

E-COMMERCE IMPLEMENTATION IN INDIA: A STUDY OF SELECTED ORGANIZATIONS

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Electronic commerce is a vital part of India's trade facilitation policy. Following major initiatives in liberalization in 1991 the need to facilitate international trade through policy and procedural reforms has become the cornerstone of trade and fiscal policies. Electronic commerce, including electronic data interchange (EDI), has been implemented in various organizations in India, in particular those that are closely involved in international trade. It is known that the level of electronic commerce development in the organizations has been either facilitated or inhibited by various factors. In order to identify these factors an empirical study comprising a questionnaire combined with case studies and in-depth interviews in selected organizations was carried out. The results indicate that factors primarily intrinsic to the organizations and organization-driven strategies have been more significant causal factors than either network-driven strategies or factors extrinsic to the organizations in the implementation of e-commerce in India.

Electronic commerce is today a vital part of India's trade facilitation policy. Since 1991, after India took major initiatives in liberalization and opening of the economy with a view to integrate itself with the global economy, the need to facilitate international trade both through policy and procedure reforms has become the cornerstone of India's trade and fiscal policies. As of early 2003, there are some 18 million internet users and about 500 licensed ISPs in the country while the e-commerce market size according to the IDC report is estimated to be \$ 1.750 billion, including both business to business (B2B) and business to consumer (B2C) modes.

The era of electronic data interchange (EDI) was ushered in with the setting up of the EDI Council in the Ministry of Commerce in 1994, the organization

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responsible for facilitating international trade. The EDI Council has promoted the introduction of EDI and e-commerce in the trade processes of various vital trading partners responsible for the regulation and facilitation of international trade. These organizations include the Indian Customs and Central Excise, ports and airports authorities, shipping lines, airlines, facilitating bodies such as the Directorate General of Foreign Trade (DGFT), Agriculture and Processed Food Export Development Authority (APEDA) and Apparel Export Promotion Council (AEPC). The Council has promoted the use of EDIFACT standards and triggered re-engineering efforts in vital trading partners. Significant efforts have been made by various trading partners to become EDI and e-commerce capable. Results are visible in organizations that have attained a degree of maturity in conducting e-commerce transactions. In the EDI system of Indian Customs and Central Excise, more than 95 per cent of import-export transactions are through the EDI/e-commerce mode. The disbursement of duty drawback is automated and the refund mechanism is almost paperless wherein the beneficiaries of the refunds get the credit in a designated bank automatically whenever exports are made. In the web enabled system of DGFT, 65 per cent of the transactions by way of application filing for various schemes by the trading community is on the e-commerce mode. Almost 800 applications per day are made on the e-commerce mode to DGFT. This has led to a significant reduction in processing time from the earlier 30-45 days to between 6 and 24 hours. Significant benefits in terms of reduction in transactions cost for the exporter/importer are witnessed not only on account of reduction in paper cost but also in a reduced number of visits to the organization. The integration of the digital signatures in the EDI/e-commerce projects in these agencies would lead to further strengthening and development of the e-commerce network.

As e-commerce usage grew in the country, its reach and penetration called for the development of appropriate infrastructure and providing a legal framework for secure e-commerce. The ISP policy of 1998 and the IT Act, 2000 have catalysed the development of infrastructure in terms of reach and security in the country.

I. METHODOLOGY

In order to identify the various issues and practices in e-commerce implementation, pilot case studies were done by interacting with key agencies, viz. EDI Council of India and Directorate General of Foreign Trade (DGFT), and based on the issues emanating from these pilot case studies and the issues identified from the relevant literature, a questionnaire was designed in order to capture the various key determinants for e-commerce growth in India. The questionnaire was validated for face, criterion and content validity. This validation was done by feedback from academicians, practitioners and implementers in key government organizations that are important partners in the e-commerce network and was administered on a sample

Table 1. Respondents response pattern

<i>Sl. No.</i>	<i>Entity</i>	<i>No. of respondents</i>	<i>Responses received</i>
1.	Business organizations (trading/manufacturing)	150	74
2.	Value added networks (VAN) operators, system integrators and service providers	20	11
3.	Government entities/organizations	10	6
4.	Consultancy firms/academic institution/trade bodies	20	12
5.	Total	200	103

size of 200 organizations out of which 103 responded as given in table 1. A purposive stratified organization sample was considered.

Research issues and analysis

The following five broad research issues were analysed on the basis of the responses received. The research questions were framed on the basis of the issues which emanated out of the pilot case studies conducted and the literature review on the subject. The analysis has been done using SPSS statistical package.

Factors affecting e-commerce implementation

Facilitators for e-commerce implementation

In order to analyse the key facilitators, 12 identified facilitators from the pilot case studies and the literature review were used and empirically tested on a 7 point scale. The score 0 indicates 'does not facilitate', 1 indicates 'weakly facilitates', 2 indicates 'moderately facilitates', 3 indicates 'significantly facilitates', 4 indicates 'facilitates', 5 indicates 'strongly facilitates' and 6 indicates 'greatly facilitates'. The response is indicated in table 2.

The results revealed that the mean facilitation scores of all the facilitators indicate that these either 'facilitate' or 'significantly facilitate' e-commerce development. None of the facilitators strongly or greatly facilitate e-commerce development. The CEO's role, readiness of key government organizations and cost saving emerge as the top order facilitators with rankings as 1, 2 and 3 as indicated in table 2.

In order to identify the clusters of facilitators, factor analysis using Principal Component analysis was carried out. Three facilitators with Eigen values of more than 1.0 and collectively accounting for 62.2 per cent of variance were retained after Varimax rotation. The rotated factors loading on three factors is given in table 3.

