexible organizations to deal with wide range of potential threats and opportunities using techniques such as scenarios, real options, financial options; and addressing uncertainty rather denying or resisting it. Sharma (2010) has studied the effect of various flexibilities on competitiveness, which enhances performance in mobile telecom companies in India. Strategic, financial, marketing, and operational flexibilities are best predictors of competitiveness and affect various perspectives of performance.

The EPMS models have been implemented in hundreds of organizations across the world in different forms in various industries but have failed in many organizations to achieve the intended objective of driving performance improvements. Some researchers have studied the effect of EPMS implementation, causes of success and failures. Martinez and Kennerley (2005) studied EPM in Energy companies in Europe and found that it has mix of positive and negative effects of EPM. Eight positive effects of EPM observed include: Focus on important aspects, business improvement, improvement in customer satisfaction, increase in productivity, alignment of operations with strategy, improvement in employee satisfaction, continuous improvement culture, and improvement in company reputation. On the other hand seven negative effects include: time consuming, considerable investment, bureaucratic, over-complicated measures, misleading prioritization, mechanistic, and monotonous. Ittner and Larcker (2003) have studied more than 60 service and manufacturing companies and discovered that only few companies are able to achieve benefits of non-financial measures. The main reason for not able to achieve benefits are: Measures not linked to strategy, cause and effect relationship not validated, right performance target not set, and measuring incorrectly i.e. statistical validity and reliability of performance indicators. According to Eccles (1991), data generation in respect of non-financial measures such as market share, quality, innovation, customer satisfaction and employee satisfaction is less often quarterly or annual and rarely become part of regular reporting to managers. Flow of information at various levels in the organization is another important issue, which affects performance measurement and decision making.

From an empirical study of 349 CEO of large and medium companies in Spain, Gimbert et al. (2010) has established a positive association between top management use of strategic performance measurement system (SPMS) and comprehensive strategic decisions/ agenda in terms of number and variety, in each strategic review / reformulation, which eventually affect corporate strategic change. Edson et al. (2009) developed a process to integrate operations strategy and operations performance measurement system, which leads to consistent strategy implementation. Lack of acceptance of BSC by the employees, which is due to inadequate communication by the management, leads to weak BSC implementation (Chen and Jones, 2009). Due to uncertainty and competition, Chinese put greater emphasis on growth. Fleming et al. (2009) from an empirical study of 104 Chinese manufacturing firms, have established a linkage that those firms making greater use of BSC are performing at high levels. According to Thomas and William (2005), to effectively adopt and realize the benefit of performance management system, long-term planning, short-term planning and management reporting should be synchronized. Senior executives and business line managers should collaborate and communicate. Organizations adopted effective PMS, have flexibility devoting more time in proactive informed decision making and less time reacting.

Tangen (2004) highlights that modern frameworks have not addressed the practicalities of measurement and there is need for these frameworks to fulfil the unique measurement needs of a specific company, particularly at the operational level. Tapinos et al. (2005) provided empirical evidence on the impact of performance measurement and management on the strategic planning processes. Impacts are greater in large organizations and organization operating in rapidly changing environment. Bruno et al. (2005) in a case study in Brazilian company demonstrated how resources and competencies convert into performance. It was found that environmental factors related to demand had strongest performance determinant, employee satisfaction showed association with all BSC perspective but employee competency had no correlation with enterprise performance in the case study. Performance management is a process to ensure that resources including human resources are used in attaining the desired goal (Halachmi, 2005).

There is research gap that effect of flexibility on effectiveness of enterprise performance management system has not been studied. In this empirical research the effect of strategic and information system flexibility on effectiveness of EPMS has been studied in oil industry in India.

Research Objectives and Methodology

The objective of the study is to identify factors of strategic flexibility (SF), information system flexibility (IF) and their impact on the effectiveness of enterprise performance management system (EPM).

A conceptual model has been developed based on literature review (Figure 1). Twelve research variables have been identified from strategic flexibility, seven from IS flexibility and 6 from dimensions of EPM effectiveness. Based on conceptual model, macro and micro hypotheses has been formulated as under.

Macro Hypotheses

The macro hypotheses are placed in Table 1.

H0: Independent variables are **not** predictor of EPM effectiveness.

H1: Independent variables are predictor of EPM effectiveness.

