A Study to Identify Further Up-Gradation of Information Technology (IT) to Support the Procurement Process

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ABSTRACT

Electronic procurement (EProcuremrnt) was touted as revolutionizing the supply chain and offering organizations a vast number of advantages. Such hype has caused business to focus on the supply function to a greater extent than in the past. The savings promised were too good not to consider and many organizations needed to make these savings to stay competitive.The purpose of the research is to study the further up gradation of Information Technology (IT) to support the procurement process and to identify the significant difference of further up gradation of Information Technology (IT) to support the procurement process across industry, Size and Ownership of the firm. The current study is a descriptive study, for which, primary data were collected through structured questionnaire with the help of personal survey method. The sampling unit is an Executive and/or a Manager concerned with Procurement activities of an organisation. The sampling technique adopted for the survey is non-probability convenience sampling technique. In this study, researchers used SPSS 20 to analyze the data and using nonparametric statistics. There is a significant difference of further up gradation of Information Technology (IT) to support the procurement process across industry, Size and Ownership of the firm.

Keywords : Information Technology (IT), E-procurement, Marketplace, EDI, Web-EDI

E-PROCUREMENT

E procurement is an automation tool for corporate purchasing process. The core definition is a business to business sale using the internet as the medium for order processing. E procurement is more than the simple shortening of the supply chain with the Internet closing time and distance obstacles between suppliers and users of products. Instead, it is a comprehensive integrated IT network that encourages purchasing discipline and leverages group buying power for all procurement responsible people in an organization.

THE HISTORY

The origin of e-procurement began in the 1980s, with the development of electronic data interchange (EDI). EDI allowed customers and suppliers to send and receive orders (and invoices as well) using call-forwarding networks. In the 1990s, technology, as it tends to do, improved and software companies began to develop electronic catalogues, specifically for the vendor's use and, e-procurement software has become a mixture of the two: a platform for sending and receiving orders and various catalogues. Marketplaces have also proved to be a popular addition to e-procurement software".

SOURCING E-PROCUREMENT SERVICES

Sourcing e-procurement services require proper planning a clearly defined strategy.

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However, e-Procurement is more than just a system for making purchases online. A true e-procurement system can connect companies and their business processes directly with suppliers, managing all interactions between them. This traditionally includes the management of bids, supplier correspondence, pricing history and an electronic communication system. Outsource companies provide services covering the design of the strategy through to implementation, hosting and maintenance of the on-going operations. The selection of the right service for a company's requirements is the key to success. Some e-procurement service providers only provide e-sourcing services, others may only provide the hosting services and some specialize by industry.E-sourcing is the process from identifying suitable vendors, to obtaining competitive terms and managing the on-going supply relationship.

E-PROCUREMENT TOOL

E procurement systems consist of a number of different tools. These include automation of internal ordering processes, online catalogues from approved vendors, and an electronic Request for Proposal (e-RFP) process that leverages online auctions (e-auctions) to accumulate bids on providing goods and services for a specific project.The choice of which document to use: RFI RFP RFQ and for which type of sourcing project depends on the desired outcome,i.e., whether it is information, or a firm proposal or a detailed price bid that is needed.A Request for Information (RFI) is a method of collating information from different suppliers prior to formally sourcing products or services. It is normally used when there are many potential suppliers and not enough information is known about them. It is a structured process where a long list of potential suppliers can be reduced to a short list of those organizations that are willing and able to fulfil your requirements.A Request for Proposal (RFP) is a formal method of receiving detailed and comparable proposals from different suppliers for a defined product or service. It is a comprehensive document that

should provide all the required information needed to make an informed purchasing decision. A Request for Quotation (RFQ) is a competitive bid document used when inviting suppliers and subcontractors to submit a bid on projects or products. A RFQ is suitable for sourcing products that are standardized or produced in repetitive quantities. A technical specification must be provided as well as commercial requirements. Sometimes a RFQ can be preceded by a RFP where the shortlisted suppliers are requested to provide a more detailed price quote.The RFI, the RFP and the RFQ are all tools that can be used separately or in combination to achieve a successful sourcing solution.

Research Objective

The objective of the research is :
1. To study the scopefor further up gradation of Information Technology (IT) to support the procurement process.
2. To asses if the process of further up gradation of Information Technology (IT) to support the procurement is significantly different across industry, Size and Ownership of the firm.