Table 2. Facilitators for e-commerce implementation

<i>Variable name</i>	<i>Facilitator</i>	<i>Mean facilitation score (*)</i>	<i>Rank</i>
F1	Acceptance of electronic transactions under law	4.22	5
F2	Cost savings under electronic mode over paper mode of transactions	4.40	3
F3	Fiscal incentives for electronic commerce transactions	3.76	9
F4	Involvement of Chief Executive Officer	4.86	1
F5	Pressure and insistence for EC/EDI mode by foreign buyers	3.83	8
F6	Insistence for EC/EDI mode by other partners of value chain (viz. vendors/suppliers) within country	3.73	10
F7	Penetration of internet usage	4.20	6
F8	Proactive role by industry associations	3.29	12
F9	Reengineering of business processes	4.25	4
F10	Readiness of concerned government agencies	4.42	2
F11	Strategic advantages including enhanced business opportunities offered by electronic commerce transactions	4.09	7
F12	Use of related technologies viz., coding, article numbering etc.	3.66	11

The three factors are identified as ‘community and process driven facilitator’ which indicates network influence and BPR impact on e-commerce development, ‘technology and organizational facilitator’ which indicates CEO’s role/technology related influences and ‘cost savings and fiscal incentives facilitator’ which indicates cost of transaction driven facilitators as indicated in table 3.

As part of this research, the following hypotheses were developed and tested statistically.

Hypothesis 1: The organization’s growth in e-commerce implementation is facilitated more by extrinsic factors than by the intrinsic factors.

The available literature on e-commerce implementation suggests that e-commerce is an unavoidable business compulsion and that if organizations do not adapt to e-commerce, their survival would be at stake. The pressure from the value chain partners is therefore perceived to be a key driver for an organization to adopt e-commerce. The factor analysis results identify three types of facilitators viz. facilitators extrinsic to the organization (community and process driven facilitator), intrinsic to the organization (technology and organizational facilitator) and process related facilitator (cost driven facilitator).

Table 3. Facilitator factors: varimax rotation and principal component factor analysis

<i>Factor</i>	<i>Factor</i>	<i>Components of the factor</i>	<i>Eigen value</i>	<i>Variance per cent</i>	<i>Range of values of factor loading</i>
FF1	Community and process driven facilitator	• Pressure and insistence for EC/EDI mode by foreign buyers.	0.90	7.5	0.51 to 0.91
		• Insistence for EC/EDI mode by other partners of value chain (viz. vendors/suppliers) within country	0.75	6.2	
		• Proactive role by industry associations	0.46	3.8	
		• Re-engineering of business processes	0.34	2.8	
		• Readiness of concerned government agencies	0.25	2.1	
FF2	Technology and organizational facilitator	• Acceptance of electronic transactions under law	4.75	39.6	0.54 to 0.80
		• Involvement of Chief Executive Officer	0.96	8.0	
		• Penetration of internet usage	0.57	4.8	
		• Strategic advantages including enhanced business opportunities offered by electronic commerce transactions	0.18	1.5	
		• Use of related technologies viz., bar coding, article numbering etc.	0.11	0.9	
FF3	Cost driven facilitator	• Cost savings under electronic mode over paper mode of transactions	1.39	11.6	0.73 to 0.82
		• Fiscal incentives for electronic commerce transactions	1.32	11.0	

To test the hypothesis, paired t test between variables F4 (CEO's role) and F6 (value chain insistence) and F4 (CEO's role) and F5 (foreign buyers pressure) was carried out on the universe. The results are indicated in table 4 at serial numbers 1 and 2.

Mean facilitation score of CEO's involvement is more than that of mean facilitation scores of pressure by value chain partners or by foreign buyers at a significance level of .01, thus negating the hypothesis that extrinsic factors facilitate more than the intrinsic factors.

The result also indicates that since e-commerce implementation is a strategic decision, involving investment, managing re-engineered processes and structural changes in the organization, the CEO's role is critical. The role of the intrinsic factors has also been in the e-commerce implementation model of the Directorate General of Foreign Trade (DGFT) in which a flexible e-commerce model with intrinsic factors like CEO's proactive role has been a vital determinant in the implementation.

**Table 4. Comparison of variable 1 with variable 2
(paired t test for validation of hypothesis)**

	Variable 1	Variable 2	Variable 1 (N = 103)		Variable 2 (N = 103)		t value
			\bar{X}	SD	\bar{X}	SD	
1.	F4	F6	4.86	1.16	3.73	1.88	6.12**
2.	F4	F5	4.86	1.16	3.84	1.85	5.43**
3.	F3	F2	3.76	1.72	4.40	1.38	3.72**
4.	I8	I5	4.07	1.43	2.81	1.42	6.53**
5.	I8	I7	4.07	1.43	2.95	1.48	6.93**
6.	I8	I19	4.07	1.43	2.88	1.54	7.04**
7.	I13	I3	3.78	1.48	2.81	1.41	4.49**
8.	I13	I4	3.78	1.48	2.20	1.48	7.01**
9.	I14	I3	4.07	1.58	2.81	1.41	5.40**
10.	I14	I4	4.07	1.58	2.20	1.48	7.67**
11.	EMG1	EMG11	3.88	1.45	3.81	1.22	0.39
12.	EMG4	EMG7	4.75	0.98	3.60	1.39	6.38**
13.	EMG10	EMG11	4.60	1.19	3.81	1.23	4.34**
14.	ME	DE	2.10	0.63	1.88	0.98	2.27**
15.	BPR3	BPR2	2.42	1.13	1.59	1.20	4.40**
16.	GS	IS	2.04	0.99	1.80	0.97	2.37*
17.	GS	CS	2.04	0.98	2.45	0.93	4.71**
18.	CS	IS	2.45	0.93	1.80	0.99	6.67**
19.	OB	SB	3.05	1.63	2.83	1.53	2.98*

\bar{X} : Mean SD: Standard Deviation; N: Sample size

* Significant at .05 Level

** Significant at .01 Level

Hypothesis 2: Fiscal incentives on e-commerce transactions have motivated organizations more for e-commerce implementation than a reduction in the cost of transactions.

There is presently an ongoing debate as to whether e-commerce transactions should be taxed. At present with no tariff on business through e-commerce, such fiscal incentives could have been instrumental in facilitating the growth of e-commerce.

To test this hypothesis, paired t test between variable F3 (Fiscal incentives) and F2 (cost savings) on the universe was carried out. The results are indicated in table 4 at serial number 3.

The mean facilitation score of 'fiscal incentives' facilitator is lower than the mean of the 'cost of transactions benefit' and the difference is also significant at .01 level (in fact .000), thereby not supporting the hypothesis. Therefore it is the reduction in the cost of transaction by e-commerce that facilitates more than fiscal incentives.