Table 1: The Macro Hypotheses for Research

Macro Independent Variables	Hypotheses	Hypotheses Code
Strategic Flexibility (SF)	Strategic flexibility positively influences the EPM effectiveness	H_{SF}
Information System Flexibility (IF)	Information system flexibility positively influences the EPM effectiveness	H_{IF}

Micro Hypotheses

H0FiEj (i=1,…,19, j=1,…,6): ith type of factor does **not** influences jth type of EPM effectiveness

HFiEj (i=1,…,19, j=1,…,6): ith type of factor influences jth type of EPM effectiveness.

The micro hypothesis $\mathbf{H_{SF1SA}}$ means that the government policy and control positively influences the EPMS strategic alignment. Similarly other micro hypotheses have been formulated.

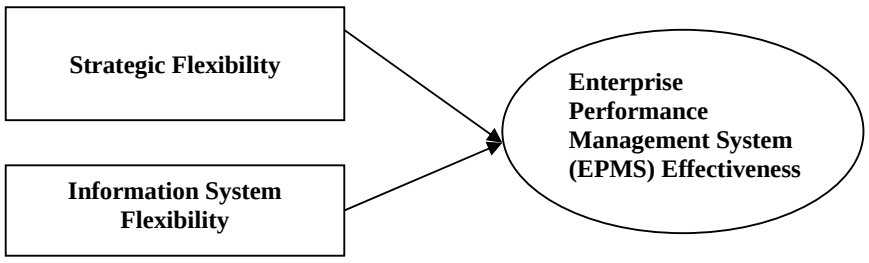

Figure 1: Conceptual Model for EPMS Effectiveness

Empirical study based on survey method has been carries out to establish the relationship between EPM effectiveness and flexibility variables, both at macro and micro levels. Questionnaire has been designed using 6-point likert scale (1 for strongly disagree to 6 for strongly agree) to test the impact of strategic flexibility and IS flexibility on EPMS effectiveness along six dimensions viz. strategic alignment, strategic monitoring, and four perspectives i.e. financial, customer, internal business process, and learning and growth.

The questionnaire has been pilot tested and validated for consistency and reliability. Primary data was collected through questionnaire based survey. After repeated follow-ups, 139 responses from ten companies (six government owned public sectors and four private owned) were received out of 500 questionnaire mailed and emailed to executives in 15 upstream oil and gas companies in India. Univariate and multivariate analysis were carried out using SPSS package. Descriptive statistics of independent/dependent macro and micro variables are exhibited in Tables 2, 3, and 4.

Table 2: Descriptive Statistics for Independent/Dependent Macro Variables

N=139 *(6-Point Likert's scale)*

S. No.	Independent/ Dependent Macro Variables	Description	Mean	Median	Std. Dev.
1	SF	Strategic flexibility	4.47	4.58	0.79
2	IF	Information system flexibility	4.27	4.29	0.92
3	EFF	EPMS effectiveness	4.06	4.24	0.90

It is evident from the Table 2 that mean and median are close to normal distribution and the means values are greater than 4.0. Hence it can be said that organizations are giving greater emphasis on strategic flexibility, IS flexibility and EPM effectiveness.

Table 3: Descriptive Statistics for Independent Micro Variables

N=139 *(6-Point Likert's scale)*

S. No	Independent Micro Variables	Description	Mean	Median	Std. Dev.
1	**SF01**	Government policies and control	4.39	4.50	0.98
2	**SF02**	Organizational infrastructure	4.45	5.00	1.25
3	**SF03**	Technological capability	4.40	5.00	1.06
4	**SF04**	Skilled manpower	4.69	5.00	1.03
5	**SF05**	Global opportunity	4.77	5.00	1.03
6	**SF06**	Global competition	4.60	5.00	1.05
7	**SF07**	Core competence	4.67	5.00	0.94

8	**SF08**	Diversification opportunity	4.63	5.00	1.00
9	**SF09**	Competitive strategy	4.55	5.00	1.07
10	**SF10**	e-business	4.57	5.00	1.02
11	**SF11**	Merger and acquisition	4.18	4.00	1.20
12	**SF12**	Market forces	4.25	5.00	1.28
13	**IF01**	EPMS computerization	4.63	5.00	1.09
14	**IF02**	EPMS functionality	4.08	4.00	1.23
15	**IF03**	Flexibility to access EPM system	4.40	5.00	1.09
16	**IF04**	Processing capability	4.25	4.00	1.06
17	**IF05**	Flexibility to change software system	4.10	4.00	1.08
18	**IF06**	Minimal investment for change	4.27	4.00	1.01
19	**IF07**	Flexibility of IT personnel	4.37	5.00	1.12

From the Table 3, it can be seen that mean and median values are close and hence it is close to normal distribution. All the 12 strategic flexibility and 7 information system flexibility micro variables are having mean score greater than 4.0 and standard deviation around 1.0, which gives enough confidence in mean values.