RESEARCH METHODOLOGY

The current study is a descriptive research with an objective to study the document exchanged in e-Procurement through EDI.For this, primary data were collected through structured questionnaire using personal survey method. The sampling unit is an Executive and a Manager engaged in E-procurement activities of an organisation. The sampling technique adopted for the survey is non-probability convenience sampling technique. Sample size of 49 companies from the entire Gujarat which includes South Zone, North Zone, Central Gujarat and Saurashtra region has been selected for this study.

Data Analysis and Findings

1.Kruskal-Wallis test is used for data analysis with an objective to understand if the process of further up gradation of Information Technology (IT) to support the procurement process is

significantly different across industry, Size and Ownership of the firm.

Ho : There is no significant effect of Industry on further up gradation of Information Technology (IT) to support the procurement process.

Technology (IT) to support the procurement process.

H1: There is a significant effect of Industry on further up gradation of Information

Technology (IT) to support the procurement process.

Table 1: The statistics			
Procurement process	Chi-Square	df	Asymp. Sig.
Optimizing the Analysis of expenditure	10.758	7	0.15
Supplier assessment	16.889	7	0.018
Contract management	10.468	7	0.164
Development and review of procurement strategy	12.26	7	0.092
Negotiation (invitations to tender, auctions)	3.72	7	0.811
Supplier identification	8.142	7	0.32
Order processing of direct goods	5.819	7	0.561
Automated invoice entry processing	5.756	7	0.569
Order processing of indirect goods	12.527	7	0.085
Order processing of services	7.648	7	0.365
Cooperative disposition / planning with suppliers	3.913	7	0.79
Order processing of investment goods	17.649	7	0.014
Electronic interchange of business documents (EDI)	6.07	7	0.532
Cooperative product development with suppliers	6.14	7	0.523

Table 1 show the p-value of the procurement processfor further up gradation of Information Technology (IT)across Industry. The p-value of "Supplier assessment" process is 0.018 and "Order processing of investment goods"is 0.014 which are less than 0.05, Hence for these Procurement Processes the null hypothesis is rejected. Thus, for these two processes, we may infer that there is significant effect of technology upgradation across the industry.

For other procurement processes shown in Table 1 above, we fail to reject the null hypothesis and may, therefore, infer that further probe is needed to assess if these process are significantly affected by further up gradation of information technology across the industry.

Table 2 shows the mean rank of various industries. From the mean rank; we can say thatTextileCompany (Mean Rank – 41) has maximumpositive effect of further up gradation of Information Technology (IT) as for the supplier assessment.Similarly, as for the order processing of investment goods, Chemical & Petroleum Company (Mean rank - 34.86)has the maximumpositive effect offurther up gradation of Information Technology (IT).

Table2: Ranks

	Industry Based on Product	N	Mean Rank
Optimizing the Analysis of expenditure	Chemical & Petroleum	14	31.36
	Automotive	3	24.83
	Pharmaceutical	3	12.5
	Information Technology	6	18.5
	Textile	4	34
	Engineering & Machine Tools	9	24.22

	Fertilizer	2	24.5
	Others	8	20
	Total	49	
Supplier assessment	Chemical & Petroleum	14	26.07
	Automotive	3	32.67
	Pharmaceutical	3	32.67
	Information Technology	6	14.5
	Textile	4	41
	Engineering & Machine Tools	9	23.33
	Fertilizer	2	26
	Others	8	18.88
	Total	49	
Contract management	Chemical & Petroleum	14	33.93
	Automotive	3	23.33
	Pharmaceutical	3	23.33
	Information Technology	6	16.33
	Textile	4	24.38
	Engineering & Machine Tools	9	21.5
	Fertilizer	2	20.25
	Others	8	22.56
	Total	49	
Development and review of procurement strategy	Chemical & Petroleum	14	35.25
	Automotive	3	19.67
	Pharmaceutical	3	24.5
	Information Technology	6	20.25
	Textile	4	17.75
	Engineering & Machine Tools	9	18.89
	Fertilizer	2	25.5
	Others	8	23.19
	Total	49	
Negotiation (invitations to tender, auctions)	Chemical & Petroleum	14	20.32
	Automotive	3	27.67
	Pharmaceutical	3	32.83
	Information Technology	6	27.58
	Textile	4	27.63
	Engineering & Machine Tools	9	24.78
	Fertilizer	2	19.75
	Others	8	27.56
	Total	49	
Supplier identification	Chemical & Petroleum	14	27.07
	Automotive	3	22.83
	Pharmaceutical	3	35
	Information Technology	6	22.83
	Textile	4	28.63
	Engineering & Machine Tools	9	16.22