The above result tends to support the present scenario in which e-commerce development is not at a level where the organizations are entirely on the e-commerce mode and therefore a revenue implication by way of tariff concession is not all that significant for such an organization. As of now, organizations seem to be deriving more benefits by way of a reduction in the cost of transaction by adopting the e-commerce mode. In the e-commerce model of DGFT, users of the network have been motivated by the fact that the transaction costs have been insignificantly reduced by reduced processing time of the license request and its issuance and therefore reduction in user visits. The requisite license issuance fee is to be paid both in the e-commerce mode and non-e-commerce mode.

Inhibitors to e-commerce implementation

In order to analyse key inhibitors, 20 identified inhibitors from the pilot case studies and literature survey were used and empirically tested on a 7 point scale. The score 0 indicates 'does not inhibit', 1 indicates 'weakly inhibits', 2 indicates 'moderately inhibits', 3 indicates 'significantly inhibits', 4 indicates 'inhibits', 5 indicates 'strongly inhibits' and 6 indicates 'greatly inhibits'. The results are analysed in table 5.

Factors that have inhibited e-commerce implementation are indicated in table 5. The inhibitors with high mean inhibition scores are low level of readiness of major network players in the government's core network, lack of a legal and security framework, low level of priority and infrastructural constraints.

To a significant extent, this also correlates with the facilitation scores of high order facilitators. Thus while readiness of key network players is a facilitator, its low level of readiness is also a inhibitor while the CEO's role is a great facilitator, low order of priority of e-commerce and lack of support of top management also 'inhibits the development of e-commerce implementation. The availability of a 'legal and security' framework has a more facilitating than inhibiting effect.

Table 5. Inhibitors to e-commerce implementation

<i>Variable name</i>	<i>Inhibitors</i>	<i>Mean inhibition score (*)</i>	<i>Rank</i>
I1	Budgetary constraints viz. low investment in IT	2.56	19
I2	Difficulty in assessing tangible benefits accrued by EC/EDI mode of transactions	2.80	17
I3	High prices of EC/EDI software viz. mapping, translation and communication software	2.80	16
I4	High tariff for internet usage	2.20	20
I5	Human resistance to change for new way of operations	2.80	15
I6	Infrastructural constraints like small number of value added networks (VAN's) poor communication facilities etc.	3.64	5
I7	Low perceived strategic benefits of EC/EDI	2.95	13
I8	Low level of readiness of the major EC/EDI players like customs, ports, banks etc.	4.07	1
I9	Low level of internet penetration	3.60	6
I10	Lack of support by top management	3.15	10
I11	Low order of priority of EC/EDI implementation in India	3.68	4
I12	Low level of IT penetration and functional linkages with business operations	3.47	7
I13	Lack of security of EC/EDI transactions over internet	3.78	3
I14	Lack of legal acceptance of EC/EDI transactions	4.07	2
I15	Low level of process re-engineering	3.13	11
I16	Low perception of need of BPR to supplement EC/EDI	3.44	8
I17	Lack of expertise regarding process re-engineering	3.16	9
I18	Lack of professional and technical expertise regarding EC/EDI implementation	3.05	12
I19	Resistance for undertaking requisite re-engineering for EC/EDI operations	2.88	14
I20	Wide gap between IT and user skills	2.58	18

In order to determine clusters of inhibitors, factor analysis using Principal Component Factor analysis was carried out. Six factors with Eigen values of more than 1.0 and collectively accounting for 76.9 per cent of variance were retained after Varimax rotation. The rotated factor loadings on six factors are given in table 6. The six factors of inhibitors are identified as 'technology and resource inhibitors', 'readiness inhibitors' 'BPR and investment inhibitors' 'tariff inhibitors' 'legality related inhibitors' and 'organizational inhibitors'.

Table 6. Inhibitor factors: varimax rotation and principal component factor analysis

<i>Variable name</i>	<i>Factor</i>	<i>Component of the factor</i>	<i>Eigen value</i>	<i>Variance per cent</i>	<i>Range of values of factors loading</i>
F11	Technology and resource inhibitors	• Infrastructural constraints like small number of value added networks (VAN's) poor communication facilities etc.	1.07	5.3	0.53 to 0.84
		• Low level of internet penetration	0.51	2.6	
		• Lack of support by top management	0.46	2.3	
		• Lack of expertise regarding process re-engineering	0.14	0.7	
		• Lack of professional and technical expertise regarding EC/EDI implementation	0.19	0.6	
		• Resistance for undertaking requisite re-engineering for EC/EDI operations	0.09	0.5	
		• Wide gap between IT and user skills	0.08	0.4	
		F12	Readiness inhibitors	• Difficulty in assessing tangible benefits accrued by EC/EDI mode of transactions	
• Low perceived strategic benefits of EC/EDI	0.77			3.9	
• Low level of readiness of the major EC/EDI players like customer, ports, banks etc.	0.66			3.3	
• Low order of priority of EC/EDI implementation in India	0.43			2.2	
• Low level of IT penetration and functional linkages with business operations	0.36			1.8	
F13	BPR and investment inhibitors			• Budgetary constraints viz. low investment in IT	6.70
		• Low level of process re-engineering	0.21	1.1	
		• Low perception of need of BPR to supplement EC/EDI	0.16	0.8	

Table 6. (continued)

<i>Variable name</i>	<i>Factor</i>	<i>Component of the factor</i>	<i>Eigen value</i>	<i>Variance per cent</i>	<i>Range of values of factors loading</i>
FI4	Tariff inhibitors	• High prices of EC/EDI software viz. Mapping translation and communication software	1.81	9.1	0.79 to 0.81
		• High tariff for internet usage	1.70	8.5	
FI5	Legality related inhibitors	• Lack of security of EC/EDI transactions over internet	0.35	1.7	0.85 to 0.90
		• Lack of legal acceptance of EC/EDI penetrations	0.28	1.4	
FI6	Organizational inhibitors	• Human resistance to change for new way of operations	1.27	6.4	0.78

As a part of further analysis on the research issues, the following hypothesis was developed and tested.

Hypothesis 3: Low level of readiness of the key government agencies in the core network has inhibited e-commerce growth more than the low perception of process re-engineering or low perception of its benefits.

To test this hypothesis, paired t test between variables I8 (low readiness level) and I5 (human resistance to change), I8 (low readiness level) and I7 (low perceived strategic advantage) and I8 (low readiness level) and I19 (resistance for re-engineering) on the universe was carried out. The results are shown in table 4 serial numbers 4, 5 and 6.