Table 4: Descriptive Statistics of Dependent Micro Variables of EPM Effectiveness

N=139 *(6-Point Likert's scale)*

S. No	EPM Effectiveness Dependent Micro Variables	Description of Dependent Micro Variables of EPM Effectiveness	Mean	Std. Dev.
1	**SA**	Strategic alignment	3.98	1.08
2	**SM**	Strategic monitoring	4.03	1.08
3	**FP**	Financial perspective	4.33	1.03
4	**CP**	Customer perspective	4.40	0.99
5	**BP**	Internal business process perspective	4.00	0.95
6	**LP**	Learning and growth perspective	4.09	0.88

All the 6 dependent micro variables of EPMS effectiveness have mean score of > 4.0 and standard deviation around 1.0, which gives enough confidence in mean value as indicative data (Table 4).

Results and Discussion

Bivariate and multivariate analysis has been carried out to test the hypotheses and validate proposed EPMS model as given in Figure 1.

Correlation analysis

Pearson's correlation analysis has been carried out to measure the relationship between independent macro/micro and dependent macro/micro variables. The results of correlation

analysis for macro and micro variables are exhibited in Table 5 and Appendix I respectively. Macro as well as micro variables are exhibiting strong correlations.

Table 5: Correlation Analysis between Independent and Dependent Macro Variables

	SF	IF	EFF
SF	1	0.674	0.719
IF	0.674	1	0.782
EFF	0.719	0.782	1

Note: All Correlations are significant at the 0.01 level (2-tailed).

Regression analysis

Regression analysis for dependable macro variable (EPM effectiveness), has been carried out and the result is shown in Table 6. The values of R^2 is more than 0.65 i.e. 65 per cent variation in EFF is explained by independent variables. Strategic flexibility and IS flexibility are major predictor of EPM effectiveness at macro level.

Table 6: Regression Summary at Macro Level

EPMS Dependent Macro Variables	**R^2**	**Std Error**	**F**	**Sig. of F**	**EPMS Const/ Indep. Variables (Predictors)**	**B**	**T**	**Sig. of T**
EFF	0.679	0.516	144.06	0.000	Const	-0.037	-0.143	0.886
					IF	0.539	8.300	0.000
					SF	0.403	5.334	0.000

To analysis deeper, stepwise regression analysis at micro level has been carried out for each dependent micro variable and the results are summarised in Table 7.

Table 7: Regression Summary at Micro Level

EPMS Dependent Micro Variables	**R^2**	**Std Error**	**F**	**Sig. of F**	**EPMS Const/ Indep. Variables (Predictors)**	**B**	**T**	**Sig. of T**
SA	0.652	0.651	76.05	0.000	Const	0.219	0.808	0.421
					IF2	0.409	6.917	0.000
					SF12	0.247	4.091	0.000
					SF9	0.215	3.167	0.002
SM	0.743	0.549	69.43	0.000	Const	0.165	0.536	0.593
					IF2	0.491	7.894	0.000
					SF12	0.174	3.537	0.001

					IF3	0.196	3.105	0.002
					SF5	0.172	3.169	0.002
					IF6	-0.134	-2.296	0.023
FP	0.613	0.698	31.38	0.000	Const	0.555	1.316	0.191
					IF5	0.619	6.741	0.000
					SF6	0.477	5.329	0.000
					IF6	-0.358	-4.326	0.000
					IF1	0.274	3.642	0.000
					SF5	-0.304	-3.239	0.002
					SF1	0.159	2.178	0.031
CP	0.422	0.824	44.92	0.000	Const	1.071	2.965	0.004
					SF12	0.337	5.432	0.000
					IF1	0.391	5.116	0.000
BP	0.674	0.539	84.06	0.000	Const	0.686	2.855	0.005
					IF2	0.258	4.335	0.000
					SF12	0.326	7.124	0.000
					IF3	0.191	3.125	0.002
LP	0.609	0.553	63.30	0.000	Const	0.808	3.293	0.001
					IF5	0.264	3.894	0.000
					IF1	0.314	5.335	0.000
					SF12	0.164	3.349	0.001