	Fertilizer	2	19.5
	Others	8	29.5
	Total	49	
Order processing of direct goods	Chemical & Petroleum	14	23.86
	Automotive	3	33.5
	Pharmaceutical	3	27
	Information Technology	6	27.5
	Textile	4	32
	Engineering & Machine Tools	9	17.89
	Fertilizer	2	27.5
	Others	8	25.06
	Total	49	
Automated invoice entry processing	Chemical & Petroleum	14	26.18
	Automotive	3	27
	Pharmaceutical	3	11.5
	Information Technology	6	32.08
	Textile	4	26.75
	Engineering & Machine Tools	9	25.83
	Fertilizer	2	19.5
	Others	8	21.5
	Total	49	
Order processing of indirect goods	Chemical & Petroleum	14	26.07
	Automotive	3	30.83
	Pharmaceutical	3	29.33
	Information Technology	6	12.75
	Textile	4	37.88
	Engineering & Machine Tools	9	20.61
	Fertilizer	2	32.75
	Others	8	25.06
	Total	49	
Order processing of services	Chemical & Petroleum	14	30.43
	Automotive	3	23
	Pharmaceutical	3	23
	Information Technology	6	19.5
	Textile	4	33.5
	Engineering & Machine Tools	9	21
	Fertilizer	2	11.75
	Others	8	24.69
	Total	49	
Cooperative disposition / planning with suppliers	Chemical & Petroleum	14	27.93
	Automotive	3	28.5
	Pharmaceutical	3	28.5
	Information Technology	6	19.42
	Textile	4	23.38
	Engineering & Machine Tools	9	20.94

	Fertilizer	2	28.5
	Others	8	25.94
	Total	49	
Order processing of investment goods	Chemical & Petroleum	14	34.86
	Automotive	3	31
	Pharmaceutical	3	30
	Information Technology	6	14.5
	Textile	4	26.5
	Engineering & Machine Tools	9	19.67
	Fertilizer	2	8.5
	Others	8	20.88
	Total	49	
Electronic interchange of business documents (EDI)	Chemical & Petroleum	14	28.21
	Automotive	3	27
	Pharmaceutical	3	27
	Information Technology	6	20.67
	Textile	4	27
	Engineering & Machine Tools	9	16.56
	Fertilizer	2	27
	Others	8	29.13
	Total	49	
Cooperative product development with suppliers	Chemical & Petroleum	14	26.46
	Automotive	3	19.33
	Pharmaceutical	3	23.67
	Information Technology	6	23.67
	Textile	4	24.5
	Engineering & Machine Tools	9	19.89
	Fertilizer	2	43
	Others	8	27.56
	Total	49	

Likewise,KruskalWallis testis performedto understand ifthe effect of further up gradation of Information Technology (IT) to support the procurement process is significantly differentacross Size and Ownership of the firm.

Table 3 shows the result of the test.

Ho: There is no significant effect of Size and Ownership of the firmon further up gradation of Information Technology (IT) to support the procurement process.

H1: There is a significant effect of Size and Ownership of the firmon further up gradation of Information Technology (IT) to support the procurement process.

Table 3: Significant effect of Size and Ownership of the firmon further up gradation of Information Technology (IT) to support the procurement process.

Statement	Size (Investment)	Ownership	Interpretation
Optimising the Analysis of expenditure	$P = 0.005$ Ho - rejected		Large scale firm has provided more importance to Optimising the Analysis of expenditure for further up gradation of IT
Supplier assessment	$P = 0.014$ Ho - rejected	$P = 0.048$ Ho - rejected	Joint Sector and large scale firm has provided more importance to Supplier assessment for further up gradation of IT

Table 3 shows the p-value of the procurement process for further up gradation of Information Technology (IT) across Size and Ownership of the firm, which is less than 0.05, Hence for these statements, the null hypothesis is rejected. So, for these two procurement processes, there is significant effect of Size and Ownership of the firmon further up gradation of Information Technology (IT) to support the procurement process.