The low level of readiness of core government agencies has been the highest inhibitor as compared to low perception of BPR, human resistance to BPR and low level of perception of e-commerce benefits, its mean inhibition score is higher than the others at a significant level of .01.

The key government agencies like Customs, port authorities, DGFT, Export Promotion Councils are the core infrastructure of e-commerce facilitation and therefore any growth of e-commerce in the international trade sector is determined critically on the readiness level of these agencies with regard to e-commerce. Also the fact that the process re-engineering in the Indian context has been basically by way of process improvement and of moderate intensity, it has not inhibited with a higher intensity than the low level of readiness of the key government agencies. The case studies of the Directorate General of Foreign Trade and Customs have revealed that it has been the interface issues on the interchange processes that have inhibited rather than the intra-agency re-engineering issues.

Hypothesis 4: The lack of legal and security frameworks have inhibited more than the high prices of software and tariffs for internet.

The organizations have been greatly hesitant to transmit sensitive data on the net. The data of the key trading partners in the e-commerce network is also sensitive. Also the higher costs of software and internet have been dampening e-commerce implementation.

In order to test this hypothesis t test between variables I13 (lack of security) and I3 (high software prices), I13 (lack of security) and I4 (high internet tariff) and I14 (lack of legality) and I3 (high software prices) and I14 (lack of legality) and I4 (high internet tariff) was carried out on the universe. The result are shown in table 4 at serial numbers 7, 8, 9, 10.

The results of paired t test show that mean inhibition scores for lack of legality and security framework are less than the mean inhibition score of higher cost of software and internet tariff at a significance level of .01 level (in fact .000 level) and thus support the hypothesis. Therefore lack of confidence in transactions inhibits e-commerce development.

In 2000, an Information Technology (IT) Act was passed. The transactions on e-commerce in international trade involves transmission of critical information which is of vital interest to the business sector as such transactions include invoice transfer, customs clearances, issuance of approvals on imports, etc. which require a high level of security along with an appropriate legal back up. Also during the time when the data for the study has been collected in (1999-2000), the period witnessed a hype in e-commerce on account of success stories of re-engineering, viz. opportunities flowing from worldwide growth of the internet etc. and the desire to experiment with new technology, the high tariffs on the internet and for software were not considered as an inhibitor. Also during this period, there has been a considerable fall in the prices of internet charges and also of the software on account of web solutions being provided at competitive prices by growth of various Internet Service Providers (ISP). Therefore the mean inhibition score of legal and security framework appears to be adequate in explaining the phenomena of the vibrant period of growth of e-commerce in India.

Management strategies adopted for e-commerce implementation

On the basis of the literature survey and expert opinions gathered during interviews, 12 management strategies were identified which were indicated as primarily guiding e-commerce development in an organization. The response to these strategies was gathered on a 7 point scale. Score 0 indicates 'when the strategy was never used', score 1 indicates 'strategy rarely used', score 2 indicates 'strategy not so often used', score 3 indicates 'strategy moderately used', score 4 indicates 'strategy used around 50 per cent of the time'. Score 5 indicates 'strategy used most of the time',

Table 7. Management strategies for e-commerce implementation

	<i>Management strategy</i>	<i>Mean score (*)</i>	<i>Rank</i>
EMG1	EC/EDI strategy is integrated with international business strategy	3.88	6
EMG2	Investments for EC/EDI is a planned activity	4.62	2
EMG3	Large investments are made for EC/EDI implementation	4.10	5
EMG4	EC/EDI implementation is determined by top management	4.75	1
EMG5	EC/EDI implementation is determined by middle management	3.70	9
EMG6	EC/EDI implementation is determined by buyers	3.56	11
EMG7	EC/EDI implementation is determined by value chain partners	3.60	10
EMG8	EC/EDI implementation is determined by consultants	3.13	12
EMG9	EC/EDI investments are made on return on investments basis	3.87	7
EMG10	EC/EDI implementation is perceived to increase organization's competitive edge	4.59	3
EMG11	Fall in line/business compulsion philosophy guides EC/EDI implementation	3.81	8
EMG12	Business Process Re-engineering (BPR) is perceived as a necessity for effective EC/EDI implementation	4.42	4

score 6 indicates 'strategy used to a large extent'. The response gathered from 103 respondents is reflected in table 7. From the ranking of the mean scores in table 7, it can be seen that the strategies driven by the CEO, planned investment, generating a competitive edge are the higher order strategies adopted by the organizations.

Factors obtained by Principal Component Factor analysis and with Eigen values more than 1 accounting for 67.2 per cent of variance were retained for Varimax rotation. The factor loadings on four factors are given in table 8.

The four management strategies which emerged by the factor analysis are 'BPR and investment driven management strategy', 'fall in line and network driven strategy', 'CEO driven strategy' and 'middle management and customer driven strategy'.

As a part of this research, the following hypothesis was developed and tested.

Hypothesis 5: Organization driven strategy has been more acceptable than the network driven strategy.

In order to test the hypothesis, paired t test was carried out between the variable EMG1 (EC/EDI strategy integrated with international business strategy) and EMG4 (EC/EDI implementation determined by top management) and EMG7 (EC/EDI implementation determined by value chain partners) and EMG10 (EC/EDI implementation perceived to increase organization's competitive edge) and EMG11 (fall in line/business compulsion philosophy guides EC/EDI implementation) on the universe. The results of t test are given in table 4 at serial numbers 11 and 12.