As evident from Table 7, regression analysis at micro level, coefficient of determination (R^2) is above 0.60 except in case of customer perspective i.e. more than 6o per cent of variation in micro variables of EPMS effectiveness is explained by the independent micro variables of strategic flexibility and IS flexibility. All the 6 models are overall good at confidence limit > 99 per cent as significance of $F < 0.01$. All the independent variables are significant in the models at confidence level of 99 per cent as the result of t-test for the model indicate significance of $T < 0.01$.

Interpretation and Conclusion

The effect of strategic flexibility and information system flexibility on the effectiveness of enterprise performance management system has been examined in the study. The major factors related to strategic flexibility and information system flexibility affecting EPMS effectiveness in driving performance improvements and competitiveness have been identifies in the study of the Indian upstream oil organizations. The hypothesis has been proved i.e. the strategic flexibility and information system flexibility factors positively influence the

effectiveness of enterprise performance management and they are in-line with findings of earlier researchers.

The identified micro factors, in order of importance, are: market forces, EPMS functionality, EPMS computerization, global opportunities, flexibility to access, flexibility to change system, minimal investment for change system, government policies and control, global competition, and competitive strategy. Based on the results of hypotheses testing, following interpretations and conclusions are being made:

1. Enterprise performance management is strongly correlated with strategic flexibility and IS flexibility, both at macro and micro level. Micro variables of strategic flexibility and IS flexibility are also strongly correlated among themselves.
2. Strategic flexibility and IS flexibility influences positively the effectiveness of enterprise performance management.
3. Predictors of EPM strategic alignment are EPMS functionality, market forces, and competitive strategy.
4. EPMS functionality, market forces, flexibility to access system, and global opportunity will increase strategic monitoring. Investment required to change system affects strategic monitoring negatively i.e. if investment is not made for change of system software, it will not be able to monitor strategically.
5. Financial perspective is influenced by flexibility to change system, global competition, EPMS computerization, and government policy and control. To change system and global opportunity will require additional investment and hence influencing financial perspective negatively.
6. Marker forces and EPMS functionality affects customer perspective.
7. Internal business process perspective is affected by EPMS functionality, market forces, and flexibility to access system.
8. Flexibility to change system, EPMS computerization, and market forces are major predictor of learning and growth perspective.

Limitations of the study and suggestions for further works

The study is limited to middle and senior management of Indian upstream oil companies and operational managers has not been covered. Further research on effect of other flexibilities such as organizational, operational, technological, functional, and HR flexibilities on effectiveness of EPMS may be carried out. To enhance the utility of the study, the research

may also be extended to cover operational level managers and to cover other sectors of industry.

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Annexure I
Correlation between Independent and Dependent Micro Variables of EPM Effectiveness

	SA	SM	FP	CP	BP	LP
SF01	0.361	0.390	0.432	0.417	0.452	0.392
SF02	0.562	0.533	0.349	0.277	0.527	0.432
SF03	0.338	0.345	0.399	0.220	0.434	0.448
SF04	0.441	0.513	0.409	0.374	0.528	0.497
SF05	0.470	0.540	0.411	0.243	0.475	0.442
SF06	0.426	0.452	0.489	0.223	0.466	0.344
SF07	0.471	0.481	0.371	0.251	0.503	0.385
SF08	0.509	0.546	0.399	0.283	0.564	0.501
SF09	0.566	0.546	0.440	0.319	0.536	0.493
SF10	0.443	0.431	0.288	0.281	0.376	0.430
SF11	0.500	0.488	0.488	0.449	0.428	0.493
SF12	0.655	0.611	0.529	0.493	0.688	0.570
IF01	0.620	0.672	0.606	0.469	0.611	0.670
IF02	0.733	0.824	0.615	0.456	0.721	0.653
IF03	0.537	0.614	0.507	0.445	0.574	0.544
IF04	0.592	0.628	0.556	0.532	0.606	0.617
IF05	0.672	0.707	0.658	0.450	0.662	0.676
IF06	0.392	0.413	0.306	0.249	0.457	0.439
IF07	0.376	0.400	0.397	0.385	0.468	0.439

Note: All Correlations are significant at the 0.01 level (2-tailed).