From the mean rank, interpretations arealso given in the last column of above Table for the respective procurement process for which null hypothesis rejected.

2. For the present study factor analysis is performed on the 14 procurement process for which data were obtained to understand the effect offurther up gradation of Information Technology (IT). These statements were measured on a continuum ranging from one to five (1 –Not Important at all to 5 –Most Important).

Bartlett's Test of Sphericity : As shown in the Table 4, the significant value of Bartlett's Test is 0.000, this leads to rejection of the idea that the correlation matrix is identity matrix.

Kaiser-Meyer-Olkin Test for Sampling Adequacy: The data has KMO statistic as 0.824 (Table 4), which is greater than 0.5. Hence, this value is acceptable and justifies the appropriateness of factor analysis.

Table 4 : KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.824
Bartlett's Test of Sphericity	Approx. Chi-Square	467.268
	df	91
	Sig.	.000

Communalities

Communality is the amount of variance a variable can explain with all the factor being considered. This is also the percentage of variance explained by the common factors. The method selected for factor analysis is Principle Component Analysis. In this method, the total variance in the data is considered. The initial communalities for Principle Component Analysis are 1. However, the primary concern is the

extracted communalities, which are achieved after extraction of factors. The communalities are shown in Table 5; table shows that the extracted communalities are high, and hence, acceptable for all the procurement process. However, there is one procurement process for which the extracted communality is low, and that procurement process is:

Cooperative product development with suppliers

Despite the fact that communality on the above statement is low, this low communality is at a level that can be ignored.

Table 5: Communalities

	Initial	Extraction
Optimising the Analysis of expenditure	1.000	.789
Supplier assessment	1.000	.728
Contract management	1.000	.805
Development and review of procurement strategy	1.000	.745
Negotiation (invitations to tender, auctions)	1.000	.699
Supplier identification	1.000	.752
Order processing of direct goods	1.000	.767
Automated invoice entry processing	1.000	.783
Order processing of indirect goods	1.000	.683
Order processing of services	1.000	.574
Cooperative disposition / planning with suppliers	1.000	.683
Order processing of investment goods	1.000	.679
Electronic interchange of business documents (EDI)	1.000	.681
Cooperative product development with suppliers	1.000	.518

Extraction Method: Principal Component Analysis.

Variance explained

Table 6 shows the Eigen values of all the components that can be extracted and cumulative variance. However, it is required that the maximum amount of variance should be explained in minimum number of components – for this reason extraction of the components is required. Only those factors are extracted for which the Eigen values are greater than one. These factors are three in number and together contribute 70.611% of total variance. This is a fair percentage of variance to be explained and assumes of the appropriateness of the factor analysis. Thus extracting three factors from a total of 14 statements of Procurement process is good by all means.

Table 6: Total Variance Explained

Comp-onent	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumul-ative %	Total	% of Variance	Cumul-ative %	Total	% of Variance	Cumul-ative %
1	6.901	49.291	49.291	6.901	49.291	49.291	4.119	29.418	29.418
2	1.910	13.642	62.933	1.910	13.642	62.933	3.282	23.441	52.859
3	1.075	7.678	70.611	1.075	7.678	70.611	2.485	17.752	70.611
4	.942	6.726	77.337						
5	.626	4.469	81.806						
6	.571	4.080	85.887						
7	.540	3.860	89.746						
8	.421	3.006	92.753						
9	.277	1.977	94.729						
10	.211	1.507	96.236						
11	.171	1.221	97.458						
12	.152	1.083	98.541						
13	.116	.832	99.372						
14	.088	.628	100.000						

Extraction Method: Principal Component Analysis.

Further, Table 6 shows the extraction sum of square loadings for the scale ofprocurement process. However, a careful look at table 6 shows that 70.611% variance is not uniformly distributed across all components where only the first component accounts for 49.291% of variance. Thus in order for the variance to be uniformly distributed across all the components a rotation of the components matrix is required. Components matrix is the loadings of various variables to the extracted components.

The variance explained by each component after the rotation method is shown in Table 6. It is evident from this table that the variance is now evenly distributed in a range of 29.418% – 17.512%, which was 49.291% - 7.678% before rotation.

Rotated Factor Matrix: An analysis of factor loadings in the rotated factor matrix helps in interpreting and naming the three factors that have been extracted in the earlier section. Interpretation is done by identifying the statements that have very high loadings on the same component. These factors can then be interpreted in terms of the statements having

high factor loading.Table 7 shows the Rotated Component Matrix.