Table 8. Management strategies for e-commerce implementation – factors

<i>Variable name</i>	<i>Factor</i>	<i>Components of the factor</i>	<i>Eigen value</i>	<i>Variance</i>	<i>Range of values of factor loading</i>
FEMG1	BPR and investment driven management strategy	<ul style="list-style-type: none"> • Investment for EC/EDI is a planned activity • Large investments are made for EC/EDI implementation • EC/EDI implementation is perceived to increase organization's competitive edge • Business Process Re-engineering (BPR) is perceived as a necessity for effective EC/EDI implementation 	2.35	19.6	0.57 to 0.82
			1.35	11.3	
			0.36	3.0	
			0.18	1.5	
FEMG2	Fall in line approach and network driven strategy	<ul style="list-style-type: none"> • EC/EDI strategy is value chain partners by value chain partners • EC/EDI investments are made on return on investments basis • Fall in line/business compulsion philosophy guides EC/EDI implementation 	0.60	5.0	0.70 to 0.85
			0.39	3.2	
			0.23	1.9	
FEMG3	CEO driven strategy	<ul style="list-style-type: none"> • EC/EDI strategy is integrated with international business strategy • EC/EDI implementation is determined by top management • EC/EDI implementation is determined by consultants 	3.15	26.2	0.59 to 0.82
			1.21	10.1	
			0.46	3.8	
FEMG4	Middle management and customer driven strategy	<ul style="list-style-type: none"> • EC/EDI implementation is determined middle management • EC/EDI implementation is determined buyers 	0.95	7.9	0.72 to 0.87
			0.77	6.4	

As per result of paired t test, the mean score for the strategy which integrates e-commerce and EDI with international business strategy is more than the mean score of fall in line strategy. The difference is however not significant either at the .05 or the .01 levels. The mean score of strategy being determined by top management is higher than the mean score of strategy being determined by value chain partners as indicated in serial number 12 of table 4. This difference is also significant at .01 level (in fact .000 level). In the implementation of e-commerce in various key organizations such as Customs and DGFT which are the hub of the international trade network, the organizations have driven e-commerce implementation rather than the network influence.

Practices of BPR and factors affecting its implementation

BPR approaches and IT usage

The BPR term as given by Michael Hammer and James Champy (1993) indicated this as a turnaround approach requiring 'heavy blasting', right from clean slate start and not incremental changes such as TQM and Kaizen. IT was advocated as an enabler to BPR and not as mere automation tool. Many other authors, viz. Lon Roberts (1995), Arun Kumar and Khanna (1994) have identified IT's enabling role in BPR. The role of BPR is also evidenced from various e-commerce implementation cases in India.

In order to identify the approach followed in Indian organizations, a 5 point scale was used to capture the approach followed. Score 0 indicates 'non-agreement with the indicated approach. Score 1 indicates 'agreement to a small extent, score 2 indicates 'agreement to a moderate extent', score 3 indicates 'agreement to a significant extent', and score 4 indicates 'agreement to a great extent'.

On the same scale, IT's incidental usage or as a prerequisite to BPR has been evaluated. The BPR approach pattern and IT usage pattern is show in tables 9 and 10.

Table 9. Business process re-engineering – IT usage pattern

<i>IT usage</i>	<i>Mean</i>	<i>Rank</i>
IT usage as enabler is incidental to BPR	2.04	2
IT used as an essential pre-requisite for BPR	3.03	1

Table 10. Business process re-engineering (BPR) approaches

<i>Variable name</i>	<i>Approach</i>	<i>Mean score</i>	<i>Rank</i>
BPR1	Re-engineering carried out to a certain extent in one area and replicated to other functional areas	1.79	3
BPR2	Drastic re-engineering in one area and replicated to other functional areas	1.59	4
BPR3	Moderate re-engineering in all areas but carried out simultaneously	2.42	1
BPR4	Drastic re-engineering in all functional areas cutting across all functional areas	2.17	2

BPR enabled e-commerce

In order to identify the various facilitators and inhibitors to BPR enabled e-commerce, a 7 point scale was used to seek response on the various identified facilitators and inhibitors. The score 0 indicates 'factor does not facilitate or inhibit', score 1 indicates 'factor weakly facilitates or inhibits', score 2 indicates 'factor moderately facilitates or inhibits', score 3 indicates 'factor significantly facilitates or inhibits', score 4 indicates 'factor facilitates or inhibits', score 5 indicates 'factor strongly facilitates or inhibits' and score 6 indicates 'factor greatly facilitates or inhibits'.

The mean inhibition and facilitation scores on the BPR related factors are shown in tables 11 and 12.

Table 11. BPR enabled e-commerce – facilitators

<i>Variable name</i>	<i>Facilitators</i>	<i>Mean facilitation score</i>	<i>Rank</i>
BF1	High perception about need for BPR	3.68	5
BF2	Perception that BPR supplemented EC/EDI initiatives leads to more effective results	4.20	1
BF3	Perception that EC/EDI can not be successfully implemented with out BPR	3.26	8
BF4	Motivation by success stories of other organizations/countries	4.07	2
BF5	Need for drastic change of existing processes	3.69	4
BF6	High adaptability of people to new processes	3.99	4
BF7	High order of complexity in the existing business transactions	3.06	9
BF8	Higher the dependence of organization on international business operations	3.50	7
BF9	Small size of organization	2.13	10
BF10	Rising cost of business transactions	3.50	6

Table 12. BPR enabled e-commerce – inhibitors

<i>Variable name</i>	<i>Inhibitors</i>	<i>Mean</i>	<i>Rank</i>
BI1	BPR is a time consuming exercise	3.10	6
BI2	Low level of perception about BPR	3.45	2
BI4	Lack of resources	3.40	3
BI5	Lack of top management's commitment	3.00	7
BI6	Lack of technical and professional support	3.34	4
BI7	High price of software solutions viz. ERP/SAP	3.55	1
BI9	Resistance against adaptability of new processes	3.34	5

The perception that BPR can supplement e-commerce implementation for effective results and success stories of other implementation projects are highest order BPR enablers. Factors like size of organization, complexity of processes, higher dependence on international business, rising cost of transactions are lower order facilitators. On the inhibition side, high prices of software, low perception of BPR and lack of resources and expertise inhibit BPR implementation.

The mean score for IT usage as an essential prerequisite for BPR is more than that of IT usage being incidental, thus establishing that IT plays a crucial role in the BPR effort. This is also evident from e-commerce implementation practices in various trading partners in the core government network, where e-commerce readiness has been determined by the level of IT diffusion and penetration and its use to enable the re-engineering of processes within the organization and in business network redesign.

Three facilitator factors with Eigen values greater than 1.0 obtained by component factor analysis explain variance of 73.1 per cent, while two inhibitor factors with Eigen values greater than 1.0 explain 65.8 per cent of variance.

The facilitators are seen to be grouped into 'BPR acceptability driven facilitators,' 'complexity and cost driven facilitators' and 'organization culture and structure related facilitators' while inhibitors are grouped as 'BPR process complexity inhibitor' and 'resources availability and CEO's role related inhibitors'.