Under Varimax rotation, 7 out of 13 statements have factor loadings e"0.550 in case of Factor 1. This reveals that 53.84 % of the statements are clubbed into Factor 1. In the similar way 4 out of 13 statements have factor loading e"0.550 in case of Factor 2. This reveals that 30.77% of the statements are clubbed into Factor 2. 2 out of 13 statements have factor loading e"0.550 in case of Factor 3.This reveals that 15.38% of the statements are clubbed into Factor 3.

Table 7: Rotated Component Matrix

	Component		
	1	2	3
Optimising the Analysis of expenditure	.426	.778	.048
Supplier assessment	.612	.459	.378
Contract management	.877	.106	.157
Development and review of procurement strategy	.728	.017	.463
Negotiation (invitations to tender, auctions)	.128	-.192	.804
Supplier identification	.389	.149	.760
Order processing of direct goods	.173	.776	.367
Automated invoice entry processing	.067	.883	-.004
Order processing of indirect goods	.628	.501	.194
Order processing of services	.438	.608	-.114
Cooperative disposition / planning with suppliers	.670	.268	.402
Order processing of investment goods	.762	.314	.023
Electronic interchange of business documents (EDI)	.656	.307	.396

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Table 8: Component Transformation Matrix

Component	1	2	3
1	.720	.548	.426
2	.178	-.739	.650
3	-.671	.392	.629

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Naming of the Factors

Table 9: Rotated Component Matrix

	Component		
	1	2	3
Contract management	.877		
Order processing of investment goods	.762		
Development and review of procurement strategy	.728		
Cooperative disposition / planning with suppliers	.670		
Electronic interchange of business documents (EDI)	.656		
Order processing of indirect goods	.628		
Supplier assessment processing	.612		
Automated invoice entry		.883	
Optimising the Analysis of expenditure		.778	
Order processing of direct goods		.776	
Order processing of services		.608	
Negotiation (invitations to tender, auctions)			.804
Supplier identification			.760

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Table 9 indicates the grouping of statements under each factor as per factor loadings. The

names given to the three factors are as under: Supplier empanelment, Contract document Management system and Auction platforms.

Supplier empanelment:The first factor consists of seven variables of further up gradation of Information Technology (IT) to support Procurement Process which Includes: Contract management, Order processing of investment goods, Development and review of procurement strategy, Cooperative disposition / planning with suppliers, Electronic interchange of business documents (EDI), Order processing of indirect goods and Supplier assessment.

Contract document Management system:The second factor consists of four variables of further up gradation of Information Technology (IT) to support Procurement Process which Includes: Automated invoice entry processing, optimising the Analysis of expenditure, Order processing of direct goods and Order processing of services.

Auction platforms:The third factor consists of two variables of further up gradation of Information Technology (IT) to support Procurement Process which Includes:Negotiation (invitations to tender, auctions) and Supplier identification.

MAJOR FINDINGS

Multi National Companies (MNCs) are in favour of starting and expanding their businesses in India owing to its high economic growth and favourable business environment. In India, Manufacturing sector's contribution in India's GDP is very high. In such a situation, western corporate are eying on those Indian Manufacturing firms that have either adopted e-procurement practices or in the process of adoption of e-procurement.

Majority of the respondents have considered the importance of further up gradation of Information Technology to support *'Optimising the Analysis of expenditure'*, *'Supplier assessment'*, *'Contract Management'*, *'Development and review of procurement strategy'*, *'Order processing of indirect goods'*, *'Cooperative product development with suppliers'* and *'Electronic interchange of business documents (EDI)'*.

Study found the significance of difference in further up gradation of IT to support the procurement process across the Size of the firm and Ownership of the firm.

THE FINDINGS ARE GIVEN

Textile Company has positive effect on *'Supplier assessment'* procurement process for further up gradation of Information Technology (IT). Chemical & Petroleum Company has positive effect on *'Order processing of investment goods'* for further up gradation of Information Technology (IT).

In Large Scale Companies based on investment, the most important further up gradation of Information Technology to Support procurement process have been found as *'Optimizing the Analysis of expenditure'*.

In Joint Sector Companies, the most important further up-gradation of Information Technology to Support has been found as *'Supplier assessment'*.

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