As part of the research, the following hypothesis was tested on the basis of the data gathered from the 103 respondents.

Hypothesis 6: Drastic re-engineering approach has been less acceptable in the Indian organizations than the moderate re-engineering approach.

The above hypothesis is framed on the basis of the available literature which indicates that Indian organizations have adopted a moderate or path of low resistance to re-engineering.

Table 13. BPR enabled e-commerce – facilitator factors

<i>Variable name</i>	<i>Factor</i>	<i>Components of the factor</i>	<i>Eigen value</i>	<i>Variance</i>	<i>Range of values of factor loading</i>
FBF1	BPR acceptability driven facilitators	• High perception about need for BPR	4.88	48.8	0.61 to 0.88
		• Perception that BPR supplemented EC/EDI initiatives leads to more effective results	1.28	12.8	
		• Motivation by success stories of other organizations/countries	0.80	8.0	
FBF2	Complexity and cost driven facilitator	• Perception that EC/EDI cannot be successfully implemented without BPR	1.14	11.4	0.73 to 0.78
		• High order of complexity in the existing business transactions	0.35	3.5	
		• Rising cost of business transactions	0.15	1.5	
FBF3	Organization culture and structure related facilitator	• Need for drastic change of existing processes	0.48	4.8	0.52 to 0.81
		• High adaptability of people to new processes	0.43	4.3	
		• High the dependence of organization on international business operations	0.25	2.5	
		• Small size of organization	0.23	2.3	

In order to test the above hypothesis a paired t test was used. Items 1 and 3 of table 9 represent moderate re-engineering approach while items 2 and 4 represent a drastic re-engineering approach. The results of paired t test are given in table 4 at serial number 14.

The mean score of variable BPR3 (moderate re-engineering) as compared to variable BPR2 (drastic re-engineering) is higher and the difference is significant at .01 level in fact (.000 level). Thus the moderate re-engineering approach is preferred to the drastic re-engineering approach. This is also explained by the practice of building e-commerce readiness in the various key organizations where customized automation and process simplification is carried out rather than the drastic re-engineering of processes. The Customs and DGFT organization evidence the fact that simultaneous moderate re-engineering in all areas has been the preferred approach.

Table 14. BPR enabled e-commerce – inhibitor factors

<i>Variable name</i>	<i>Factor</i>	<i>Component of the factor</i>	<i>Eigen value</i>	<i>Variance</i>	<i>Range of values of factor loading</i>
FBI1	BPR process complexity inhibitor	• BPR is a time consuming exercise	3.37	48.2	0.65 to 0.91
		• Low level of perception about BPR	1.23	17.6	
		• High price of software solutions viz. ERP/SAP	0.35	5.0	
		• Resistance against adaptability of new processes	0.22	3.2	
FBI2	Resources availability and CEO's role related inhibitors	• Lack of resources	0.72	10.4	0.66 to 0.90
		• Lack of top management's commitment	0.66	9.4	
		• Lack of technical and professional support	0.44	6.3	

E-commerce interaction and pattern of diffusion

The level of penetration and diffusion of e-commerce is varied in different organizations. According to the National Association of Software Companies (NASSCOM) survey of 1999 in 2000-2001 shows, out of \$ 250 million e-commerce transactions, \$ 20 million were B2C while \$ 230 million were B2B. However by 2003, the situation had been reversed with 75 per cent revenue expected from B2C and 25 per cent from B2B.

Interaction pattern with key trading partners

In order to identify the interaction of various organizations with key government organizations information on vital trading partners in the network, response on a 5 point scale was collected from the identified sample of respondents. Score 0 indicates 'no interaction', score 1 indicates 'small degree interaction', score 2 indicates 'moderate degree interaction', score 3 indicates 'significant level of interaction' and score 4 indicates 'high degree of interaction'.

The percentage response under various interaction level and mean interaction score is given in table 15. The interaction pattern shows the business to government (B2G) and business to business (B2B) mode of interaction patterns. The mean interaction score is highest for foreign buyers followed by banks, airlines and customs. Thus the interaction level in B2B mode has been higher than the interaction level of B2G mode.

The interaction pattern is shown in table 15.

Table 15. Trading partners interaction pattern

	<i>*High degree of interaction</i>	<i>*Significant level of interaction</i>	<i>*Moderate degree of interaction</i>	<i>*Small degree of interaction</i>	<i>*No interaction</i>	<i>*Total no. of response</i>	<i>*Mean interaction score</i>	<i>*Rank</i>
Custom	26.2	11.7	16.5	24.3	21.4	100	1.98	4
Banks	17.5	23.3	31.1	11.7	16.5	100	2.15	2
Ports	12.6	19.4	16.5	25.2	26.2	100	1.67	5
Foreign buyers	20.4	25.2	23.3	15.5	15.5	100	2.20	1
Shipping lines	2.9	13.6	26.2	33.0	24.3	100	1.38	7
DGFT	13.6	12.6	8.7	35.0	30.1	100	1.45	6
Airlines	22.3	19.4	19.4	14.6	24.3	100	2.01	3

* per cent of response of total response.

Diffusion pattern in various trade processes

The diffusion is highest on the processes viz. shipping/transport instructions, customs clearance, delivery schedule transactions and order processing as shown in table 16. In terms of importance therefore it is seen that processes pertaining to B2B have assumed higher priority as compared to processes supporting B2G transactions. The level of interaction with size and type of organizations indicates that the interaction level with banks and foreign buyers with larger organizations increases. Such a trend is also significant at .01 and .05 level respectively. Also the correlation with the type of organization indicates that the level of interaction is highest with government organizations.

Table 16. Trade processes diffusion pattern

	<i>Not important at all</i>	<i>Slightly important</i>	<i>Important</i>	<i>Significantly important</i>	<i>Very important</i>	<i>Critically important</i>	<i>Cannot tell for sure</i>	<i>Total per cent response</i>	<i>Mean diffusion score</i>	<i>Rank</i>
Order/invoice processing	0	10.7	26.2	18.4	21.4	23.3	0	100	3.20	4
Delivery schedule transactions	0	10.7	16.5	28.2	27.2	17.5	0	100	3.24	3
Payment advises	0	4.9	33.0	22.30	17.5	22.3	0	100	3.19	5
Regulatory clearances viz. quotas/licences	6.8	13.6	19.4	15.5	30.1	14.6	0	100	2.92	8
Transport/shipping instructions	0	5.8	20.4	13.6	31.1	29.1	0	100	3.57	1
Goods clearance at customs viz. bill of entry etc.	0	6.8	16.5	28.2	31.1	17.5	0	100	3.36	2
Custom duty payment	1.9	8.7	26.2	31.1	20.4	11.7	0	100	2.94	7
Refund of taxes/duties	1.0	5.8	23.3	34.0	19.4	16.5	0	100	3.15	6

The mean interaction score of organizations which is highest for foreign buyers, followed by banks, airlines and customs correlates with the diffusion score observed in the trade process diffusion table which indicates high scores for transport/shipping instructions, customs clearance, delivery schedule and invoices. Thus the interaction and diffusion pattern indicates more B2B transactions than B2G transactions.

Hypothesis 7: The interaction level of key trading partners is higher with government organizations and service providers.

To test the hypothesis correlation coefficients were evaluated. The correlation matrix as given in table 17 reveals that as type value decreases (i.e. government and service providing organizations), the interaction score increases. The correlation of trading partners with size and type of organization shows that interaction with customs, bank, port, shipping lines and regulatory organizations increases with government organizations and such a correlation is significant at .01 level with banks and foreign buyers. The interaction also increases when the size of organization is large, and is significant at .01 and .05 levels.

Table 17. Correlation of pattern of interaction with size and type of organization

<i>Organization</i>	<i>Size</i>	<i>Type</i>
Custom	0.15	-0.43**
Banks	0.33**	-0.43**
Ports	0.15	-0.30**
Foreign buyers	0.09*	-0.22
Shipping lines	0.05	-0.22**
DGFT	0.07	-0.29**
Airlines	0.10	-0.13

* Significant at .05 level

** Significant at .01 level

Determinants of the stages of growth of e-commerce and impact of e-commerce usage on organizations

Four stages of growth of e-commerce as indicated in table 18 were identified and responses from 103 respondents analysed. Table 18 indicates that the highest score is for the consolidation stage and the least is for the integration stage. The e-commerce transactions are increasing as compared to the BPR enabled e-commerce transactions thus indicating that BPR has not necessarily been integrated into the e-commerce implementation practice and approach.

Table 18. Stages of growth of e-commerce

<i>Micro variable name</i>	<i>Variable</i>	<i>Variable name</i>	<i>Mean score</i>	<i>Rank</i>
SG1	There is high level of awareness about EC/EDI in organization	Awareness stage (AS)	2.40	2
SG2	Proportion of EC/EDI mode transactions are more than paper mode transactions	Growth stage (GS)	2.04	3
SG3	Share of EC/EDI transactions to paper transactions are increasing			
SG4	Most of the existing EC/EDI transactions are BPR enabled	Integration stage (IS)	1.80	4
SG5	BPR enabled transactions are increasing			
SG6	The budget on EC/EDI implementation is increasing	Consolidation stage (CS)	2.45	1
SG7	Commitment level of top management is increasing			

Table 19. Percentage response distribution for four stages of growth

	<i>Agree to a great extent</i>			<i>Do not agree</i>		
AS	25.30	11.70	43.70	16.50	2.90	
GS	13.65	18.95	35.45	21.85	10.20	
IS	10.65	8.30	39.80	33.00	8.25	
CS	19.40	26.70	34.45	17.50	1.45	

* 0 = do not agree'

2 = agree to moderate extent;

4 = agree to great extent

1 = agree to small extent;

3 = agree to a significant extent;

Hypothesis 8: The level of integration stage is higher than the growth stage and lower than the consolidation stage.

In order to determine the comparative level of growth, paired t test between variables GS and IS, GS and IS, CS and IS was carried out on the universe. The results are given in table 4 serial numbers 16 to 19.

The level of integration stage is lower than at the growth stage and this difference is significant at .05 level. The level of the consolidation stage is more than that of the integration stage and growth stage which is significant at .01 level. The results of t test show that the level of integration is less than the level of growth. This can also be explained by the fact that BPR is not all that important a facilitator

in terms of its rank in the hierarchy and also the fact that moderate re-engineering is the preferred approach than drastic re-engineering. The hypothesis therefore does not hold.

Hypothesis 9: The level of stages of growth is higher in key government organizations and large organizations.

In order to test the hypothesis a t test was performed comparing type of organization with stages of growth; the results are in table 20.

Table 20. Comparison of stages of growth between type of organization

	<i>Type 1 (N = 29)</i> <i>Government/service providers</i>		<i>Type 2 (N = 74)</i> <i>Trading/manufacturing organizations</i>		<i>t value</i>
	\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>	
AS	2.55	1.12	2.34	1.12	1.87
GS	1.90	0.99	2.10	0.99	0.92
IS	2.16	1.18	1.66	0.89	2.33*
CS	2.80	1.07	2.32	0.84	2.39*
OS	2.56	0.76	2.34	0.63	1.49

* Significant at .05 level

** Significant at .01 level

OS: Overall stage of growth

The level of the three stages of growth in government organizations is higher than in the trading/manufacturing organizations. However, the difference is significant at .05 level for the integration and consolidation stages. This, when looked at from the perspective of the current scenario of e-commerce in India where the key core government organizations such as Customs, DGFT, ports, airlines etc. are in the process of establishing connectivity through business network redesign by process re-engineering and laying communication infrastructure, appears to support the results.

In order to identify the determinants of the stage of development of e-commerce, a regression analysis was done. The results are given in table 21.

As can be seen from table 21 four independent variables have entered into the equation as the regression analysis is performed. 53 per cent of the growth of e-commerce is determined by these independent variables i.e. FEMG1, FEMG3, FBI1, and FBF3. The BPR and investment driven strategy and CEO driven strategy has significant positive effect on the level of stage of growth. In fact these two variables explain 45 per cent of the growth of e-commerce.

Table 21. Determinants of overall stage of growth of e-commerce including EDI – a regression model

<i>Independent variables</i>	<i>Dependent variables (Overall stage)</i>				<i>T value</i>
	<i>Beta coefficient</i>	<i>R square</i>	<i>R square change</i>	<i>Simple R</i>	
BPR and investment driven management strategy (FEMG1)	0.35**	0.34	–	0.58**	4.35
CEO driven strategy (FEMG3)	0.38**	0.45	0.11	0.56**	5.14
BPR process complexity inhibitor (FBI1)	-0.36**	0.51	0.06	-0.30**	3.97
Organization culture and structure related facilitator (FBF3)	0.18*	0.53	0.02	-0.001	2.01

Multiple R = 0.73

R Square = 0.53

* Significant of 0.05 level

** Significant of 0.01 level

The organization culture and structure related process re-engineering facilitators also have a positive effect on the stage of growth. The complexity of BPR has a retarding effect on the stage of growth as the BPR process complexity inhibitor has a negative beta value. The beta value for the four independent variables are significant either at 0.05 level or at 0.01 level.

The regression model of the stage of growth (SOG) of e-commerce is indicated as below:

Regression Model

$$\text{SOG} = -.00299 + (0.35 * \text{FEMG1}) + (0.38 * \text{FEMG3}) \\ - (0.36 * \text{FBI1}) + (0.18 * \text{FBF3})$$

Impact of e-commerce

In order to study the impact of e-commerce on organizations, the following hypothesis was tested by paired t test on the universe.

The response received on the benefits accruing to organizations is indicated in table 22.

Table 22. Benefits from e-commerce usage

<i>Variable name</i>	<i>Variable</i>	<i>Mean score</i>	<i>Rank</i>
BEN1	Improved competitiveness	3.08	1
BEN2	Reduced cost of transactions	3.02	2
BEN3	Improved strategic benefits	2.94	3
BEN4	Business development	2.71	4

Hypothesis 10: The strategic benefits achieved by the organizations by use of e-commerce are more than the operational benefits.

From the results of paired t test in table 4 in serial number 19, the operational benefits achieved are more than the strategic benefits and the difference is significant at 0.05 level. Thus the hypothesis is not proved, as it holds the other way. The lowering of transactions cost due to reduced number of transactions, less visits for clearances and reduced turnaround time have been some of the operational advantages to the users of the e-commerce network in DGFT. The strategic benefits in terms of higher business orders, faster payments, better customer value are possibly some of the strategic advantages which have not come out in the forefront in the country during the study period. The volume of e-commerce transactions was low due to small network size.

II. CONCLUSIONS

The findings of the study on the basis of results obtained by the statistical analysis and the responses received from 103 respondents identify various capacity-building determinants for an organization so as to make it e-commerce capable. As e-commerce has no boundaries, the organizational level issues identified in the context of India are, in fact, relevant at the national level and also at the regional level. The learning issues emanating from the study suggest the following policy issues. These have implications for regional cooperation especially in the ESCAP region.

Building organizational e-capability-facilitators and inhibitors

The findings identify building organizational capability as a more important facilitator for e-commerce development than the environmental facilitation through various value chain partners. Thus, organizational issues viz. core competence and structural capabilities are more relevant and important for organizations. In fact the study indicates that factors which are intrinsic to the organizations viz. involvement

of CEO are more facilitating than extrinsic factors like insistence by foreign buyers or by other value chain partners. The ranking of the inhibitors also indicates that the highest order facilitators are the involvement by CEO, readiness of the key government organizations and any cost savings achieved by e-commerce transactions. The three groups of facilitators are identified as community and process driven facilitators, technology and organizational facilitators and cost-driven facilitators. Fiscal incentives are found to be less motivating than a reduction in the cost of transactions. Low level of readiness of government agencies has been considered as a main inhibitor. In fact more than the low perception of process re-engineering the lack of legal and security frameworks inhibited more than the high price of software and tariffs for internet access. Thus infrastructural bottleneck issues related to e-readiness of core trading partners or lack of secure environment have inhibited more than tariff related issues.

Adopting appropriate management strategies for e-capability

The study also indicates that the organizations followed various management strategies viz. BPR and investment driven, CEO driven, fall in line approach and the strategy driven by middle management and foreign buyers. As indicated by the model on stage of growth, the organizational driven management strategies have been more acceptable than the network driven strategies. The stage of growth has in fact been inhibited by the complexity involved in the BPR exercise. The select case studies of various trading partners have indicated that the transparency which emerges in an e-commerce network needs to be accepted by all stake holders viz. the government and the trading community. User support is critical for the successful implementation of the e-commerce network. For increasing the reach of the network access, flexible network access to users in terms of cost, security and choice of network are essential.

Process reform through big bang re-engineering approach

On the issue of re-engineering, it has been indicated that the organizations have followed a moderate level of re-engineering which implies that the clean slate approach may lead to turbulence in terms of cultural, human resistance, skills set and costs and is therefore not a preferred approach. The re-engineering approach in the trading partners is more organization specific and is focused to reduce the number of processes, frequency of interaction, reduce paper flow and its associated costs and reduce the response time so as to reduce the transaction time on an overall basis. The organizational specific drive overshadows a broader approach to re-engineering which in a rational manner may require eliminating or redeploying certain agencies involved in the international trade process. A re-engineering approach which assumes the relevance of all organizations and enables the re-engineering effort to integrate the re-engineered islands through connectivity may not lead to optimal results. A big

bang approach in re-engineering is required which of course may need bold decisions on redesign of the trade flow processes at the national level; this may in turn lead to a major shakeout. Of course the user flexibility and access should be a vital aspect of the process reform and the re-engineering mission.

Security and legal framework

In process facilitation, security and legal issues have been considered as more vital than tariff issues. This implies that at a national and regional level there is a need for entering into model agreements between various certification authorities which would facilitate e-commerce growth in the region.

Infrastructure development

To increase the reach of e-commerce, there is a need to facilitate growth of private internet bandwidth exchanges and local peering of ISP's, rationalizing taxes on the infrastructure hardware for e-commerce and the license fee structure for the service providers.

Taxation and payment issues

The e-commerce taxation issues have not been accorded primacy over the cost-benefit achieved or achievable by e-commerce implementation. This implies that the debate on issues pertaining to taxation is premature, as the overall volume of e-commerce transactions has not attained a significant level. However there is a need to encourage the augmentation of banking technology infrastructure, develop a regulatory framework to support payment gateways, encourage adoption of new payment methods and finally framing appropriate netting legislation.

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